Winterbourne Wind Farm

Updated Biodiversity Development Assessment Report

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Winterbourne Wind Farm

Updated Biodiversity Development Assessment Report

0760651

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ACRONYMS AND ABBREVIATIONS

Name	Description
ALA	Atlas of Living Australia
ANOSIM	Analysis of Similarity
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BBAMP	Bird and Bat Adaptive Management Plan
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCS	Biodiversity Conservation Science Directorate (NSW)
BC Regulation	*Biodiversity Conservation Regulation 2017* (NSW)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CRM	Collision Risk Modelling
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwlth)
DECCW	Department of Environment, Climate Change and Water (NSW)
DP	Deposited Plan
DPE	Department of Planning and Environment (NSW)
DPI	Department of Primary Industries (NSW)
DPHI	Department of Planning Housing and Infrastructure
EEC	Endangered Ecological Community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
GIS	Geographic Information System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
kV	Kilovolts
LGA	Local Government Area
m	Metres
MW	Megawatts
MWh	Megawatt-hours
MNES	Matters of National Environmental Significance
NA	Nature Advisory Pty Ltd
NEM	National Electricity Market

Name	Description
NGH	NGH Environmental Pty Ltd
nMDS	Non-metric Multidimensional Scaling
NP	National Park
NSW	New South Wales
O&M	Operations and Maintenance
OEH	Office of Environment and Heritage (NSW)
OSOM	Oversized and Overmass
PCT	Plant Community Type
PMST	Protected Matters Search Tool
PP	Pinch Point
REZ	Renewable Energy Zone
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIMPER	Similarity Percentage (quantitative analysis routine in PRIMER 7)
SSD	State Significant Development
SVTM	State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VIS	Vegetation Integrity Score
VMP	Vegetation Management Plan
VZ	Vegetation Zone
WTG	Wind Turbine Generator

GLOSSARY

Term	Description
Assessable vegetation	The extent of vegetation cover within the Subject Land that is required to be assessed for direct impacts. This vegetation is to be assigned to a plant community type with broad condition state.
Benchmark (DPIE 2020)	The quantitative measures that represent the 'best attainable' condition for each PCT, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, no high-frequency burning, and evidence of recruitment of native species.
Biodiversity risk weighting	Use in the BAM to evaluate the ecological risks of threatened entities from the Biodiversity Offsets Scheme (BOS)
Biodiversity values	Being vegetation integrity, habitat suitability and biodiversity-related values prescribed by the *Biodiversity Conservation Regulation 2017* (BC Regulation).
BioNet Vegetation Classification	The vegetation community-level classification (i.e., plant community types) for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. This is published by the Department and available at www.environment.nsw.gov.au/research/Visclassification.htm.
Cleared lands	Lands deemed to be void of native vegetation (s 60J (2) of the *Local Land Services Act 2013* (LLS Act). These are designated as Category 1 – Exempt Land.
Condition attributes	The matters assessed for composition, structure and function to determine vegetation integrity. The condition attributes for composition and structure are assessed according to growth form groups.
Development footprint (DPHI 2020)	The area of land that is directly impacted by a proposed development, including access roads and areas used to store construction materials. The term development footprint is also taken to include clearing footprint.
Development site (DPHI (2020)	An area of land that is subject to a proposed development under the *Environmental Planning and Assessment Act 1979* (EP&A Act)
Direct impacts	Impacts on biodiversity values and threatened species habitat that relate to clearing native vegetation and impacts on biodiversity values prescribed by the BC Regulation. This includes impacts from activities related to the construction or operational phase of the proposal
Habitat suitability (BC Act)	Being the degree to which the habitat needs of threatened species are present at a particular site
Indirect impacts (DPHI 2020)	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts
Low conservation value grasslands	Lands deemed to be low conservation value grasslands (s 60F (3) of the LLS Act). These are designated as Category 1 – Exempt Land.
Minimise (DPHI 2020)	a process applied throughout the development planning and design life cycle that seeks to reduce the residual impacts of development on biodiversity values

Term	Description
No net loss (DPHI 2020)	Refers to the standard set out in Chapter 10 of the BAM that in the opinion of the Minister will result in no net loss of biodiversity in NSW
Patch size	An area of native vegetation that: ▪ occurs on the development site or biodiversity stewardship site ▪ includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.
Plant community type	A NSW plant community type identified using the PCT classification system.
Prescribed impacts	Means the prescribed impacts identified in clause 6.1 of the BC Regulation. Prescribed impacts can be direct or indirect impacts.
Residual impact	An impact on biodiversity values that remains after all reasonable measures have been taken to avoid, minimise or mitigate the impacts of development. Under the BAM, an offset requirement is determined for the remaining impacts on biodiversity values.
Risk of extinction	The likelihood that the local population, CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on its viability
Significant impact (EPBC Act)	A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance.
Shannon-Weiner Index	The Shannon-Wiener Index is a measure of biodiversity that considers both species richness and evenness. It ranges from 0 to 5, with higher values indicating greater diversity. Values below 1.99 are considered very low, 2.0-2.49 are low, 2.50-2.99 are moderate, 3.00-3.49 are high, and 3.50 and above are very high. In most ecological studies, values typically fall between 1.5 and 3.5. (Beals, Gross and Harrell, 2000)
Subject Land	The Subject Land is the land subject to the development proposed. This area is taken to be the development footprint, which is the area of direct impact requiring the clearing of native vegetation and habitat by the Project.
Vegetation integrity (DPHI 2020)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.
Vegetation zone	a relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state.

DECLARATIONS

Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I, Mark Aitkens, certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the ***Biodiversity Conservation Act 2016*** (BC Act).

Signature:	
Date:	18 June 2025
BAM Assessor Accreditation Number: BAAS17034	

Conflict of Interest

I, Mark Aitkens, declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interest of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature:	
Date:	18 June 2025
BAM Assessor Accreditation Number: BAAS17034	

Details and experience of contributors to the preparation of the BDAR

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EXECUTIVE SUMMARY

OVERVIEW

WinterbourneWind Pty Ltd (the Applicant) proposes to construct, operate, maintain, and decommission the Winterbourne Wind Farm (the Project) within the rural locality of Walcha, New South Wales (NSW). The Applicant seeks development approval under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act) as a State Significant Development (SSD). This requires the preparation of a Biodiversity Development Assessment Report (BDAR) as the Project has a significant impact on biodiversity values (s7.14 of the *Biodiversity Conservation Act 2016* (BC Act)).

This Updated BDAR is the third version prepared for the Project to assess impacts relating to an amended Project and to address matters raised in public and agency submissions, particularly agency advice provided by the Conservation Programs, Heritage and Regulation (CPHR) [formerly Biodiversity Conservation Division].

PURPOSE OF BDAR

The purpose of this BDAR is to identify and assess biodiversity values in accordance with the Biodiversity Assessment Method (BAM) 2020, which sets the 'no net loss' impact standard for impacts on biodiversity. This includes:

- Defining the biodiversity values of the Subject Land[1] (Stage 1 assessment); and
- Assessing direct, indirect and prescribed impacts on these biodiversity values (Stage 2 assessment).

The assessment requires implementation of the Mitigation Hierarchy, which is a process that shapes the Project to avoid and minimise impacts on biodiversity values. Mitigation measures are also proposed to address impacts.

All impacts that cannot be avoided or minimised are termed 'residual impacts'. These are quantified by mapping native vegetation into vegetation zones (VZs), which comprise a plant community type (PCT) in a broad condition state[2]. A vegetation integrity score (VIS) is calculated for these VZs using data collected in BAM plots. VIS measures vegetation condition relative to benchmark data (i.e., flora composition and structure and function (habitat)). The extent of impacts on threatened species is also estimated. This determines the biodiversity offset liability incurred by the Project.

These impacts are expressed in biodiversity credits (i.e., ecosystem and species credits), which are to be sourced from comparable approved biodiversity stewardship sites (i.e., offset sites) using 'like for like' trading rules to achieve the 'no net loss' objective of the BAM.

[1] The Subject Land: is the land subject to the development proposed. This area is taken to be the development footprint, which is the area of direct impact requiring the clearing of native vegetation and habitat by the Project.
[2] Broad condition state: areas of the same PCT that are in relatively homogeneous condition. The assessment of broad condition state is used to stratify areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.

THE PROJECT

The Project involves the construction, operation, maintenance and decommissioning of:

- Up to 118 wind turbine generators (WTG) with a hub height of 149 metres (m) and maximum tip height of 230 m (vertical tip);
- A battery energy storage system (BESS) of up to 100 MW/200 MWh capacity;
- Two 33/330 kV electrical substations, including control room, transformers, circuit breakers, switches, and other ancillary equipment;
- Ancillary infrastructure including (but not limited to) internal access tracks, road upgrades, meteorological masts (met masts), and an operation and maintenance (O&M) facility; and
- Temporary elements required during the construction phase, including an on-site quarry, water supply and storage from groundwater bores, mobile concrete batching plant, site buildings and facilities for workers, and hardstand laydown areas.

The disturbance footprint of the Project (i.e., Subject Land) assessed in the Updated BDAR is approximately 882.08 ha, which is 296 ha larger than the disturbance footprint assessed for the EIS Project Layout. The footprint has increased by including some local roads where upgrades are required, an on-site quarry, and amended design of access tracks and some turbines to improve constructability.

The disturbance footprint is nested within numerous participating properties (associated landowners) collectively known as the Project Area[3]. The Project Area has an approximate area of 21,844 ha and, being linear, is approximately 220 km in length.

ASSESSMENT HISTORY

This report is the third in a series of three BDARs, which have been prepared in response to project footprint iterations refined by ecological data gathered for the site over a five year period. It builds on the information gained from two earlier versions of the BDAR, these being the EIS BDAR prepared by NGH (2022) and the Amended Project BDAR prepared by ERM (2024). The chronology and key elements of these assessments are outlined in **Table E-1**.

TABLE E-1 CHRONOLOGY OF BIODIVERSITY ASSESSMENTS

Project BDAR	Comments
EIS BDAR (NGH 2022)	Assessed disturbance footprint of 584.76 ha (157.81 ha Category 1 – Exempt Land and 426.95 ha Category 2 – Regulated Land), excluded local roads EIS Layout design Included a Land Categorisation Assessment
Amended Project BDAR (ERM 2024)	Assessed disturbance footprint of ~910 ha, included local roads (~108 ha) Amended Report Layout design including a significant number of turbines being relocated or micro-sited and associated access pathways with consideration for constructability Excluded a Land Categorisation Assessment
Updated BDAR (ERM 2025) (this BDAR)	Assessed disturbance footprint of ~882 ha, included local roads (~80 ha) Refined Amended Report Layout incorporating small changes to access pathways and correction of footprint required in the local road network (i.e., overestimate of local road upgrades in Amended Project Layout) Included a Land Categorisation Assessment for the Amended Project Layout

[3] Combined area of all participating/host properties

An iterative approach to Project design involved further avoidance of higher biodiversity values (e.g., woodlands and forests) by placing Project infrastructure in areas of low biodiversity value. Impact minimization was achieved by aligning the Project footprint to areas of moderate condition grasslands, otherwise degraded by loss of woody vegetation.

Most of the Project design amendments were assessed in the Amended Project BDAR (ERM 2024) along with consideration of updates relating to agency submissions. The Updated BDAR (this BDAR), has focused on responding to additional submissions received and some additional Project design amendments that have been made to further reduce ecological impacts.

BIOREGIONAL CONTEXT

The Project Area is located within the Walcha Plateau Interim Biogeographic regionalization of Australia (IBRA) subregion of the New England Tablelands IBRA bioregion and Niangala Plateau and Slopes Mitchell Landscape. These are generally described as over cleared landscapes where native vegetation cover has been reduced to between 10-30% cover. The remaining cleared area is almost entirely developed for agriculture (e.g., cropping/ livestock grazing).

East of Walcha and within the Project Area, vegetation occurs on a high rolling plateau of elevation between 1050 to 1400 m with local relief of 100 m. Vegetation is formed mainly on steeply dipping sedimentary geologies (Devonian slate, phyllite, tuff, sandstone, conglomerate, chert and jasper, faulted Permian conglomerate, sandstone and mudstone, Carboniferous sandstone, slate and schist) with small areas of Permian granite. These conditions give rise to low to moderate soil fertility, with higher soil fertility restricted to isolated occurrences of basaltic soils. Higher biodiversity values are generally found in the more over cleared landscapes, particularly on soils with higher fertility.

Higher altitudes, which are mostly in the eastern third of the Project Area, comprise vegetation communities dominated by narrow-leaved peppermint (*Eucalyptus radiata*), messmate (*Eucalyptus obliqua*) and mountain gum (*Eucalyptus dalrympleana* ssp. *heptantha*), with snow gum (*Eucalyptus pauciflora*), black sallee (*Eucalyptus stellulata*) and ribbon gum (*Eucalyptus nobilis*). Tall open forest of New England blackbutt (*Eucalyptus andrewsii* ssp. *campanulata*), silver-top stringybark (*Eucalyptus laevopinea*), diehard stringybark (*Eucalyptus cameronii*), narrow-leaved peppermint (*Eucalyptus radiata*) occurs on the moist plateau margins.

Central and western parts of the Project Area comprise woodland of snow gum and black sallee on western ridges, with manna gum (*Eucalyptus viminalis*) and mountain gum on mid-slopes and New England Peppermint (*Eucalyptus nova-anglica*) in the valleys on cold sites. Open forest of broad-leaved stringybark (*Eucalyptus caliginosa*), Yellow Box (*Eucalyptus melliodora*), narrow-leaved peppermint (*Eucalyptus radiata*), and narrow-leaved black peppermint (*Eucalyptus nicholii*) occur on better soils.

According to regional geological maps, vegetation found on basalt-derived soils is uncommon in the Project Area. These consist of open forests and woodlands of manna gum, snow gum and black sallee.

Cold-air drainage inverts the tree patterns in wide valleys, as the distribution of these species is largely determined by climate parameters.

Vegetation communities growing on basaltic soils consist of broad-leaved stringybark, New England blackbutt, and narrow-leaved peppermint on the hills, with Yellow Box, wattle-leaved peppermint (*Eucalyptus acaciiformis*), New England Peppermint, snow gum, black sallee and ribbon gum in the valleys.

Historical land clearing started in the mid to late 1800's with considerable widespread pasture development and cropping emerging in the 20th century and continuing to this day. Most of the historical land clearing focused on the more arable lands (i.e., flatter more fertile soils), thus disproportionately focused on valley floors and adjacent slopes. These lands typically comprised the most threatened vegetation cover of the region, with present day incidence of native vegetation cover in these parts of the Project Area being restricted to isolated trees and small patches amid treeless lands comprising modified pastures and cropping.

Native vegetation cover predominantly occurs on the upper slopes and ridges where land clearing and pasture modification efforts have been less prominent. Consequently, grasslands in these parts of the Project Area typically comprise a greater native species component.

WOODY VEGETATION COVER: A PROXY FOR HIGH BIODIVERSITY VALUES

Prior to European settlement, the natural vegetation of the eastern New England Tablelands mostly comprised a mosaic of grassy eucalypt woodlands and forests of montane to subalpine character with an average of 30 large trees per hectare. Post European settlement, recent aerial imagery plainly shows the change in woody vegetation cover throughout the region, which is now sparse and generally found in less arable areas such as ridgelines and steep sided hillsides. Scattered trees and small patches predominate in the flatter country where land clearing and disturbance/modification for grazing and cropping is most prominent.

The extent of forests and woodlands within the Project Area (i.e., 21,844 ha) and Subject Land (i.e., 882.08 ha), was estimated from the NSW Native Vegetation Woody Vegetation Extent 2011 (https://datasets.seed.nsw.gov.au/dataset/nsw-woody-vegetation-extent-2011c0569), as shown in **Chart E-1**.

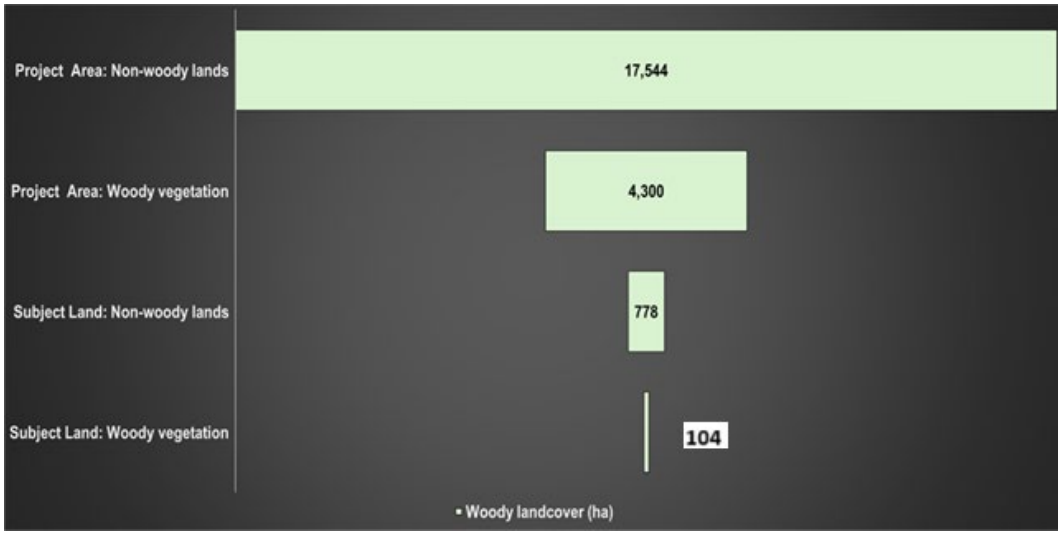


CHART E-1 WOODY AND NON-WOODY VEGETATION COVER OF THE PROJECT AREA AND SUBJECT LAND

Approximately 12% or 104 ha of the Subject Land is mapped as woody vegetation, with the Project Area having nearly 20% or 4,300 ha woody vegetation.

Proportionally, the Subject Land contains less forest and woodland than the Project Area (i.e., 12% versus 20%). This difference reflects design efforts to place or locate the Project in a manner that avoids impacts on lands with higher biodiversity value. However, some unavoidable impacts do arise where topography and associated constructability challenges necessitate the clearing of native vegetation.

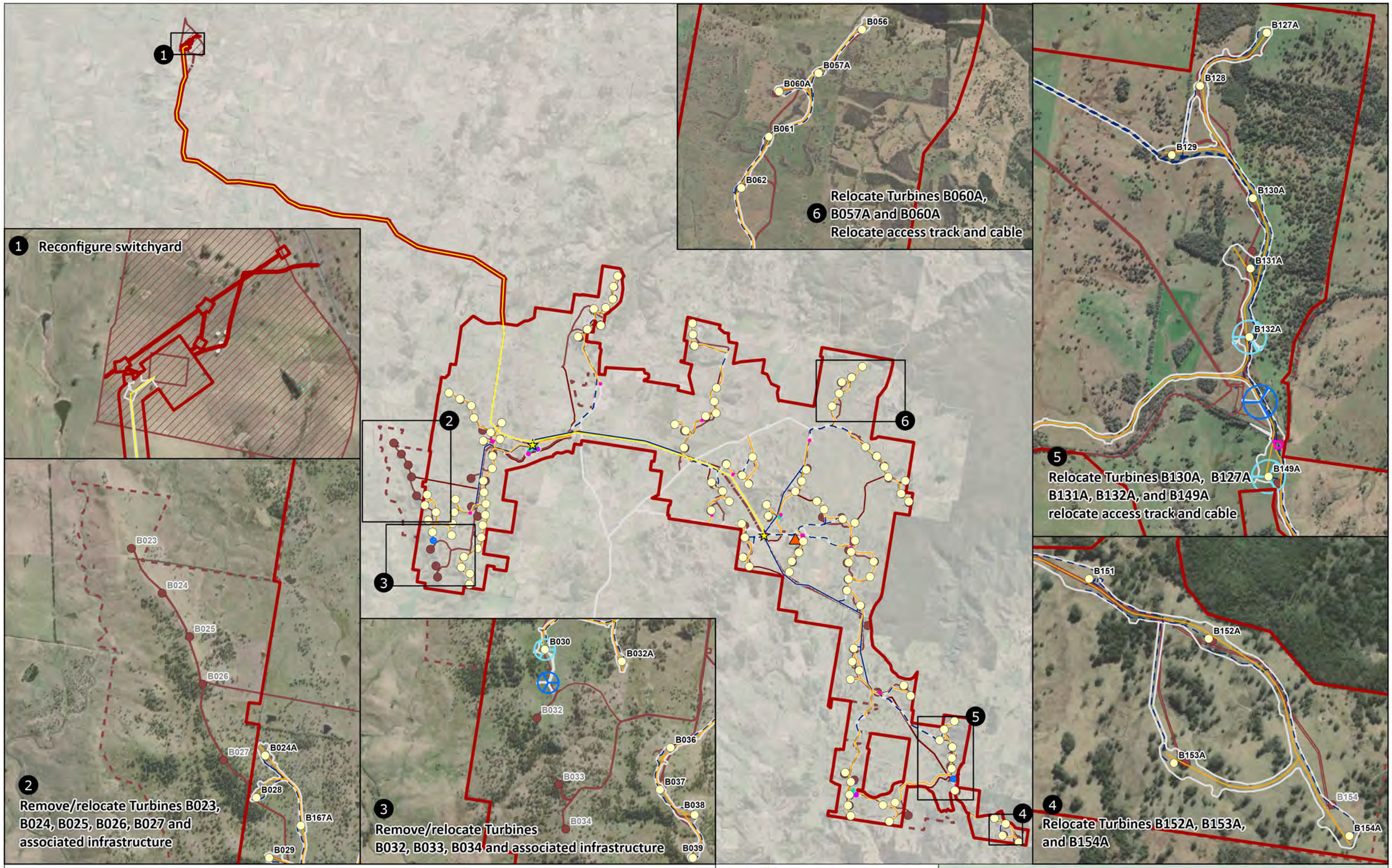
AMENDED DESIGN, ADDRESSING SUBMISSIONS AND BCS ADVICE

Design amendments have been made since the exhibition of the EIS (November 2022 to January 2023), with further amendments made following the exhibition of the Amendment Report (October to November 2024). The reduced impact from these recent changes has been assessed in this Updated BDAR. The locations of further key/latest layout amendments are shown in **Figure E-1** and summarised in **Table E-2** below.

TABLE E-2 FURTHER KEY DESIGN AMENDMENTS THAT REDUCED BIODIVERSITY IMPACTS

Map Area	Project Amendment	Impact/benefit
1	Footprint for switchyard refined in location and area	Predominantly located within low condition grasslands
2	Relocated turbines B023, B024, B025, B026, B027 and associated infrastructure	Avoided impacts on woody vegetation, thus reducing impacts on areas of higher VIS and habitat that may be occupied by threatened fauna. Reduced potential for indirect impacts on larger patches of remnant native vegetation. Lowered the risk of turbine strike on bird and bat species as removed turbines were nested within native vegetation.
3	Relocated turbines B032, B033, B034, and associated infrastructure	Avoided impacts on woody vegetation, thus reducing impacts on areas of higher VIS and habitat that may be occupied by threatened fauna. Reduced potential for indirect impacts on larger patches of remnant native vegetation.
4	Relocate turbine B60A, relocate access track and cable	Aligned impacts with lower condition grasslands.
5	Relocate turbines B130A, B131A, B132A, and B149A. Relocate access track and cable.	Aligned impacts with lower condition grasslands. Reduced direct impacts on native vegetation including movement pathways for the Southern Greater Glider.
6	Relocate turbines B152A, B153A, and B154A. Relocate track.	Minor reduction in direct impacts on woody vegetation (construction impacts).

The updated direct impacts on biodiversity values are summarized in **Table E-3** and **Table E-4**. These compare the ecological impacts determined by the NGH BDAR in 2022, with the latest Updated BDAR. Note that the mapping of vegetation in the Subject Land has been improved by further and more detailed assessments of land categories. This has illustrated that a higher proportion of the grasslands in the subject land have a lower VIS than was previously mapped by the NGH BDAR. There have also been further design modifications that have resulted in lesser ecological impacts as reflected in the tables below.



Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Ancillary Infrastructure
- Transmission Line
- Substations
- Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

Created By: VN

Drawing Size: A3

0 2 4 6km

1:160,000

E-1 Key Project Amendments (Map 1 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

1
Relocate Turbines B015A,
B016A, B018A
Relocate access track and cable
Add 33kv overhead line
Add Contractor Laydown

2
Relocate turbines B020A, B025A,
B026A, B027A, B028A, B034A,
B045A, B167A, B172A
Relocate access track and cable
Remove cable
Add 33kv overhead line

3
New access track and cable

4
Relocate Turbine B146A
Relocate access track and cable

5
Relocate Turbines B139A,
B140A, B141A, B142A
Relocate access track and cable
Relocate Ancillary Infrastructure

6
Relocate Ancillary Infrastructure
Add 33kV overhead line
Remove cable
Modify 330kv Transmission Line

Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Ancillary Infrastructure
- Transmission Line
- Substations
- Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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E-1 Key Project Amendments (Map 2 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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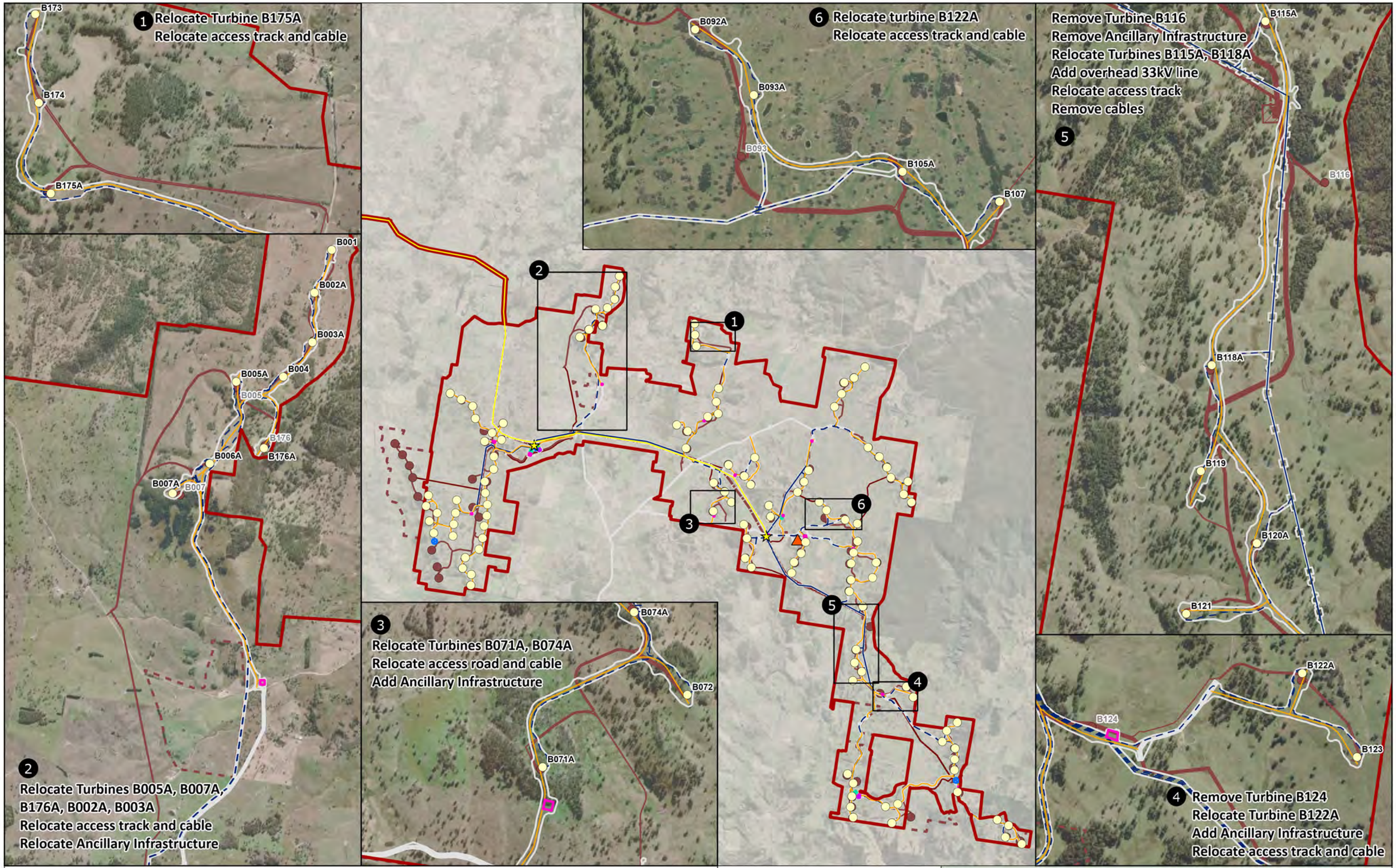

Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Transmission Line
- Substations
- Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
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E-1 Key Project Amendments (Map 3 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

1 Relocate access track and cable
Add Ancillary Infrastructure

B051
B052
B053
B054A
B046
B047A
B048A

Relocate Turbines B082A, B086A,
B087A, B092A, B093A
Relocate access track and cable
Add 33kV Overhead Line
Add Ancillary Infrastructure

7

B086A
B087A
B088
B092A
B093A
B081
B082A
B093
B105A

6
Relocate Turbines B063A,
B064A, B066A, B065A,
B069A, B070A
Relocate access track and cable

B063A
B064A
B065A
B066A
B068
B069A
B070A

5 Relocate Turbines B105A, B109A,
B110A, B111A, B112A, B116A
Relocate Ancillary Infrastructure
Relocate access track and cable

B105A
B107
B108
B109
B109A
B111A
B110A
B116A
B112A

1
2
3
4
5
6
7

Relocate Turbines B073A, B076A, B078A., B079A
Relocate access track and cable
Relocate Transmission Line
Add Ancillary Infrastructure

2
B083
B076A
B078A
B073A
B079A

3
B169
B170A
B171
Relocate Turbine B170A
Relocate access track and cable
Add Ancillary Infrastructure

B102
B112A
B113A
B115A

4
Relocate Turbines B112A, B113A, B115A
Replace cable with 33kV overhead line

Legend

Amendment Layout
Project Area
Subject Land
Turbines
330kV Transmission Line
Substation/Switchyard
Quarry
Battery Energy Storage System
Concrete Batch Plant
Contractor Laydown
O&M Building
Construction Compound
Permanent Met Mast
Temporary Met Mast
Access Tracks
33kV Overhead Line
Underground Electrical Cable
EIS Layout
Wind Farm Boundary
Turbines
Transmission Line
Substations
Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

E-1 Key Project Amendments (Map 4 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

TABLE E-3 REVISED DIRECT VEGETATION IMPACTS

Landcover	NGH 2022 BDAR Area (ha)	Updated BDAR Area (ha)	*Comment – reasons for changes*
Excluded Lands			
Planted or urban vegetation/ Exotic grassland	Not reported	1.29	Not differentiated in NGH mapping
Category 1 - Exempt Land			
Water/roads/Planted or urban vegetation	Not reported	13.15	Not differentiated in NGH mapping
Low conservation value grasslands	157.81	402.06	A large increase of Category 1 - Exempt Land in response to an update to the Subject Land boundary (~296 ha). Additions to the development footprint mostly align with Category 1 – Exempt Land.
Category 2 - Regulated Land			
Water/ Roads/Non-indigenous vegetation cover/Planted or urban vegetation	Not reported	1.45	Not differentiated in NGH mapping
Low condition grassland (i.e., VIS*<15)	103.18	207.60	Increase associated with: ▪ Larger Subject Land area (~296 ha); ▪ Re-interpretation of PCT broad condition states using LCA[4] transects improved differentiation between low and moderate grasslands; ▪ Additional BAM plot sampling to identify and quantify lower condition grasslands; and ▪ LCA analysis indicates a large proportion of vegetation should be mapped as significantly disturbed or modified (Category 1 – Exempt Land) but retained in assessment as Category 2 – Regulated Land due to percent indigenous vegetation cover >50% (e.g., 68.80 ha in VZs 37 and 43).
Low condition grassland (i.e., 15<VIS<30)	12.28	112.80	Increase associated with: ▪ Larger Subject Land area (~296 ha); ▪ Re-interpretation of PCT broad condition states using LCA transects improved differentiation between low and moderate grasslands; and ▪ Additional BAM plot sampling to identify and quantify lower condition grasslands.
Moderate condition grassland (i.e., VIS>30)	103.31	22.82	Decrease associated with: ▪ Re-interpretation of PCT broad condition states using LCA transects improved differentiation between low and moderate grasslands; and

[4] LCA = Land Categorisation Assessment

Landcover	NGH 2022 BDAR Area (ha)	Updated BDAR Area (ha)	*Comment – reasons for changes*
			▪ Additional BAM plot sampling to identify and quantify moderate condition grasslands
Montane Bog	1.60	1.58	Little difference
Low condition woody vegetation (i.e., VIS<17)	0.00	1.30	Associated with highly modified vegetation. Includes ERM (2025) mapping of low condition shrubland (0.96 ha) and open woodlands (1.68 ha) with low condition groundcover vegetation characterized by overabundant native grasses and low plant species richness
Low condition woody vegetation (i.e., 17<VIS<30)	0.00	12.38	Associated with highly modified vegetation limited to VZ 35 (PCT 965) where groundcover vegetation characterized by overabundant native grasses and low plant species richness. This VZ is surrounded by low condition grassland (i.e., VZ 37)
Moderate condition woody vegetation (i.e., 30<VIS<60)	110.33	40.31	Increased accuracy of vegetation mapping used to aid avoidance of woody vegetation cover, which is associated with higher VIS.
High condition woody vegetation (i.e., VIS>60)	96.25	65.34	Increased accuracy of vegetation mapping used to aid avoidance of woody vegetation cover, which is associated with higher VIS.
Total	**584.76**	**882.08**	Assessable native vegetation cover increased from 426.95 ha (NGH 2022) to 464.13 ha (this BDAR). This increase is largely due to the inclusion of ~80 ha of local road corridors, which comprises ~42.6 ha of Category 2 – Regulated Land vegetation. However, native vegetation impacts requiring offsets have reduced from ~324 ha (NGH 2022) to ~255 ha (this BDAR). This decrease is due largely to the improved mapping of low condition grasslands / VIS quantification. Improved condition mapping has aided the locating of Project infrastructure in areas with least biodiversity value.

* VIS = Vegetation Integrity Score

As shown in these tables, the impacts on higher integrity vegetation (Category 2), critically endangered ecological communities (CEECs), endangered ecological communities (EECs) and various threatened species have been reduced by the latest modifications to the project.

TABLE E-4 CHANGE IN IMPACTS THROUGH PROJECT AMENDMENTS/BDAR REVISIONS

Relevant matter	Condition state/ Species	Direct impacts (ha)		
		2022 BDAR	Updated BDAR	Change
Native vegetation communities and ecosystem species	VIS < 17[5]	85.23	162.76	+ 77.53
	VIS > 17	153.11	192.66	+ 39.55
CEECs (Serious and Irreversible Impact[6] (SAII) entities)	VIS < 15[7]	0.00	46.11	+ 46.11
	VIS > 15	163.41	36.27	- 127.14
EECs (non SAII entities)	VIS < 15[7]	17.95	0.00	- 17.95
	VIS > 15	7.25	26.3	+ 19.05
Habitat for threatened species – species credit species	Austral Toadflax	0.00	0.60	+ 0.60
	Barking Owl	17.70	1.24	- 16.46
	Bluegrass	13.20	4.22	- 8.98
	Leafless Tongue Orchid	0.00	1.56	+ 1.56
	Koala	206.90	104.81	- 102.09
	Narrow-leaved Black Peppermint	13 individuals	136 individuals	+ 123 individuals
	South-eastern Glossy Black-Cockatoo	33.80	7.49	- 26.31
	Southern Greater Glider	206.50	91.00	- 115.5
	Southern Myotis	0.00	11.86	+ 11.86
	Squirrel Glider	206.50	119.15	- 87.35
	Eastern Cave Bat	0.00	9.38	+ 9.38

BIODIVERSITY VALUES OF THE SUBJECT LAND

Approximately 464.13 ha of native vegetation cover mapped within the Subject Land requires assessment for direct impacts, which is less than that assessed in the Amended BDAR (ERM 2024) as shown in **Chart E-2**. The significant drop in assessable vegetation is a consequence of assigning Category 1 – Exempt Land to large areas of the Subject Land.

[5] No offset is calculated where the VIS is < 17 for a PCT associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
[6] SAII: impacts likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct in accordance with the principles set out in clause 6.7(2) of the BC regulation
[7] No offset is calculated where the VIS is < 15 for a PCT representative of an EEC or a CEEC

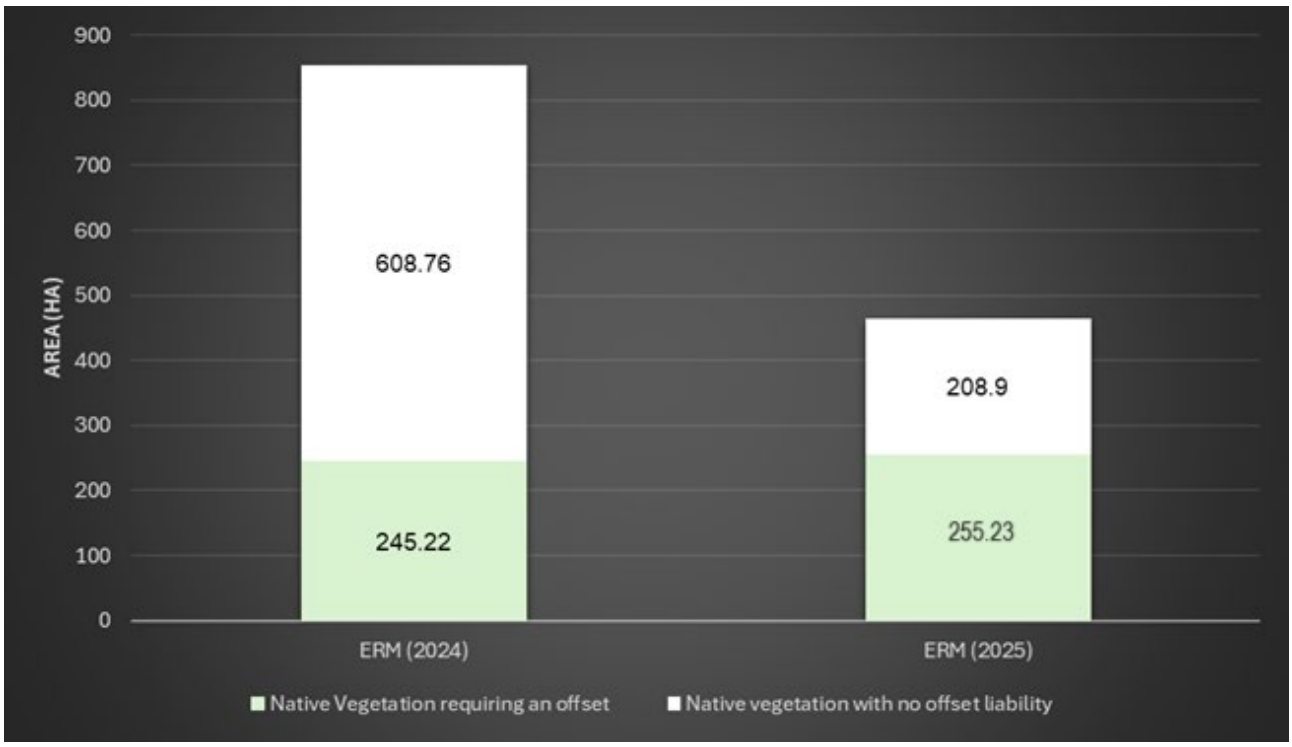


CHART E-2 ASSESSABLE VEGETATION: ERM (2024) VERSUS THIS ASSESSMENT

A broad characterisation of this native vegetation cover is provided in **Table E-5**.

TABLE E-5 BROAD CHARACTERISATION OF NATIVE VEGETATION COVER

Native vegetation cover	Description	Area (ha)
Woody vegetation cover	Landcover comprising plants of the tree growth form.	119.33
Sedgeland	Naturally occurring non-woody vegetation.	1.58
Moderate condition grassland	Landcover derived from woody vegetation not comprising plants from the tree growth form. Moderate to high groundcover species richness and/or percent cover.	135.62
Low condition grassland	Landcover derived from a woody vegetation type not comprising plants from the tree or shrub lifeform. Low to moderate groundcover species richness and/or percent cover.	207.60

The BAM requires all lands comprising assessable vegetation to be mapped and assigned to a plant community type (PCT). Native vegetation cover in the subject land was classified into 14 PCTs as detailed in **Table E-6**.

TABLE E-6 PLANT COMMUNITY TYPES IN THE SUBJECT LAND

PCT	PCT Name	ERM (2024) (ha)	This Assessment (ha)	Net change (ha)
501	Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	7.18	9.00	+1.82
510	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	68.53	30.63	-37.90
533	New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	0.62	0.66	+0.04
534	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	96.88	51.09	-45.79
565	Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	7.67	17.24	+9.57
567	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	126.37	46.55	-79.82
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	214.56	143.22	-71.34
571	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England	45.46	42.19	-3.27
766	Carex sedgeland of the slopes and tablelands Bioregion and NSW North Coast Bioregion	1.58	1.58	0.00
965	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	133.02	42.38	-90.64
970	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	130.25	55.94	-74.31
1192	Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland	17.34	22.06	+4.72
1194	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	4.50	0.93	-3.57
1512	Fuzzy Box open forest of the New England Tableland Bioregion	0.00	0.66	+0.66
Total		**853.98**	**464.13**	**-389.86**

The large reduction in the mapped extent of PCTs reflects the effect of more refined mapping of land categorization. Land categorization identified and mapped 'low conservation value grasslands' that were included in Category 1 – Exempt Land (i.e., excluded from assessment), which were previously assessed in the Amended BDAR (ERM 2024) as native vegetation.

Four threatened ecological communities (TECs) in varying condition states have been mapped within the Subject Land. The total area of these TECs is listed in **Table E-7**. The area is subdivided into high, moderate, low moderate and low condition based on VIS scores.

TABLE E-7 TECS IMPACTED BY THE PROJECT

TEC	PCT	Structure	Condition	VIS (range)	Area (ha)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	510	Woody	High[8]	83.0	0.96
			Moderate[9]	58.0	4.32
		Non-woody	Low - moderate[10]	28.9 to 33.0	11.12
			Low[11]	12	14.23
New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	533, 534	Woody	High[8]	62.3 to 72.5	5.75
			Moderate[9]	41.8 to 47.2	0.72
		Non-woody	Moderate[10]	22.8 to 30.2	13.40
			Low[11] (no offset)	11.3	31.88
Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	766	Wetland	Moderate[9]	62.2	1.18
			Low[11] (no offset)	6.9	0.40
Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion	1192, 1194	Woody	High[8]	71.4	0.93
			Moderate[9]	52.9	2.82
		Non-woody	Moderate[10]	32.6	1.22
			Low[11] (offset)	16.4	18.02

Each mapped PCT was subdivided in the mapping into vegetation zones (VZs) of different quality. Forty-four VZs were used to define the broad condition states of 14 PCTs mapped within the Subject Land (e.g., grasslands, sedgelands, open woodlands, woodlands and open forest). The mapped area of each PCT and associated number of VZs are listed in **Table E-8**.

[8] High VIS is >60
[9] Moderate VIS is 30 - 60
[10] Low – moderate VIS is 15 - 30 for degraded non-woody vegetation (i.e., grasslands) identified as part of a threatened ecological communities (TECs)
[11] Low VIS is <15 for degraded non-woody vegetation (i.e., grasslands) identified as part of a TEC with no offset liability

TABLE E-8 PCTS AND VEGETATION ZONES IN THE SUBJECT LAND

PCT		VZs	Area (ha)Error! Bookmark not defined.	BAM Plots
501	Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	2	9.00	6
510	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	6	30.63	21
533	New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	2	0.66	4
534	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	5	51.09	24
565	Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	3	17.24	11
567	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	3	46.56	11
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	5	143.22	24
571	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England	3	42.19	10
766	Carex sedgeland of the slopes and tablelands Bioregion and NSW North Coast Bioregion	2	1.58	2
965	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	4	42.37	11
970	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	4	55.93	15
1192	Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland	3	22.06	6
1194	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	1	0.93	1
1512	Fuzzy Box open forest of the New England Tableland Bioregion	1	0.66	1

For each threatened species found or considered likely to occur in the subject land, species "polygons" were mapped. Species polygons are mapped areas of estimated habitats of threatened species. These were established for threatened species classed as 'species credit species' in the Threatened Biodiversity Database Collection (TBDC). A species polygon was developed for 11 species credit species as outlined in **Table E-9**.

TABLE E-9 SPECIES CREDIT SPECIES POLYGON EXTENT

Species credit species	Polygon extent
Barking Owl (*Ninox connivens*)	800 m radius from recorded owl where suitable hollow-bearing tree intersect with woody PCTs. Excludes grasslands.

Species credit species	Polygon extent
Bluegrass (*Dichanthium setosum*)	Polygon incorporating suitable habitat adjacent to avoided individuals.
Leafless Tongue Orchid (*Cryptostylis hunteriana*)	Assumed presence. Extent of associated PCTs 533 and 1192.
Koala (*Phascolarctos cinereus*)	Associated PCTs with preferred feed trees. Excludes grasslands.
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	Count of individuals that will or may be adversely impacted. Conservative estimate for known locations of this species.
South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*)	200 m radius from suitable hollow-bearing trees intersecting with woody PCTs. Excludes grasslands. Conservative estimate of impacts as polygon includes PCTs that do not contain *Allocasuarina* species.
Southern Greater Glider (*Petauroides volans*)	Associated PCTs, excluding grasslands. Excludes woody vegetation mapped as isolated trees (i.e., crown separations too great for movement/use).
Southern Myotis (*Myotis macropus*)	Woody vegetation within 200 m of a waterbody irrespective of hollow presence or not (assumed). Conservative estimate of impacts.
Squirrel Glider (*Petaurus norfolcensis*)	Associated PCTs, excluding grasslands. Conservative estimate of impacts as species has only been found in a few locations. Excludes woody vegetation mapped as isolated trees (i.e., crown separations too great for movement/use).
Austral Toadflax (*Thesium australe*)	Limited to extent of occurrence.
Eastern Cave Bat (*Vespadelus troughtoni*)	Associated PCTs in a woody condition state within 2 km of cliff, scarp, cave (foraging habitat only).

It is noteworthy that foraging resources for the South-eastern Glossy Black-Cockatoo (i.e., *Allocasuarina* spp.) are almost entirely restricted to the eastern third of the Subject Land, with some scattered localized occurrences in the central and western parts.

PRESCRIBED IMPACTS

Impacts on biodiversity not involving the clearing of native vegetation (i.e., prescribed impacts) are also evaluated in the Updated BDAR. The Project is anticipated to have the following prescribed impacts:

- Impacts on habitat connectivity;
- Wind turbine strikes; and
- Vehicle strikes.

Potential impacts to habitat connectivity relate to direct impacts to native vegetation and habitat, as well as the potential barrier affects for aerial species, including birds and bats. The Project has been designed to maximise use of existing public and internal access tracks and access points across the Project Area plus lands with low biodiversity value, minimising vegetation clearance required and avoiding development on much of the eastern side of the Project Area where the highest concentration of habitat connectivity is present. Given the patchy distribution of native woody vegetation across the Subject Land, direct impacts are predominantly to smaller fragments of native vegetation. Due to the linear nature of the

clearing required for the Project, and the dispersed arrangement of the wind turbines, there is unlikely to be a permanent barrier to fauna movement.

The potential for wind farm operations to cause a barrier to aerial species has also been investigated, with a focus on listed threatened species, migratory species and nomadic species. Predicted flight path mapping has been completed for these species groups. Although turbine infrastructure is located within and between woodland vegetation, threatened, migratory and nomadic species dependent on woodlands are considered unlikely to be impacted by potential barrier effects caused by operating turbines. Woodland species are unlikely to fly at a height that will be influenced by the operation of the wind turbines. For those species, including Glossy Black-cockatoo and wetland birds, the spacing of infrastructure is unlikely to result in a barrier to movement due to interactions with operational turbines.

Potential impacts due to wind turbine strikes have been investigated by completing analyses of the species present through bird utilisation surveys (BUS), which included collection of data on the species observed and their flight heights. Risks associated with turbine strike on birds have been estimated through a collision risk model (CRM).

This CRM model indicates that between two and ten birds are estimated to collide with Project WTGs per year. Over the operational life of the Project this equates to between 23 and 113 collisions.

Bat surveys included seasonal deployment of bat detectors at ground level and at three heights on three met masts. Analysis of bat detector data has been completed to gain further understanding of the occurrence of microbat species at different heights, with patterns in species records reviewed against temperature and wind speed data. Broadly, this analysis showed reduced microbat activity in the cooler months and a declining number of calls detected at higher wind speeds. Bat activity across all three height treatments were highest between 0 and 8 m/s with peaks in activity occurring at approximately 5 m/s. Declines in activity are present in both the 2 m and 30 m heights once wind speeds reach 7 m/s with the total number of calls in both treatments reduced to very low occurrences once wind speeds increase above 9 m/s.

A turbine risk assessment has been completed to assess the risk of each turbine to bird and bat strike, using habitat factors such as distance to woody vegetation, proximity to water sources and topographic features (caves, ridgelines, rocky outcrops) with the potential to be used by cave-dwelling microbats. Most turbines returned a low risk rating. No turbines were deemed to be high or very high risk to birds and bats.

Vehicle strike on native fauna has been considered a risk primarily during the construction and decommissioning phases of the project when there will be increased construction traffic movements. These will be managed and mitigated through controls on vehicle movements, identifying any high-risk areas and implementing controls on vehicle speeds.

Measures to mitigate these impacts will be implemented through the following management plans:

- Construction Traffic Management Plan (CTMP);
- Construction Environmental Management Plan (CEMP);
- Biodiversity Management Plan (BMP); and
- Bird and Bat Adaptive Management Plan (BBAMP).

The framework for the BBAMP is provided in this BDAR.

AVOID, MINIMISE AND MITIGATE

The Applicant has substantially amended the Project to reduce impacts on biodiversity values as identified and quantified through surveys and assessment performed in accordance with the BAM. Endangered vegetation and threatened species habitats were prioritized for avoidance. This was particularly so for threatened flora and fauna identified as entities at risk of serious and irreversible impact (SAII). For those entities substantial impacts are likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct.

In general, impact avoidance and minimization have involved locating the Project in areas of least biodiversity value, wherever possible, which comprise approximately 71.1% of the Subject Land (i.e., 626.85 ha of 882.08 ha). This low biodiversity land consists of:

- 415.34 ha of Category 1 – Exempt Land;
- 2.61 ha of non-vegetated lands (e.g., water and roads);
- 207.60 ha of low condition grasslands (i.e., VIS <15 for TECs or <17 for non-TECs); and
- 1.30 ha of low condition open woodlands with VIS <17.

Except for some low condition open woodland and shrubland VZs (i.e., VIS <17), these lands no longer contain functional habitat features such as trees, hollow-bearing trees and fallen logs. Consequently, these degraded lands have overabundant groundcover grass species with an elevated presence of high threat weeds, resulting in low native plant diversity.

Chart E-3 displays the VIS and area for each VZ (i.e., VIS on the x -axis and VZ area on the y-axis) assessed in this Updated BDAR (chart excludes Category 1 – Exempt Land, which is not assessable). This chart demonstrates the Project has a bias towards the clearing of lands with low biodiversity value (i.e., VZs with no offset requirement).

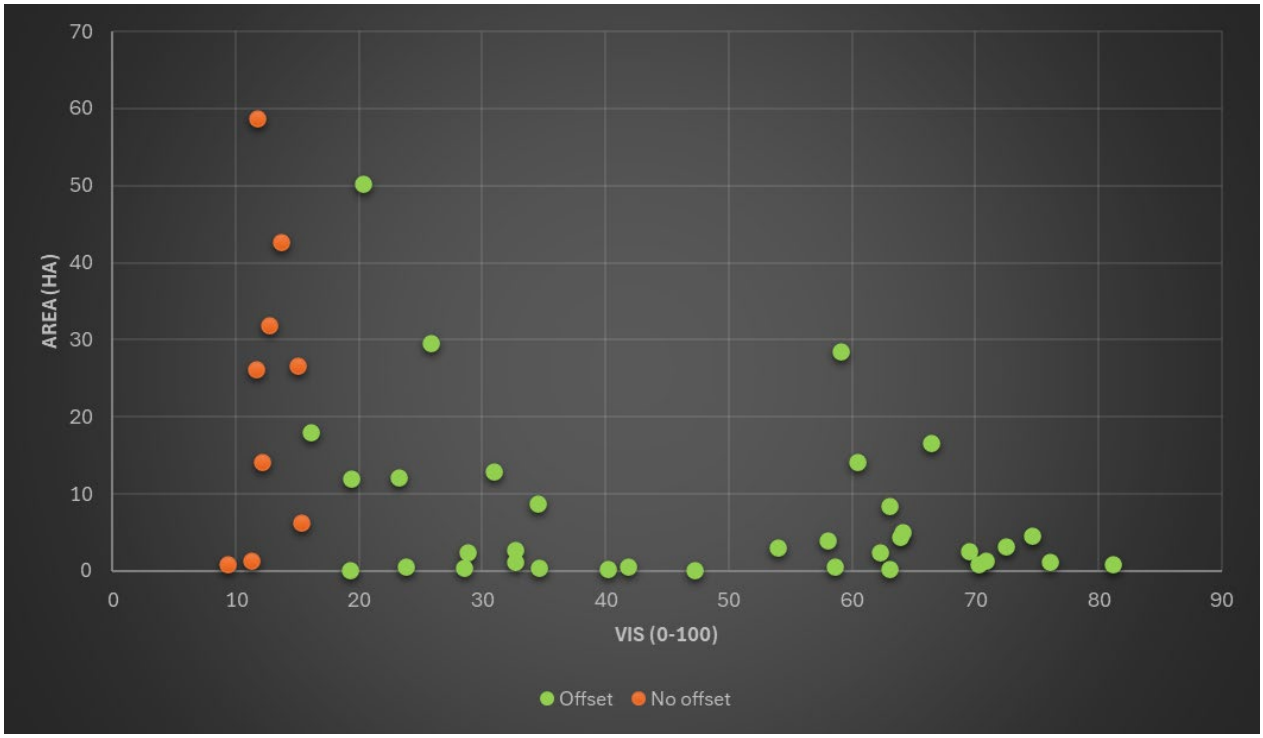


CHART E-3 VEGETATION ZONE VIS BY AREA AS ASSESSED IN THIS BDAR

Of the Subject Land, 28.9% (i.e., 255.23 ha) comprises assessable vegetation that incurs a residual impact on biodiversity values requiring an offset. For this area, impacts have been minimized where possible by aligning the Project footprint to areas of reduced biodiversity value, as characterized below by vegetation structure:

- 15.4% or 135.59 ha of the Subject Land is in a grassland state of moderate condition (mean VIS 25.3); and
- 0.1% or 0.93 ha of the Subject Land is in an open woodland state of moderate to high condition (mean VIS 47.1).

Areas of the highest biodiversity value occur within 12.2% or 107.77 ha of the Subject Land. For this vegetation, further impact minimization will be achieved in selected areas (e.g., transmission line easement) using partial clearing works to establish the Project. The clearing of native vegetation located within the transmission line easement is limited to the tree canopy only (i.e., partial impact by removing the upper part of the tree canopy only leaving the groundcover layer and associated habitat values such as leaf litter and fallen logs). Approximately 8.6 ha or 1% of the Subject Land will experience a partial impact of this nature, resulting in a future VIS similar to the moderate condition grasslands of the Subject Land.

Refinement of the Project layout and design has significantly reduced impacts on local biodiversity values including, but not restricted to, species reliant on woody native vegetation with functional habitat character such as trees, particularly those with hollows (e.g., avoidance of Koala, Greater Glider, Squirrel Glider, Glossy-Black Cockatoo and Barking Owl habitat).

Impacts on native vegetation cover within the local public road reserve network are unavoidable. Impacts have been minimised where possible by utilising the roadside environment immediately adjacent to the sealed/unsealed road surface.

The Project will impact 60.84 ha of endangered vegetation with a VIS greater than 15, with 36.27 ha of this representing impacts on SAII entities in woody (11.75 ha) and non-woody (24.52 ha) condition states. This extent by land tenure is outlined in **Table E-10**.

TABLE E-10 UNAVOIDABLE IMPACTS ON TECS BY LAND TENURE (VIS >15)

TEC	PCTs	Tenure	Condition	Area (ha)
SAII Entity[6]				
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	510	Freehold	Woody	4.32
			Non-woody	8.72
		Local road reserve	Woody	0.96
			Non-woody	2.40
New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	533, 534	Freehold	Woody	3.21
			Non-woody	9.80
		Local road reserve	Woody	3.26
			Non-woody	3.60

TEC	PCTs	Tenure	Condition	Area (ha)
Non-SAII Entity				
Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	766	Freehold	N/A	1.58
Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion	1192, 1194	Freehold	Woody	3.43
			Non-woody	18.02
		Local road reserve	Woody	0.32
			Non-woody	1.22

The total impact on SAII entities that have a residual impact with offset liability (i.e., VIS > 15) is 36.27 ha, with 10.17 ha occurring within the local road reserve corridor.

Most of the offsetable residual impacts on SAII have been minimized by locating the Project in non-woody vegetation (i.e., 24.52 ha) with a mean VIS of 28.7 (i.e., all moderate grassland VZs for PCTs 510, 533 and 534).

Direct and indirect impacts will be mitigated by measures designed to protect retained and adjacent vegetation and habitat during construction, operation and decommissioning phases. A BMP) will be prepared to the satisfaction of the Environment Agency Head for implementation prior to/during construction and through the operational period. Other plans implemented in conjunction with the BMP include a BBAMP, CTMP, SWMP and CEMP.

CUMULATIVE IMPACTS

The loss of native vegetation from within the Subject Land will contribute to the cumulative loss of biodiversity values from a region sensitive to loss (i.e., over cleared: 70-90% cleared). Combined with other Projects and at the bioregional level, the cumulative loss of native vegetation (i.e., woody and non-woody) is approximately 935 ha (i.e., approved and proposed renewable energy projects listed on the major projects website for the New England Tablelands Bioregion). Approximately 3,000 ha of vegetation clearing has been reported for infrastructure projects over a 14 year period (2009 to 2022).

Infrastructure projects are required to deliver like-for-like offsets from within the impacted region to redress the impacts associated with native vegetation and habitat loss. Currently there is sufficient capacity within the region to satisfy these offset requirements.

SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

The Project will have a direct impact on two SAII plant communities and may have an impact on individuals of three microbat species classed as SAII entities were involving breeding habitat as outlined in **Table E-11**. The assessment of impacts on SAII microbat species has been performed at the request of CPHR.

TABLE E-11 SAII ENTITIES IMPACTED BY THE PROJECT

SAII Entity	Principles	Comment
New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	1 and 2	The Project will reduce the BC Act listed extent of this TEC locally by 51.75 ha, comprising: ▪ 19.87 ha with VIS >15 (i.e., offsetable); and ▪ 31.88 ha with VIS <15 (i.e., not offsetable). Wherever possible, the Project has preferentially avoided the higher biodiversity value woody patches (i.e., woodlands, open woodlands and isolated trees) with the impact on these condition states limited to 6.47 ha as outlined below: ▪ Total clearing of 2.04 ha on freehold land; ▪ Partial clearing of 1.17 ha freehold land; and ▪ Total clearing of 3.26 ha in road reserves. Impacts have been aligned with the lower biodiversity value grasslands wherever possible including: ▪ 31.88 ha of low condition grassland (VIS<15); and ▪ 13.40 ha of moderate condition (VIS>15). Impacts on this TEC within the road reserve are largely unavoidable as these impacts are associated with the widening of existing infrastructure. Regionally, and relevant to the current known extent, the impact on this SAII is estimated to be: ▪ 0.37% for all condition states; ▪ 0.14% for condition states with VIS>15; and ▪ 0.05% for woody vegetation condition states. The latter estimate is likely more representative of the SAII loss as the current estimate for TEC extent is based solely on an extent derived from the mapping of woodlands (Benson and Ashby 2000).
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland	1 and 2	The Project will reduce the BC Act listed extent of this TEC locally by 30.68 ha, comprising: ▪ 16.40 ha with VIS >15 (i.e., offsetable); and ▪ 14.28 ha with VIS <15 (i.e., not offsetable). Wherever possible, the Project has preferentially avoided woody patches (i.e., woodlands, open woodlands and scattered trees) with the impact on these condition states limited to 5.28 ha: ▪ 4.32 ha on freehold land; and ▪ 0.96 ha on crown land (i.e., road reserve). Impacts have been deferred to the lower biodiversity value grasslands wherever possible including: ▪ 14.28 ha of low condition grassland (VIS<15); and ▪ 11.12 ha of moderate condition (VIS>15). Impacts on this TEC within the road reserve are largely unavoidable as these impacts are associated with the widening of existing infrastructure. Regionally, and relevant to the current known extent, the impact on this SAII is estimated to be: ▪ 0.002% for all condition states; and ▪ 0.0002% for woody vegetation condition states.

SAII Entity	Principles	Comment
		The latter estimate is likely more representative of the SAII loss as the current estimate for TEC extent is based on woody vegetation cover.
Eastern Cave Bat (*Vespadelus troughtoni*)	4	This species has been subject to an assessment of SAII at the request of CPHR. Breeding activity and breeding habitat have not been observed within the Subject Land. However, GIS analysis for lands outside the Subject Land has identified steep lands that may harbor cliff lines and associated microhabitat that may provide potential roosting habitat. None of this microhabitat occurs within 100m of the Subject and, therefore, won't be impacted by the Project (i.e., breeding habitat). Potential microbat foraging habitat occurs within 2 km of the Subject Land. Mitigation measures to reduce impacts to breeding and individuals of this species will be incorporated into the BBAMP.
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	4	This species has been subject to an assessment of SAII at the request of CPHR. Breeding activity and breeding habitat have not been observed within the Subject Land. However, GIS analysis for lands outside the Subject Land has identified steep lands that may harbor cliff lines and associated microhabitat that may provide potential roosting habitat. None of this microhabitat occurs within 100m of the Subject and, therefore, won't be impacted by the Project (i.e., breeding habitat). Potential microbat foraging habitat occurs within 2 km of the Subject Land. Mitigation measures to reduce impacts to breeding and individuals of this species will be incorporated into the BBAMP.
Little Bent-winged Bat (*Miniopterus australis*)	4	This species has been subject to an assessment of SAII at the request of CPHR. Breeding activity and breeding habitat have not been observed within the Subject Land. However, GIS analysis for lands outside the Subject Land has identified steep lands that may harbor cliff lines and associated microhabitat that may provide potential roosting habitat. None of this microhabitat occurs within 100m of the Subject and, therefore, won't be impacted by the Project (i.e., breeding habitat). Potential microbat foraging habitat occurs within 2 km of the Subject Land. Mitigation measures to reduce impacts to breeding and individuals of this species will be incorporated into the BBAMP.

Additional measures are proposed to address the localised loss of threatened communities at risk of SAII. The Applicant proposes to revegetate up to 15 ha of existing non-woody/cleared lands within 25 km of the Project Area to locally re-establish up to 7.50 ha for each SAII entity. This represents an increase of ~3.18 ha in a woody condition state for these SAII entities relative to the loss incurred by the Project. This outcome supports the no net loss standard of the BAM by providing local improvements in biodiversity values for CEECs. The focus of this initiative may involve:

- Committing to an active restoration program in a local biodiversity stewardship site; and/or
- Revegetation of temporary impact areas.

These additional measures will seek to improve local patch size and connectivity.

RESIDUAL IMPACTS AND BIODIVERSITY OFFSET LIABILITY

A total of 4,651 ecosystem credits have been calculated as the Project's residual impact. The Project's direct impact on biodiversity values by PCT is outlined in **Table E-12**.

TABLE E-12 IMPACTS THAT REQUIRE OFFSET - ECOSYSTEM CREDITS

PCT	PCT Name	Area (ha)	Credits
501	Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	9.00	92
510	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	30.63	394
533	New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	0.66	11
534	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	51.09	484
565	Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	17.24	209
567	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	46.55	825
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	143.22	1,267
571	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England	42.19	474
766	Carex sedgeland of the slopes and tablelands Bioregion and NSW North Coast Bioregion	1.58	51
965	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	42.38	208
970	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	55.94	373
1192	Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland	22.06	211
1194	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	0.93	33
1512	Fuzzy Box open forest of the New England Tableland Bioregion	0.66	19
Total		**464.13**	**4,651**

The residual impact calculated for species credit species is the extent of known or assumed presence following consideration of survey results, impact avoidance and application of species credit polygon rules. The residual impact for species credit species is tabulated in **Table E-13**.

TABLE E-13 IMPACTS THAT REQUIRE OFFSET - SPECIES CREDITS

Common Name	Scientific Name	Loss of habitat (ha) or individuals	Number of species credits required
Barking Owl	*Ninox connivens*	1.24	42
Bluegrass	*Dichanthium setosum*	4.22	34
Leafless Tongue Orchid	*Cryptostylis hunteriana*	1.56	31
Koala	*Phascolarctos cinereus*	119.33	3,422
Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	136 individuals	272
South-eastern Glossy Black-Cockatooa	*Calyptorhynchus lathami lathami*	7.47	242
Southern Greater Glider	*Petauroides volans*	90.97	2,566
Southern Myotis	*Myotis macropus*	11.87	343
Squirrel Glider	*Petaurus norfolcensis*	119.15	3,417
Austral Toadflax	*Thesium australe*	0.06	1
Eastern Cave Bat	*Vespadelus troughtoni*	9.38	431

OFFSET STRATEGY

The Applicant is developing a biodiversity offset strategy in parallel with the BDAR. This strategy will detail the offset approach to be undertaken to retire credit obligations and will be achieved by:

- Retiring 'like for like' credits as specified in **Table E-12** and **Table E-13** to the amount and from the regions indicated; and/or
- Funding a biodiversity conservation action instead of, or in combination with, the retirement of species credits; and/or
- Entering into a Strategic Offset Delivery Agreement with the Environment Agency Head to meet the biodiversity offset obligations; add/or
- In part or full payment into the Biodiversity Conservation Trust (BCT) *in lieu* of satisfying the offset liability specified in **Table E-12** and **Table E-13**.

Like-for-like offsets must be obtained from the same IBRA subregion, adjoining IBRA subregion or any IBRA subregion within 100km of the outer edge of the impacted site. These areas are listed below:

Same IBRA subregion

- Walcha Plateau.

Adjoining IBRA subregion

- Armidale Plateau;
- Comboyne Plateau;
- Eastern Nandewars;
- Macleay Gorges;

- Upper Manning;
- Mummel Escarpment;
- Peel; and
- Tomalla.

Within 100 km of outer edge of impacted site

- Barrington;
- Tingha Plateau;
- Bundarra Downs;
- Yarrowyck – Kentucky Downs;
- Moredun Volcanics;
- Glenn Innes – Guyra Basalts;
- Nightcap;
- Inverell Basalts;
- Wongwibinda Plateau;
- Round Mountain;
- Northeast Forest Lands;
- Guy Fawkes;
- Ebor Basalts;
- Coffs Coast and Escarpment;
- Carrai Plateau;
- Macleay Hastings; and
- Liverpool Plains.

CONCLUSION

The Project's impacts, assessed in accordance with the BAM, have demonstrated an avoid, minimize and mitigate approach to reducing impacts on high biodiversity values. As shown in **Chart E-4**, most of the Project's impacts are on lands that:

- Do not require assessment under the BAM (i.e., no biodiversity values); or
- Are calculated to have low condition vegetation and habitat not requiring an offset (i.e., VIS <17 for non-TECs and VIS < 15 for TECs); or
- Are on assessable native vegetation and habitat with a VIS of less than 30 (i.e., low biodiversity values).

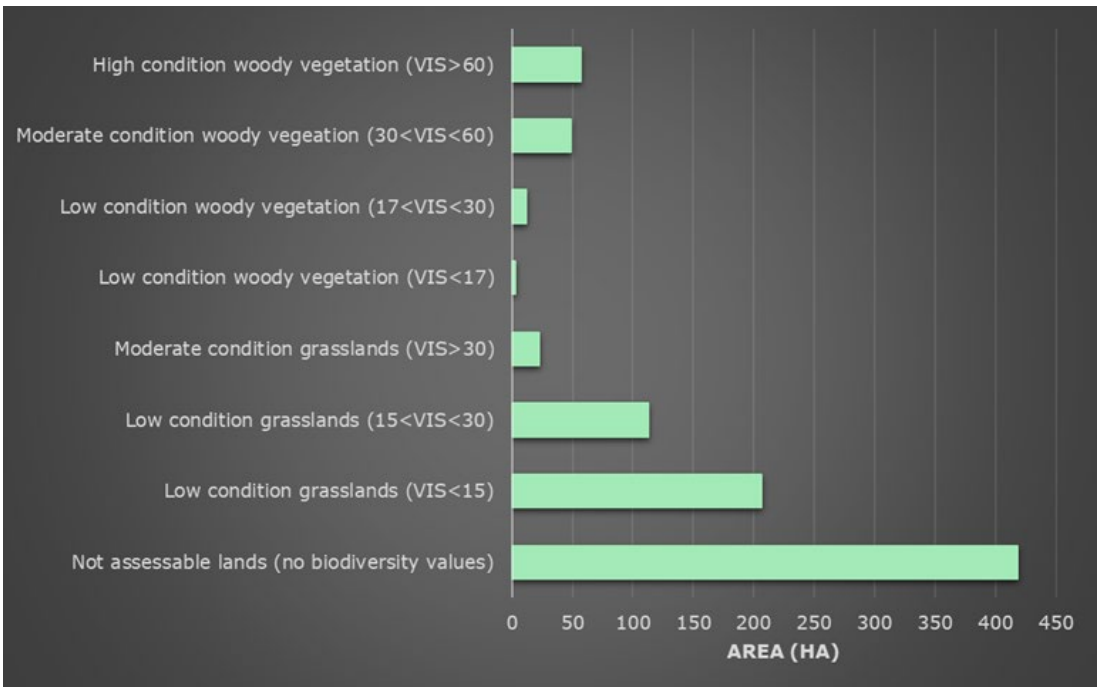


CHART E-4 SUMMARY OF BIODIVERSITY VALUES WITHIN THE SUBJECT LAND

High biodiversity values impacted by the Project are restricted to areas of woody vegetation that either form part of a CEEC, EEC and/or have a VIS > 60 (i.e., 107.77 ha or ~12.2% of the Subject Land). This is graphically shown in Chart E-5.

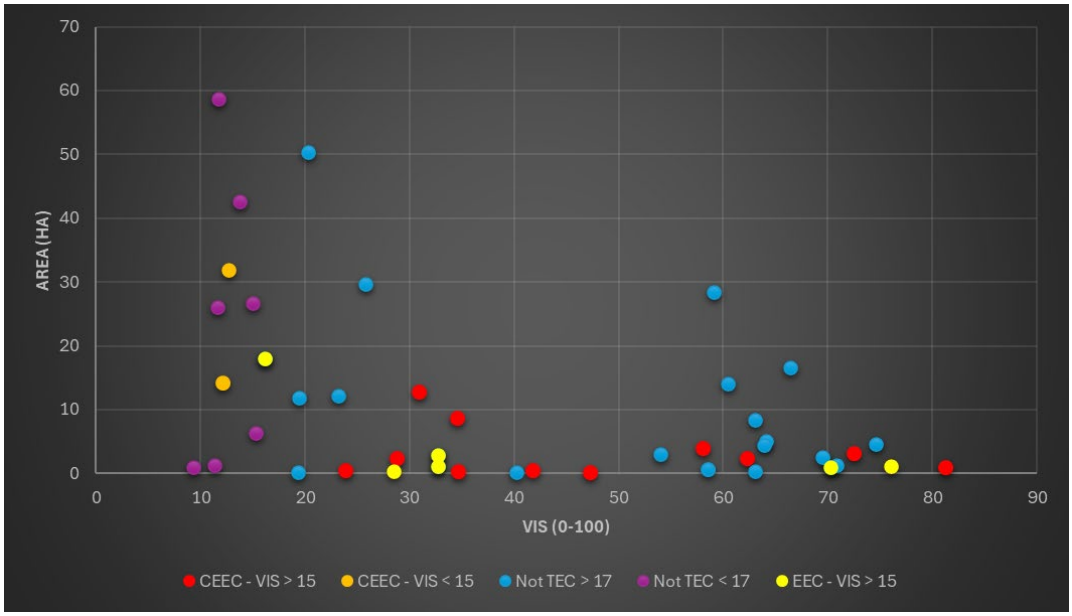


CHART E-5 IMPACT ON BIODIVERSITY VALUES BY VIS AND AREA

Adequate representations of the high biodiversity values impacted by the Project will remain within the Project Area following development (i.e., a portion of the remaining ~4,200 ha of woody vegetation).

The like-for-like offsetting of residual impacts through the BOS will ensure a no net loss outcome for endangered ecological communities and threatened species, thus maintaining compliance with the 'no net loss' standard established by the BAM.

PREFACE

1. ASSESSMENT OVERVIEW

Environmental Resources Management Australia Pty Ltd (ERM) has prepared this Updated Biodiversity Development Assessment Report (Updated BDAR) for the Winterbourne Wind Farm (the Project) on behalf of WinterbourneWind Pty Ltd (the Applicant). The Project has been assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as State Significant Development (SSD). This Updated BDAR is prepared in accordance with the Biodiversity Assessment Method 2020 (BAM), with consideration of the Draft BBAMP Framework and BBUS Guidelines 2023, as the Biodiversity Offset Scheme (BOS) applies to the Project. It also addresses the:

- Planning Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE; now Department of Planning, Housing and Environment [DPHI]) (SSD-10471, dated 17 September 2020);
- Supplementary SEARs received from the NSW Biodiversity and Conservation Division (BCD; now Conservation Programs, Heritage and Regulation [CPHR]); and
- Supplementary SEARs received from the Commonwealth Department of Agriculture, Water and the Environment (DAWE); now the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

In support of the SSD application (SSD-10471), an Environmental Impact Statement (EIS) was prepared for the Project (ERM, 2022). The EIS was publicly exhibited between 18 November 2022 and 23 January 2023 by the (then) NSW Department of Planning and Environment (DPE) (now DPHI). During the exhibition period, 959 submissions were received.

An Amendment Report and Submissions Report were submitted in September 2024. The Amendment Report included further refinement of the project layout and disturbance footprint including the removal of two turbines, relocation of 21 turbines and micro-siting of 52 turbines, addition of one new turbine, and amending the transport route to avoid using Oxley Highway for over-dimensioned heavy vehicles.

The Amended Proposal was publicly exhibited from 8 October to 4 November 2024. A total of 395 public and organisation submissions were received (excluding duplicates). A Submissions Report is being prepared in response. This Updated BDAR accompanies the Submissions Report and has addressed additional advice received from BCD relating to the exhibited Amendment Report and Amended BDAR (ERM, 2024).

1.1 RELEVANT LEGISLATION AND POLICIES

This Updated BDAR addresses Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM and omits Stage 3 (Improving Biodiversity Values) as this is only required for Biodiversity Stewardship Site Assessment Reports. The Updated BDAR also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and relevant State Environmental Planning Policies (SEPPs).

1.1.1 ASSESSMENT FRAMEWORK

The Project requires approval under Part 4 of the EP&A Act. Section 1.7 of the EP&A Act specifies that the Act has effect subject to the provisions of Part 7 of *Biodiversity Conservation Act 2016* (BC Act). Part 7 of the BC Act mandates the application of the BAM (DPIE, 2020) where the Project exceeds a biodiversity offset scheme threshold (i.e., Section 7.2 of the BC Act) and/or is "likely to significantly affect threatened species" upon application of the test (Section 7.3 of the BC Act). In this case, these thresholds do not apply as the Project is declared SSD thus mandating the preparation of a BDAR (s7.14) in the absence of a successful BDAR waiver. The Minister for Planning must consider impacts on Serious and Irreversible Impact (SAII) entities and determine if any additional measures are required to minimise impacts to those entities (s7.16(3)).

1.1.2 NEED FOR A BDAR

The BOS applies to the Project as it has been declared SSD (s7.14 of the BC Act). The Applicant has engaged an independent accredited assessor, without any conflicts of interest, to apply the BAM to assess the impacts of the Project on biodiversity values.

1.1.3 APPLICATION OF THE BAM

1.1.3.1 CONTENT

This Updated BDAR has been prepared in accordance with the relevant parts of the BAM, as required under the BC Act for development identified as "likely to significantly affect threatened species". No streamline modules were applied in preparing this Updated BDAR. The minimum information supplied in this Updated BDAR is in accordance with the relevant details specified in Table 24 of Appendix K of the BAM.

1.1.3.2 CERTIFICATION

The Updated BDAR is certified by the accredited assessor indicated on Page (viii) of this document as of the date corresponding with the signature. The BAM Calculator (BAM-C) report associated with this Updated BDAR was finalised within 14 days of the BDAR submission date.

1.1.3.3 CHANGES TO THE BAM

Clause 6.31 of the *Biodiversity Conservation Regulation 2017* outlines how an accredited assessor can address changes to the BAM that occur whilst preparing a BDAR for a Project. This clause is reproduced below for clarity:

> 6.31 Changes in biodiversity assessment method
>
> (1) If the biodiversity method is changed, a biodiversity assessment report may, during the designated period after the method is changed, be prepared on the basis of the method in force before the change, but only if the report states that it has been prepared on that basis.
>
> (2) For the purposes of this clause, the designated period is—
>
> (a) except as provided by this subclause—6 months, or
>
> (b) in the case of a biodiversity development assessment report in respect of State significant development or State significant infrastructure—12 months, or

> (c) in the case of a biodiversity certification assessment report for an application that is not a strategic biodiversity certification application—12 months, or
>
> (d) in the case of a biodiversity certification assessment report for a strategic biodiversity certification application—12 months or such longer period as the Minister approves in a particular case.

The BAM refers to the Threatened Biodiversity Data Collection (TBDC) and NSW BioNet Atlas as published databases that *must* be used in preparing a BDAR (see Section 1.4 of the BAM). Under this section, a change in these published databases has the effect of changing the BAM. Thus, such changes during the preparation of a BDAR for this Project may be interpreted as a change to the BAM. On this basis, and with reference to the specified designated periods above, the accredited assessor may prepare the BDAR based on the methods in force before the change and in so doing will state this as the case in the BDAR.

This BDAR contains site-based information used to determine the plant community types (PCTs) present within the Project Area, and thus provides a sound basis for the generation of the candidate species applicable to the Project. Changes in the candidate species list after the publishing of this Updated BDAR may represent a change in the BAM and, for this reason, these additional species may be excluded from the assessment.

A change to survey methods for Candidate Species specified in the TBDC during the preparation of the BDAR is also interpreted as a change to the BAM. The accredited assessor may choose to apply the survey methods in force before the change and, if so, the decision to do so will be stated in the Updated BDAR.

1.1.4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places – defined as Matters of National Environmental Significance (MNES).

A referral was submitted by the Applicant to the Commonwealth Department of Agriculture, Water and the Environment in 2020 (EPBC 2020/8734). The referral identified potential for significant impacts to EPBC Act listed MNES, which are likely to occur or use habitat within the Project Area and be impacted by the Project.

A delegate of the Minister for the Environment determined that the Project is likely to have a significant impact on MNES and therefore is a 'controlled action' under Section 75 of the EPBC Act. Consequently, the Project will be assessed under an Assessment Bilateral Agreement, allowing a single environmental impact assessment process for both the Commonwealth and NSW government. Supplementary SEARs were provided identifying additional matters for consideration, with the EPBC Act controlling provisions for the proposed action included:

- Listed threatened species and communities;
- World Heritage properties and National Heritage places; and
- Listed migratory species.

The assessment requirements include (but are not limited to) the EIS identifying each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action.

This must include a description of the impacts, habitat, survey methodologies and avoidance, mitigation and offset measures as well as impacts to the biodiversity within the adjacent World Heritage Property. The threatened species and communities identified in the supplementary SEARs are provided in **Table 1-1**, with further assessment provided in **Section 8.7** and any cross-referenced sections of the BDAR made in that section.

TABLE 1-1 REQUIREMENTS OF SUPPLEMENTARY SEARS

MNES	EPBC Act Listing
Listed Threatened Species and Communities	
New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community	Critically Endangered
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community	Critically Endangered
Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*)	Endangered
Koala (combined populations of QLD, NSW and ACT) (*Phascolarctos cinereus*)	Endangered
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	Vulnerable
Greater Glider (*Petauroides volans*)	Endangered
Beadle's Grevillea (*Grevillea beadleana*)	Endangered
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	Vulnerable
Narrow-leaved Bertya (*Bertya ingramii*)	Endangered
Austral Toadflax (*Thesium australe*)	Vulnerable
World Heritage properties and National Heritage places	
Gondwana Rainforests of Australia World Heritage Property and National Heritage Place	N/A
Listed Migratory Species	
White-throated Needletail (*Hirundapus caudacutus*)	Vulnerable, Migratory
Fork-tailed Swift (*Apus pacificus*)	Migratory

This list of MNES was generated from the EPBC Act referral, which was based on an incomplete investigation of the Subject Land. A review of this list as part of completing the BAM compliant investigations of the Subject Land resulted in the addition of the following species:

- *Calyptorhynchus lathami lathami* (South-eastern Glossy-Black Cockatoo);
- *Dichanthium setosum* (bluegrass); and
- *Potorous tridactylus tridactylus* (long-nosed potoroo).

These species have been observed within or nearby the Subject Land. No further MNES have been considered in this assessment as none have been observed nor are likely to be directly impacted.

1.2 BIODIVERSITY CREDITS AND CLASSES

The BAM uses biodiversity credits to measure:

- The residual impacts of a Project on biodiversity values; or

- Gains in biodiversity values at biodiversity stewardship sites.

In this application, the BDAR is measuring the direct impacts of the Project on biodiversity values using two kinds of credits, being 'ecosystem credits' and 'species credits'.

Each ecosystem credit is assigned up to seven attributes that are used to distinguish the type of biodiversity values represented by the credit and to determine whether a credit within a class is 'like' another credit.

Each species credit is assigned four attributes. Matching attributes is used to apply the 'like-for-like' rules and variation rules as set out in the BC Regulation.

1.3 ACCREDITED PERSON

A BDAR, which documents the assessment and 'No Net Loss' outcomes, must be prepared by a person accredited under Section 6.10 of the BC Act. An accredited person is referred to as an assessor.

This BDAR was authored by Mark Aitkens (lead) and Freya Robinson (associate) with contributions from Robert Ashworth, Matt Davis, Joe Clement and Hannah Centra. The BDAR was reviewed and certified by Mark Aitkens (Accredited BAM Assessor – BAAS17034) on 18 June 2025.

The assessment provided in the report is based on the BAM-C (version 1.5 last updated on 24/10/2024) with BAM data last updated on 28 October 2024 and linked to a Development Assessment Case created in the BAM-C (00022013/BAAS17034/21/00030009). The BAM-C was finalised on 18 June 2025 as part of certifying this Updated BDAR.

1.4 DATA AND INFORMATION USED

The full list of information sources referred to in this report is provided in Section 12. Digital shapefiles for all maps and spatial data have been submitted with this report. Information sources included (but were not necessarily limited to) the following:

- Proposal layers and concept designs provided by the Applicant;
- EPBC Protected Matters Search Tool (PMST) (DCCEEW, 2024a) (http://www.environment.gov.au/epbc/protectedmatters- search-tool);
- DCCEEW Species Profiles and Threats (SPRAT) database (DCCEEW, 2025a) (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl);
- DCCEEW Directory of Important Wetlands in Australia (DCCEEW, 2021) (https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands);
- Interim Biogeographical Regionalisation for Australia (IBRA) and IBRA sub-regions v7 (DCCEEW, 2023) (http://www.environment.gov.au/land/nrs/science/ibra);
- NSW Office of Environment and Heritage (OEH) Threatened Species Database Collection (NSW OEH, 2025) (http://www.environment.nsw.gov.au/threatenedspeciesapp/);
- DPIE Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE, 2019);
- NSW Biodiversity Values Map (NSW DCCEEW, 2025a) (https://www.lmbc.nsw.gov.au/Maps/index.html? viewer=BVMap);
- NSW Department of Primary Industries (DPI) Key Fish Habitat mapping (DPI, 2018);

- NSW Department of Planning and Environment (DPE) Guidance for the Biodiversity Development Assessment Report Template (DPE, 2022);
- DPE State Vegetation Type Mapping Version C2.0M2.0 (NSW DCCEEW, 2024d)(https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map);
- DPE BioNet Atlas of NSW database (EOH, 2025);
- DPE Threatened Biodiversity Data Collection (TBDC) database (NSW Government, 2025);
- DPE BioNet Vegetation Classification database (NSW Government, 2024a);
- NSW Office of Environment and Heritage (OEH) BAM Calculator (BAM-C) (NSW DCCEEW, 2024a)(https://www.lmbc.nsw.gov.au/bamcalc);
- Biodiversity Assessment Method (BAM) 2020 (DPIE, 2020);
- NSW Mitchell Landscapes map and descriptions (NSW Government , 2025a);
- Groundwater Dependent Ecosystem Atlas (BoM, 2023);
- Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (NSW DPIE, 2021) ;
- Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method (NSW DPIE, 2020) ;
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Department of Environment and Conservation (NSW DEC, 2004);
- Survey Guidelines for Australia's Threatened Mammals (Department of Sustainability, Environment, Water, Population & Communities (DSEWPC, 2011a);
- NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE, 2020);
- Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (NSW DPE, 2022);
- Draft Wind Farms – turbine strike assessment & adaptive impact management – Biodiversity Assessment Method Guide – February 2024 (NSW DCCEEW, 2024e);
- Biodiversity Development Assessment Report – Winterbourne Wind Farm (NGH, 2022);
- Winterbourne Wind Farm Scoping Report (ERM, 2020a);
- Winterbourne Wind Farm EIS (ERM, 2022); and
- Winterbourne Wind Farm - Land Category Assessment Report (NGH, 2023).

1.5 BIODIVERSITY VALUES NOT ASSESSED

The BAM does not assess biodiversity values for:

- Marine mammals;
- Wandering seabirds;
- Biodiversity that is endemic to Lord Howe Island; and/or
- Native vegetation and loss of habitat on Category 1 - Exempt Land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act), other than the additional biodiversity impacts under clause 6.1 of the BC Regulation (referred to as prescribed impacts in the BAM).

This Updated BDAR does not include an assessment of these matters. The extent of Category 1 - Exempt Land is outlined in the following section.

1.6 CATEGORY 1 - EXEMPT LAND

The Subject Land is mostly rural zoned land regulated under the LLS Act. Under the LLS Act, three land categories are defined relating to vegetation clearing:

- Category 1 – 'Exempt Land', land not subject to clearing approval;
- Category 2 – 'Regulated Land', land on which clearing of native vegetation may be carried out with or without approval in accordance with an 'allowable activity' or 'code' under the LLS Act; and
- 'Excluded Land' – Land not categorised in the Regulatory Maps and to which the LLS Act does not apply.

The Draft Native Vegetation Regulatory (NVR) Map identifies the Subject Land as containing Category 1 - Exempt Land and Category 2 – Regulated Land). The proportion of land categorization on the draft NVR map is shown in **Chart 1-1**.

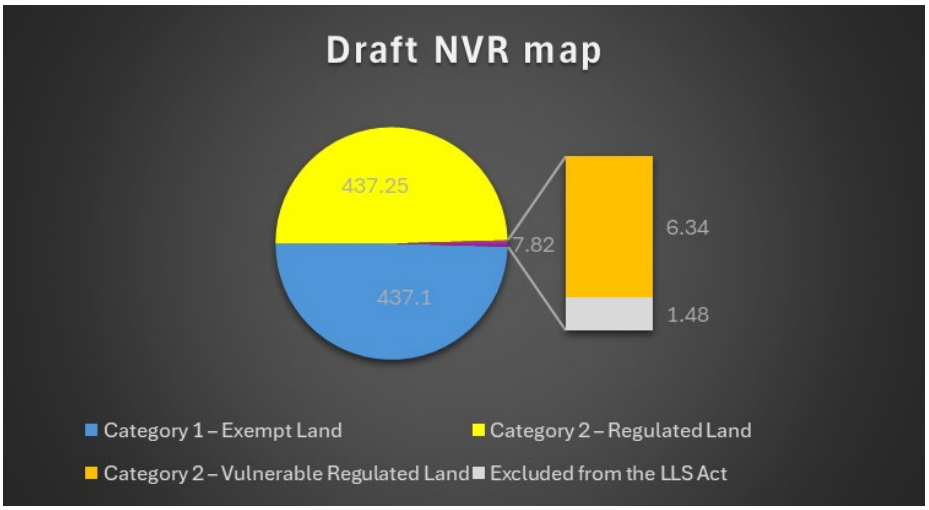


CHART 1-1 PROPORTIONS OF LAND CATEGORIES ON THE DRAFT NVR MAP

The extent of land categorization as defined by a site-specific assessment mapped extent (ERM (2025); **Appendix A**) is shown in **Figure 1-1**. By area, land categorization prepared for this BDAR is relatively consistent with that shown in the draft NVR map, as indicated in **Chart 1-2**. This site-based assessment identified an additional 21.35 ha of Category 2 - Regulated Land.

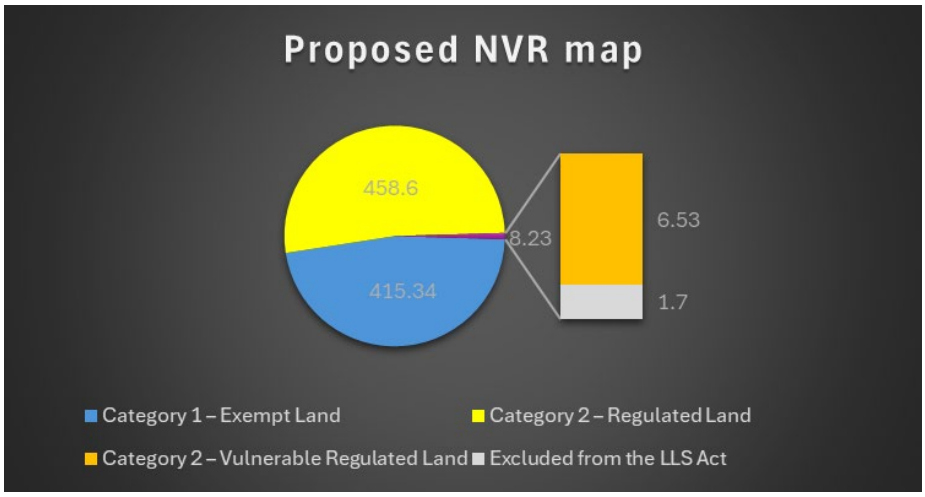


CHART 1-2 PROPORTIONS OF LAND CATEGORIES ON THE ERM NVR MAP

Legend

Project Area	Land Categorisation
Subject Land	Category 1
Highway / Major Road	Category 2
Local Road	Vulnerable

Coordinate System:
GDA 1994 MGA Zone 56

Date: 21/05/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

1:56,000

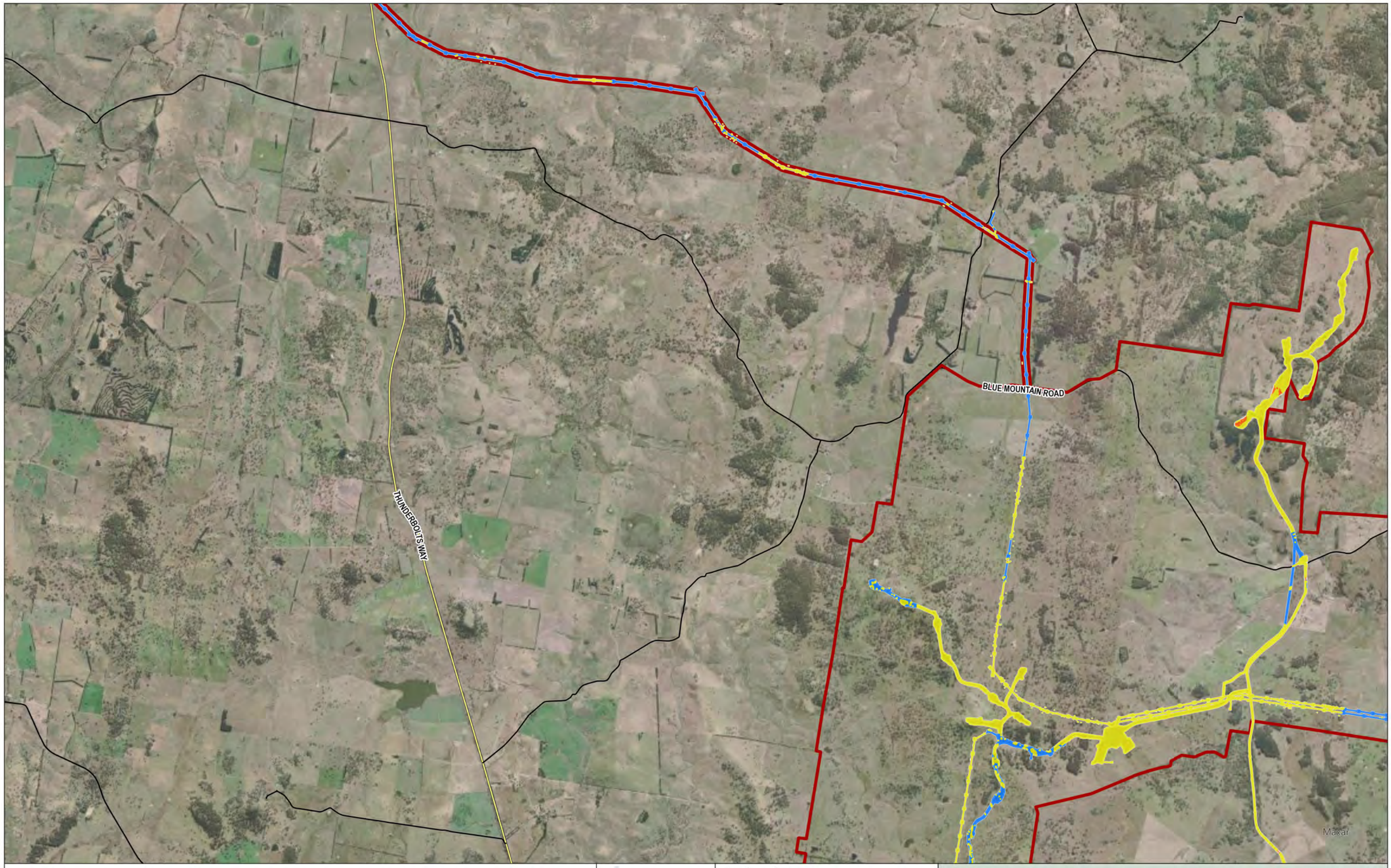
F1-1 ERM (2025) Land Categorisation of The Subject Land

Map 1 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Land Categorisation

- Category 1
- Category 2
- Vulnerable

Coordinate System:
GDA 1994 MGA Zone 56

Date: 21/05/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

1:56,000

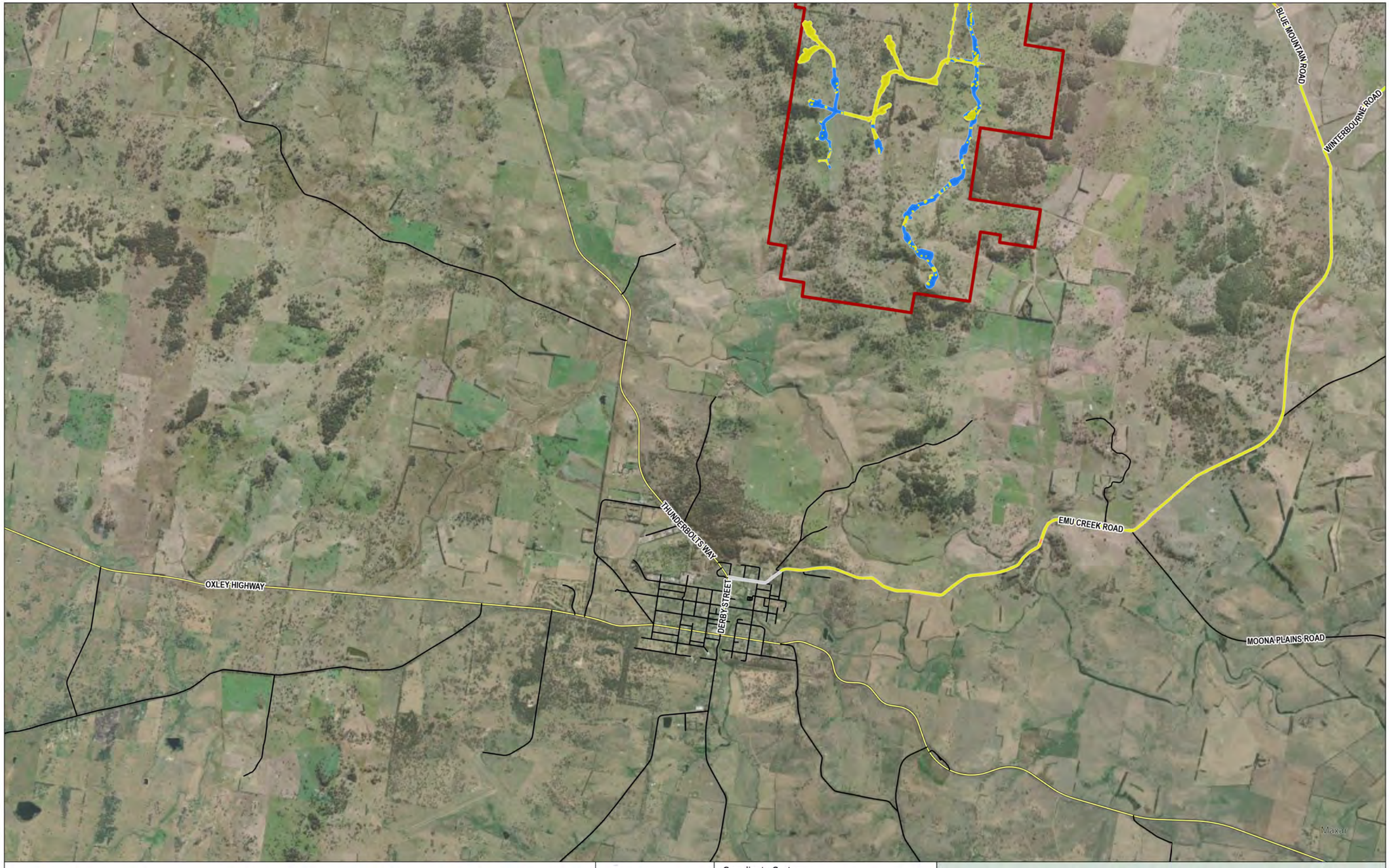
F1-1 ERM (2025) Land Categorisation of The Subject Land

Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Land Categorisation
- N/A
- Category 1
- Category 2
- Vulnerable

Coordinate System:
GDA 1994 MGA Zone 56
Date: 21/05/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:56,000

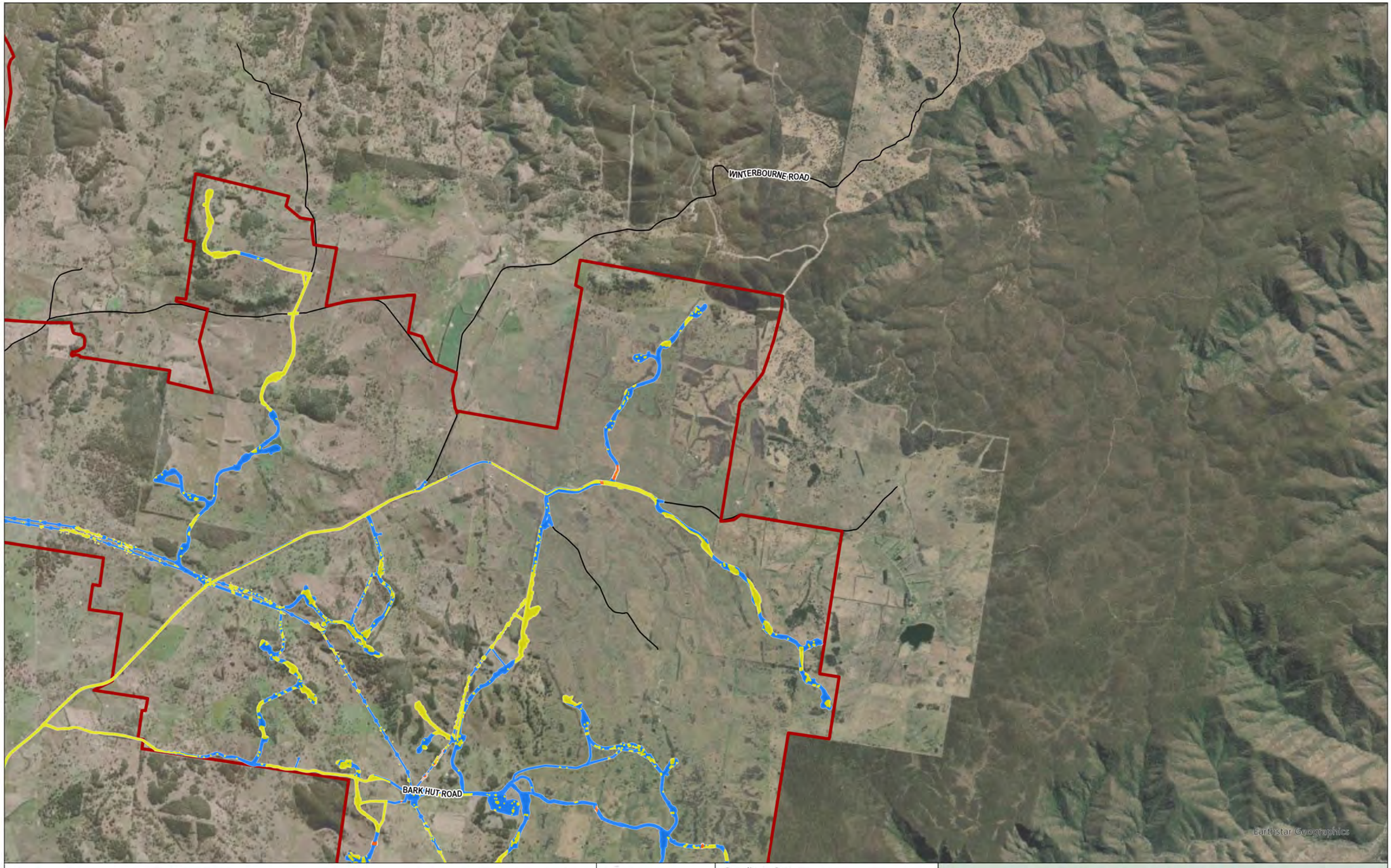
F1-1 ERM (2025) Land Categorisation of The Subject Land

Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Land Categorisation

- Category 1
- Category 2
- Vulnerable

Coordinate System:
GDA 1994 MGA Zone 56

Date: 21/05/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

1:56,000

F1-1 ERM (2025) Land Categorisation of The Subject Land

Map 4 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

MOONA PLAINS ROAD

OXLEY HIGHWAY

Earthstar Geographics

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Land Categorisation

- Category 1
- Category 2
- Vulnerable

Coordinate System:
GDA 1994 MGA Zone 56
Date: 21/05/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:56,000

F1-1 ERM (2025) Land Categorisation of The Subject Land

Map 5 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Category 1 – Exempt Land mapped in the Subject Land is described as either:

- Low conservation value grasslands (per s60F(3) of the LLS Act); and/or
- Significantly disturbed or modified (per s60J) of the LLS Act); or
- Planted exotic (e.g., Pine trees, Poplar trees); or
- Unvegetated (i.e., open water or roads).

These lands are excluded from the assessment of direct impacts; however, the assessment of prescribed impacts remain for these areas.

The ERM (2025) land categorisation mapping is generally consistent with the condition state mapping presented in Amended BDAR (ERM 2024). Specifically, the extent of Category 1 – Exempt Land presented in this assessment is similar to the extent of lands mapped as low condition grasslands in the Amended BDAR (ERM 2024). These lands were treated as assessable native vegetation cover in the Amended BDAR (ERM 2024), despite generally being of low biodiversity value (i.e., VIS<15 thus no offset liability). The Amended BDAR (ERM 2024) was therefore a conservative assessment supported by the land categorisation assessment presented in this Updated BDAR.

An example of the commonly encountered degraded 'low conservation value grassland' is shown in **Plate E-1**.

PLATE E-1 CATEGORY 1 EXEMPT LAND: LOW CONSERVATION VALUE GRASSLAND

Elsewhere, the Subject Land comprises native vegetation designated as Category 2 – Regulated Land or Category 2 - Vulnerable Regulated Land. Direct impacts are to be assessed for these areas. An example of woody vegetation that is designated as Category 2 Regulated Land is shown in **Plate E-2**.

PLATE E-2 CATEGORY 2 - REGUALTED LAND: WOODY VEGETATION

Category 2 - Regulated Land within the Subject Land also comprises non-woody vegetation (e.g., secondary grasslands). An example of grassland vegetation that is designated as Category 2 - Regulated Land is shown in **Plate E-3**.

PLATE E-3 CATEGORY 2 - REGULATED LAND: NON-WOODY VEGETATION

1.7 STRUCTURE OF THE BDAR

The BDAR structure follows the corresponding sections in the BAM to assist readability for compliance with the BAM. A BDAR, which is the biodiversity assessment report for a development site, requires the completion of Stages 1 and 2 of the BAM (DPIE, 2020). These stages include:

- Stage 1 establishes a consistent approach to assessing the biodiversity values of land; and
- Stage 2 outlines the guidance and requirements to apply the hierarchy of avoid, minimise and offset for assessing direct, indirect or prescribed impacts on biodiversity values arising from the proposed development, activity, clearing or biodiversity certification. Stage 2 also provides guidance on the use of mitigation measures where there is uncertainty on the timing or extent of impacts.

This BDAR omits the Stage 3 assessment of the BAM (i.e., relevant to biodiversity stewardship site assessments). Therefore, the section structuring in this report ends with the last section in Stage 2 (Section 10 Applying the no net loss standard).

Documents appended to this BDAR include:

- Appendix A Land Categorisation Assessment (ERM 2025);
- Appendix B NGH Technical Memos;
- Appendix C BAM Floristic Data;
- Appendix D BAM Plot Data;
- Appendix E Assessment of MNES;
- Appendix F Bat Analysis Reports;
- Appendix G Expert Report for *Litoria castanea*;
- Appendix H Bird Utilisation and Raptor Surveys 2020 – 2022 (Nature Advisory, 2022); and
- Appendix I Biodiversity Credit Report.

1.8 BDAR VERSION HISTORY

A BDAR previously prepared for the Project by NGH in 2022 (NGH, 2022) was used to inform most threatened species survey methods and results discussed within this BDAR. Since its publishing (NGH, 2022), the Project has seen several revisions to the footprint, additional surveys, collision risk modelling for bird and bat strike, and refinement of land categorization and vegetation mapping.

An Amended BDAR (ERM, 2024) was prepared to address the impacts of the Amended Project and the issues raised in government agency and public submissions in respect of the EIS. In the absence of an LCA report, the Amended BDAR was required to assess all vegetation in the Subject Land as though it was native. This required the preparation of a revised vegetation map generated by a reinterpretation of vegetation classification (i.e., PCTs) and broad condition states (i.e., vegetation zones). This included an in-depth focus on delineating between low and higher condition grasslands, with only the latter requiring an offset. Except for where the land is part of a CEEC, most of the low condition grasslands identified in the Amended BDAR have subsequently been designated as Category 1 - Exempt Land in the LCA Report appended to the Updated BDAR (**Appendix A**).

This Updated BDAR has been prepared in accordance with the BAM 2020 through contributions made by accredited and non-accredited persons since 2019. Contributors to the preparation of this Updated BDAR (and previous versions) are listed on Pages 2-7. It has benefited from a detailed LCA report where it has identified a substantial area of Category 1 - Exempt Land not dissimilar to the published draft Native Vegetation Regulatory (NVR) map.

Differences in the extent of assessable vegetation between BDAR versions are outlined below:

- 426.95 ha in NGH (2022) for 21 vegetation zones[12] (LCA report included in BDAR);
- 853.98 ha in ERM (2024) for 62 vegetation zones (LCA report not included in BDAR); and
- 464.13 ha in this BDAR for 44 vegetation zones (LCA report included in BDAR).

[12] Vegetation Zone: a relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state.

The difference in assessable vegetation between the first and third versions of the BDAR relates to the 296 ha increase in Subject Land area between these assessments. This increase was largely due to the inclusion of:

- Local roadside environments required for upgrades to accommodate oversized vehicles;
- A quarry; and
- Development footprint widening to reflect amended design accounting for constructability.

This resulted in the assessable vegetation increasing by ~37 ha, with the remaining ~259 ha mostly aligned to Category 1 – Exempt Land. Most of the increase is associated with low to moderate condition grasslands.

1.8.1 KEY UPDATES IN THE UPDATED BDAR

The following key elements have supported the preparation of this Updated BDAR:

- Land Categorisation Assessment (ERM 2025): Identified the extent of Category 1 - Exempt Land (not assessable for direct impacts);
- Assessment of updated Project design to further reduce impacts on biodiversity values;
- Updated PCT and broad condition state mapping (vegetation zones (VZs)) for area identified at Category 2 - Regulated Land;
- Completion of additional targeted threatened species surveys in parts of the Subject Land warranting further investigation;
- Further analysis of bat survey data to understand occurrence patterns based on heights recorded, temperature and wind speed data;
- Updated turbine risk assessment for bird and bat strike; and
- Updated calculation of residual impacts using the BAM-C for ecosystem and species credits.

The LCA report (Appendix A) aided the reinterpretation of non-woody vegetation cover (i.e., 218 LCA transects and associated analysis), thus improved the mapping of grassland in varying states (i.e., designation of low and moderate condition VZs). This mapping, which was supplemented by an additional 12 BAM plots, has further increased confidence in the separation of low and moderate condition grasslands otherwise designated as Category 2 - Regulated Land.

Mapping reinterpretations have resulted in some 'moderate condition grasslands' being reclassified as 'low condition grasslands', where the VIS is below the offset threshold. A total of 145 BAM plots were used in the Updated BDAR to calculate VIS, this being five more than NGH (2022) and 37 less than ERM (2024). The reduction in BAM plots used for this BDAR is due to 18 fewer VZs and smaller impact on assessable vegetation and habitat.

This Updated BDAR (current version) assesses the impact of the Project by way of:

- Proposal design: The Project involves the construction, operation, maintenance and decommissioning of a wind farm, with up to 118 WTGs, together with associated ancillary infrastructure. This BDAR additionally assesses 44 km of transmission line to connect the Project to the existing electrical network; and
- Mitigation: Mitigation measures proposed to be undertaken as part of the Project include preparation of the following:
    - Bird and Bat Adaptive Management Plan (BBAMP);

- Construction Traffic Management Plan (CTMP);
- Soil and Water Management Plan (SWMP);
- Construction Environmental Management Plan (CEMP); and
- Pest Management Control Programs.

The BBAMP intends to enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory species because of turbine strike. Monitoring will also be incorporated into the BBAMP to identify any potential changes to the species' utilisation of the Subject Land and the surrounding landscape.

The CTMP will detail mitigation and management measures which aim to minimise the impact of construction traffic by suitable signage and driving protocols as a means of reducing risk of vehicle strike. The SWMP will mitigate impacts to soil and water resources through the implementation of specific mitigation and management measures.

The CEMP will address the management and mitigation of offsite dust emissions. The Pest Management Control Programs will be developed and implemented to minimise the impacts of introduced predators on existing native fauna.

1.8.2 RESPONSE TO SUBMISSIONS

Table 1-2 addresses the comments received on 4 December 2024 from the BCS (now CPHR), in relation to the Response to Submissions (RTS) for the Winterbourne Wind Farm – Biodiversity Development Assessment Report (2024).

TABLE 1-2 RESPONSE TO SUBMISSIONS

Reference	Submission	Addressed in
BCS_01	The land category assessment requires clarification	Land Category Assessment Report (ERM 2025). See **Appendix A**.
BCS_02	The proponent needs to further demonstrate the efforts made to avoid and minimise biodiversity impacts, especially to SAII entities and consider additional opportunities to avoid and minimise impacts on biodiversity values.	**Section 7**.
BCS_03	Vegetation mapping requires revision	**Section 2.2.2** discusses additional survey efforts conducted and the amended vegetation mapping is provided in **Figure 4-1**.
BCS_05	The proposal is likely to have SAII on: ▪ White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and ▪ Derived Native Grassland ▪ New England Peppermint (*Eucalyptus nova-anglica*) Woodland ▪ Eastern Cave Bat (*Vespadelus troughtoni*) ▪ Large Bent-winged Bat (*Miniopterus orianae oceanensis*) ▪ Little Bent-winged Bat (*Miniopterus australis*)	SAII assessments have been completed for the three bat species identified as entities at risk of an SAII **Section 9.1.1** has been amended to include the following species: Eastern Cave Bat (**Section 9.1.3.1**) Large Bent-winged Bat (**Section 9.1.3.2**) Little Bent-winged Bat (**Section 9.1.3.3**)

Reference	Submission	Addressed in
BCS_06	The bird and bat strike risk assessments need to be revised	**Section 7.3.4** has been amended to include revised risk ratings and include an assessment of threatened migratory and non-threatened nomadic species, raptors and observed species within the RSA.
BCS_07	Further information on, and assessment of, potential barrier impacts are required	Assessment of potential barrier impacts have been undertaken in relation to wetland and woodland dependent species and is presented alongside predicted flightpath mapping in **Section 7.3.7**.
BCS_09	Further information on, and assessment of, raptor nesting sites are required	See **Section 4.5.1.1**.
BCS_10	Glossy Black-Cockatoo flight path mapping is required	Predicted flight path mapping for the Glossy Black-cockatoo has been completed and is presented in **Section 7.3.7.1**
BCS_11	Bat utilisation survey data needs to include more detail to inform an assessment of potential impacts	**Section 4** has been amended to include additional analysis of bat utilisation and its response to changes in season and weather. Analysis has been informed by ongoing passive surveys conducted at three met mast locations.
BCS_13	Targeted surveys for candidate frog species may not have been completed in all areas of suitable habitat	See **Section 2.2.4** for discussion regarding additional surveys conducted.
BCS_15	Further information is required to demonstrate threatened flora survey effort has met the guidelines	See **Section 2.2.3** for discussion regarding additional surveys conducted.
BCS_16	Species polygons and associated loss calculations need to be revised	See **Section 5**
BCS_19	Bird and Bat Adaptive Management Plan (BBAMP) Framework requires revision	See **Section 7.4** Pre-construction baseline acoustic surveys targeting forest owls have been included in proposed mitigation measures in **Section 7.4**. Further detail on management and mitigation actions to be undertaken should an impact trigger occur is provided in **Section 7.4**. Options for offsetting unavoidable impacts resulting from collision and/or barotrauma are outlined in **Section 7.3.5**.
BCS_20	Indirect impacts	See **Section 8.2** for the assessment of indirect impacts.
RTS_01	The development footprint assessed in the BDAR does not include all transmission line easements and the partial loss calculations for these areas need to be revised	See **Section 8.1**

Reference	Submission	Addressed in
RTS_02	Further detail is required to meet the requirements for assessing impacts on Matters of National Environmental Significance (MNES)	See **Appendix E** for assessment of impacts to MNES conducted in accordance with the guidelines. MNES have been further considered in the assessment of indirect impacts in **Section 8.7**.
RTS_03	Threatened species assessment for the local road network does not accord with Section 5 of the BAM	See **Section 2.2.3**
RTS_04	Long-nosed Potoroo was recorded and needs to be included in the assessment	Candidate species assessment: **Section 5.1.2**. MNES assessment: **Section 5.3, 7.2** and **Appendix E**.
RTS_05	The species polygon count for *Eucalytpus nicholii* does not include all occurrences of the species recorded within the development footprint	See **Figure 5-5**
RTS_06	Potential additional *Dichanthium setosum* records require clarification	No additional records of *Dichanthium setosum* are known to occur in the Project Area. Known records have been avoided. See **Figure 5-3**
RTS_07	Exclusion of direct impact areas as non-native vegetation requires justification	The Land Category Assessment report is attached as **Appendix A**.

STAGE 1: BIODIVERSITY ASSESSMENT

2. INTRODUCTION

The Project is situated 6.5 km north-east of Walcha, 35 km south of Armidale, and 75 km north-east of Tamworth, in the New England Tablelands region of NSW. The Project Area occurs across two Local Government Areas (LGA), the Walcha LGA and the Uralla Shire LGA and is within the New England Renewable Energy Zone (REZ).

The Project Area is on land predominantly used for sheep and cattle grazing where the groundcover has been improved for pasture by the introduction of exotic species. The topography is undulating and areas of steeper incline are present, and most of the woody vegetation across the Subject Land is isolated to the tops of these rises. The Project Area extends over an area of approximately 21,844 ha across 315 freehold land parcels.

The Project Area includes the main wind farm area and a main transmission line area which extends from within the wind farm to the northwest across the Salisbury Plains a distance of approximately 44 km. The transmission line area comprises a 60 m easement corridor. Upgrades to the public road network are located outside the Project Area.

Major transport corridors in proximity to the Project include:

- The New England Highway (A15) which connects Newcastle to Brisbane via Tamworth;
- The Oxley Highway (B56) which connects Walcha to Port Macquarie; and
- Waterfall Way (B78) which connects Uralla to Raleigh via Armidale.

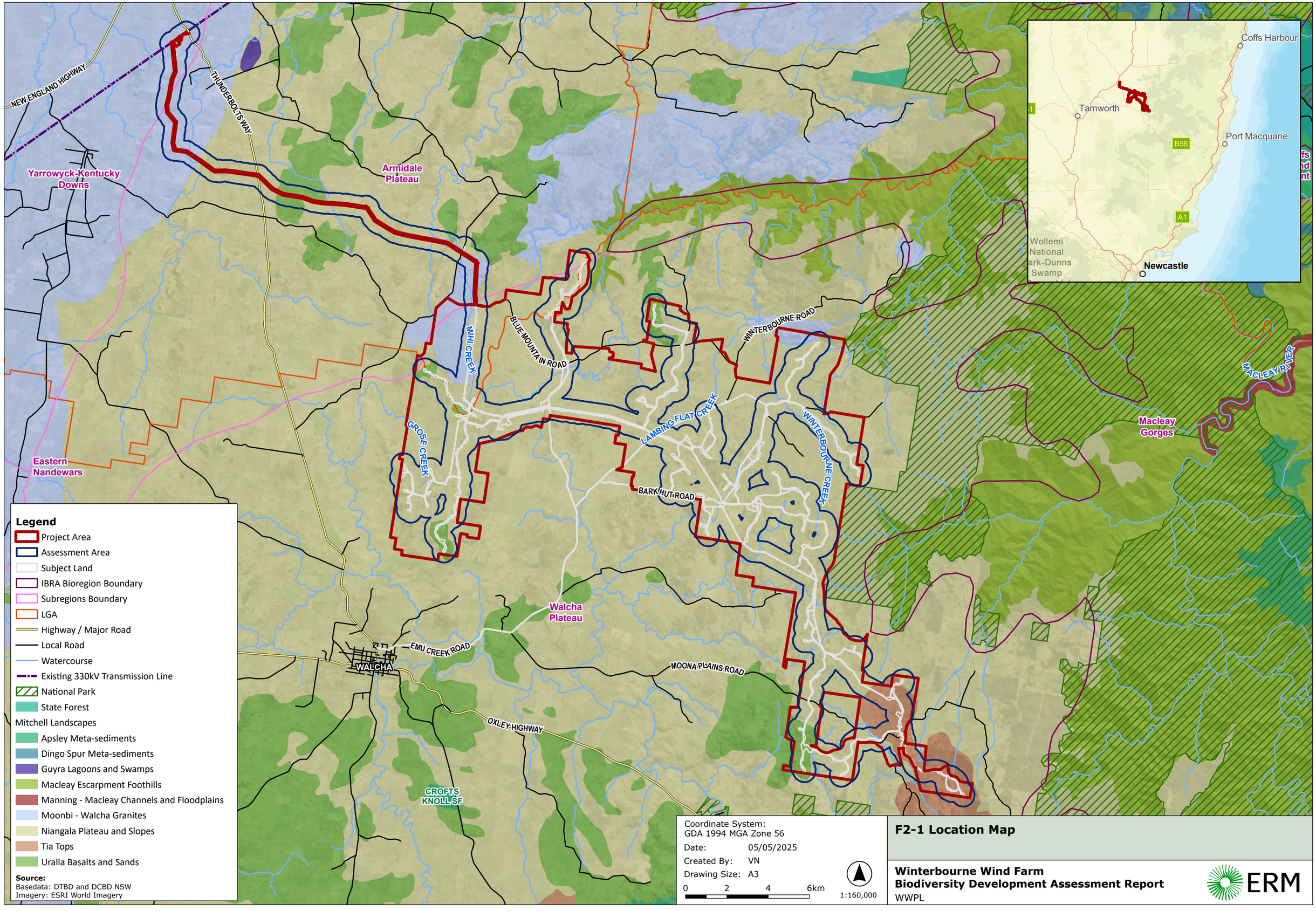
The Project location is shown in **Figure 2-1**.

2.1 PROPOSED DEVELOPMENT

2.1.1 LOCATION

The Project is located within the New England REZ, which is centered around Armidale. The Project Area is accessed via Winterbourne Road which runs east-west through the Project Area and connects with Thunderbolts Way via Emu Creek Road and Jamieson Street. The Project Area is currently used for agricultural purposes such as livestock grazing and cropping and is characterised by large areas of grassland and pastures with isolated remnant patches of forest and woodland vegetation.

The Project Area is bounded by Thunderbolts Way to the west, the Oxley Highway to the south, the Oxley Wild Rivers National Park (NP) to the east, and the Salisbury Plains to the north. Thunderbolts Way is a regional road, which extends south from Gwydir Highway, travelling through Uralla and Walcha and terminates at Scone Road in Barrington. Oxley Highway is a State Road, which runs in a general east-west alignment linking Port Macquarie and the Pacific Highway to the New England Highway near Bendemeer.



F2-1 Location Map

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

2.1.1.1 DEVELOPMENT FOOTPRINT

For the purposes of the BDAR, the term 'Development Footprint' is used hereafter to refer to the area to be directly impacted during the construction and operational phases of the Project. This term is interchangeable with 'Subject Land'. The Development Footprint covers an area of 882.08 ha and is inclusive of the wind farm components, transmission line and haul route from Staces Road in Uralla to the Project Area.

2.1.1.2 PROPERTIES

Participating properties define the extent of the Project Area and are listed in **Table 2-1**. Additional impact areas assessed in this Updated BDAR includes access roads to the transmission line and switching station and local roads requiring upgrades.

TABLE 2-1 SUBJECT LAND LOT AND DP DETAILS

Landowner Group	Lot	DP	Title
Project Area			
Landowner Group 1	5	866652	Freehold
Landowner Group 2	98, 99, 100	1128816	Freehold
	48	756473	Freehold
Landowner Group 3	89	756474	Freehold
Landowner Group 4	80, 105	756504	Freehold
Landowner Group 5	1	1154216	Freehold
	91, 92, 93, 94, 96	755820	Freehold
	1, 2	207146	Freehold
Landowner Group 6	95, 96, 97	1128816	Freehold
Landowner Group 7	1	590453	Freehold
	2	710615	Freehold
	3	1221142	Freehold
	50, 58, 81, 95, 117, 118	756477	Freehold
Landowner Group 8	2	529780	Freehold
	47, 95	756504	Freehold
	351	873508	Freehold
	1, 2, 3, 4	1090942	Freehold
Landowner Group 9	1	120126	Freehold
	70	661944	Freehold
	37, 38, 39, 44, 45, 46, 67, 68, 112, 113, 123	765477	Freehold
	3	1111348	Freehold
	1	1221141	Freehold

Landowner Group	Lot	DP	Title
Landowner Group 10	1	131437	Freehold
	2	247741	Freehold
	6, 7, 24, 29, 68, 69, 70, 71, 72, 77, 83, 89	756504	Freehold
	1	1175912	Freehold
Landowner Group 11	34, 51, 52	756476	Freehold
	352	873508	Freehold
	123	1062583	Freehold
Landowner Group 12	2	595834	Freehold
	81	756504	Freehold
	1	1210945	Freehold
Landowner Group 13	1	127753	Freehold
	2	211479	Freehold
	26, 28, 38	756473	Freehold
	103, 109	756474	Freehold
	53, 84, 85, 86, 87	756477	Freehold
	8	1144370	Freehold
	2	1192373	Freehold
	11	1199615	Freehold
	120	804549	Freehold
Landowner Group 14	131, 132	756477	Freehold
	3	1238969	Freehold
	6	1147105	Freehold
Landowner Group 15	1	1069933	Freehold
Landowner Group 16	29, 32, 33, 36, 37	756473	Freehold
Landowner Group 17	46	756473	Freehold
	1	595834	Freehold
	2	1234912	Freehold
	51	1126596	Freehold
Landowner Group 18	1, 2	360166	Freehold
	20	756504	Freehold
	3	234456	Freehold

Landowner Group	Lot	DP	Title
Landowner Group 19	99	756504	Freehold
	4	234456	Freehold
	1	576324	Freehold
	1	211106	Freehold
	1, 2	810885	Freehold
	3	618977	Freehold
	7	866652	Freehold
	1	529780	Freehold
Landowner Group 20	55, 101, 102	756504	Freehold
Landowner Group 21	65, 104, 106, 107, 108, 119, 120, 140, 141,462	756492	Freehold
	53	756476	Freehold
	1	344471	Freehold
	5, 12, 13, 17, 18, 19, 60, 68, 69, 70, 72, 73, 74, 75, 76, 77, 101, 121	755820	Freehold
	2	344472	Freehold
Landowner Group 22	1	512960	Freehold
Landowner Group 23	2	512960	Freehold
	117	756492	Freehold
	33, 50	756476	Freehold
Landowner Group 24	B	381236	Freehold
	335, 336, 337, 364, 366, 369, 399	756502	Freehold
Landowner Group 25	1	1221143	Freehold
Landowner Group 26	10	1204696	Freehold
Transmission Line and Switching Station			
Landowner Group 28	92, 115, 116, 117, 129, 146, 180, 183, 189, 198, 199, 302, 303	755836	Freehold
	1	184356	Freehold
	1	126202	Freehold
	9	1237026	Freehold
	127	755829	Freehold
	2	1243987	Freehold
Landowner Group 29	114	755829	Freehold
	205, 206	755846	Freehold
Landowner Group 30	14, 33, 34, 39, 40, 42, 78, 87	755820	Freehold
Landowner Group 31	45, 154, 155	755820	Freehold

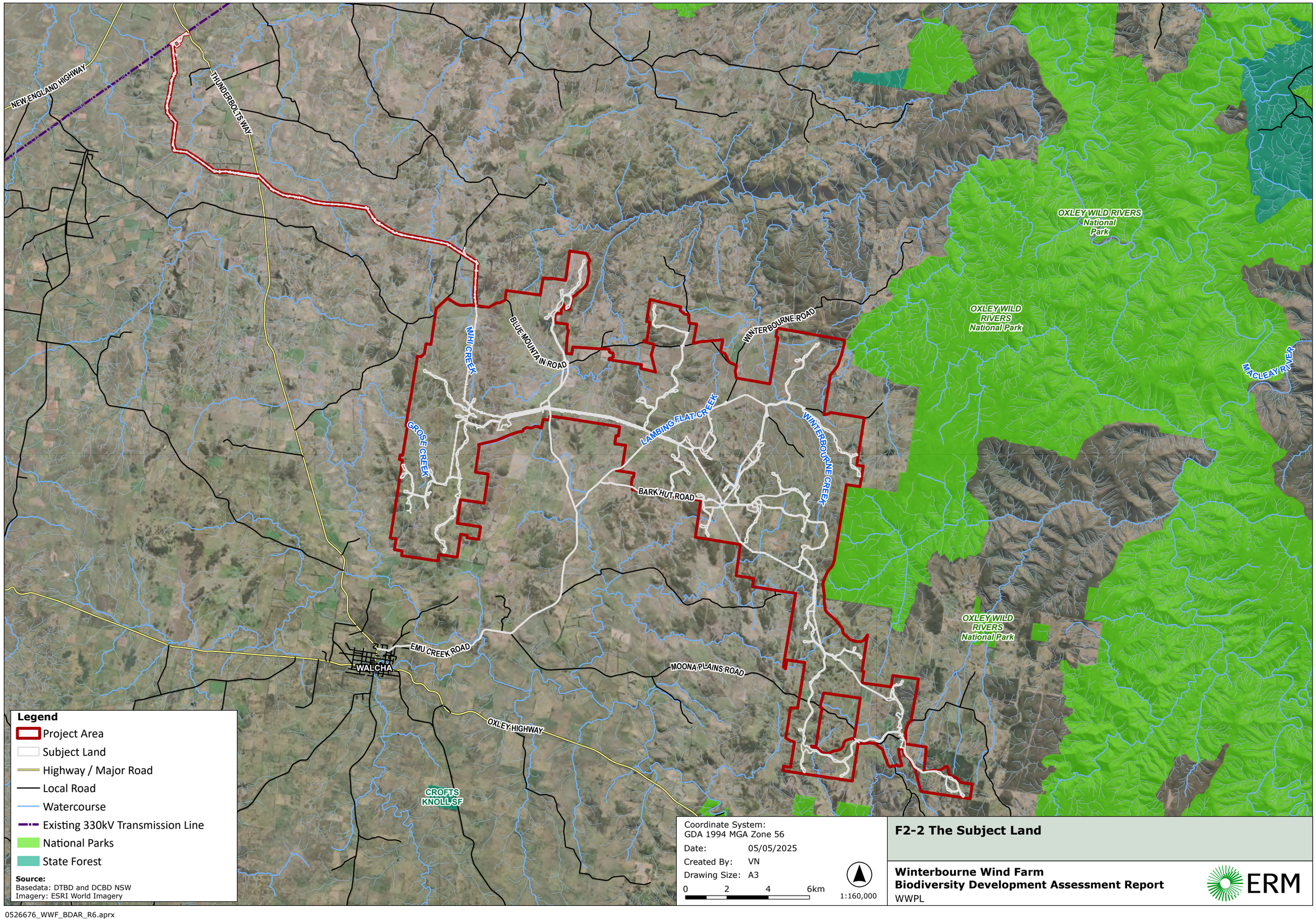
Landowner Group	Lot	DP	Title
Landowner Group 32	1	172254	Freehold
	1	1241971	Freehold
Landowner Group 33	B	372668	Freehold
Local Road Upgrades			
Landowner Group 10	39	756504	Freehold

2.1.1.3 SUBJECT LAND

The term 'Subject Land' is land to which the BAM is applied to assess the area of direct impacts and is therefore synonymous with the term 'Development Footprint'. The extent of the Subject Land is shown in **Figure 2-2**.

2.1.1.4 ASSESSMENT AREA

The Assessment Area for a linear development, such as the wind farm, is all lands within a 500 m radius of the Subject Land boundary shown in **Figure 2-2**. The Assessment Area generally comprises areas of agricultural RU1 land. Oxley Wild Rivers National Park to the east and south-east is zoned as E1 National Parks and National Reserves.



F2-2 The Subject Land

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2.1.2 DEVELOPMENT DESCRIPTION

The Project layout for which approval is sought is shown in **Figure 2-3** with components further discussed in **Table 2-2**.

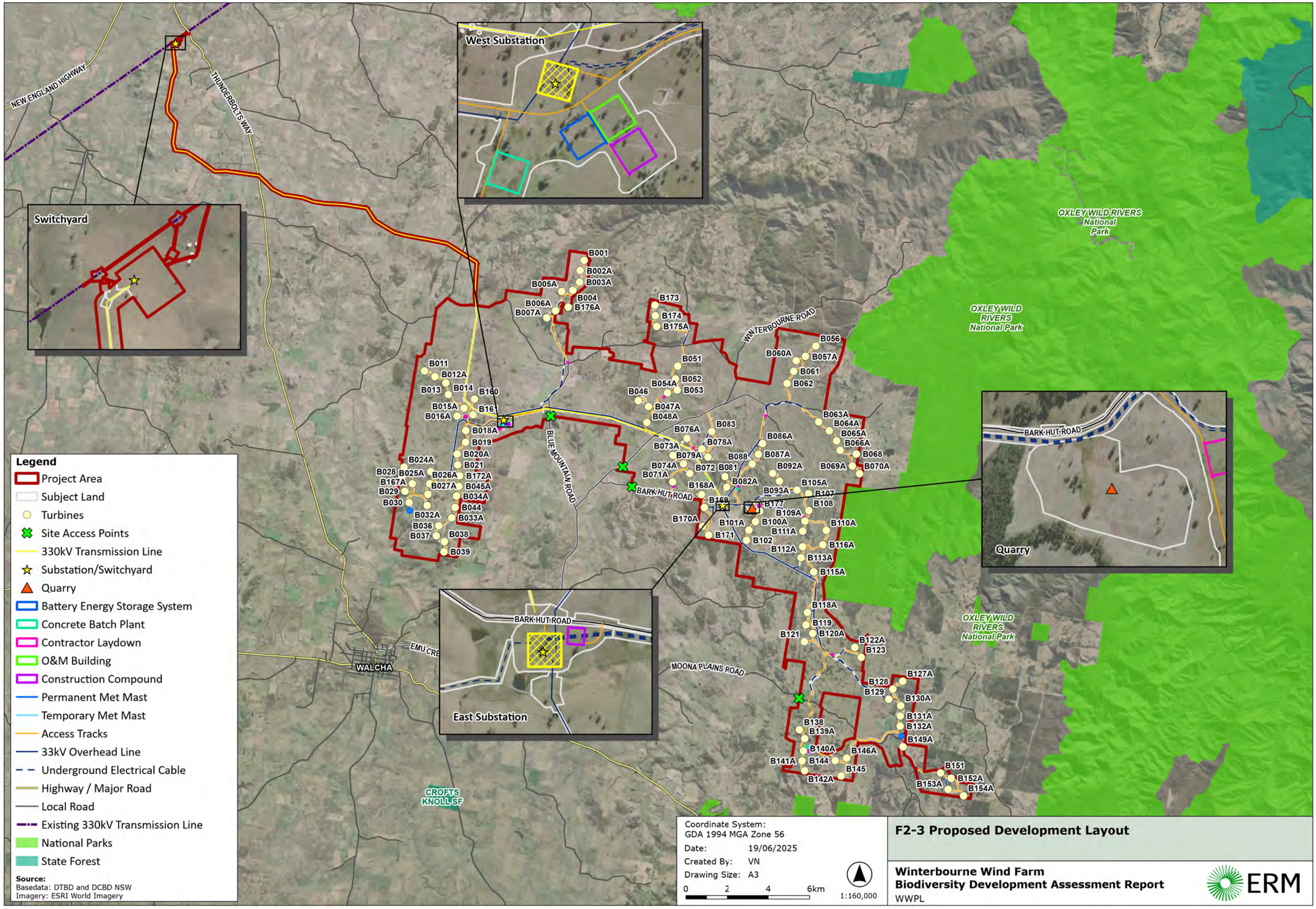
TABLE 2-2 PROJECT COMPONENTS

Project Component	Description	Quantity
Project Footprint		
Project Area	Total area to which the Application applies	21,844 ha
Development Footprint	The area of land that is directly impacted by the Project including all temporary and permanent disturbance areas; and all areas where vegetation may be removed during project construction and operation. The Development Footprint is inclusive of the wind farm components, transmission line and haul route.	882.08 ha
Permanent Development Footprint	The area of land that will be subject to permanent alteration because of the Project's infrastructure until decommissioning. This is generally associated with areas for the WTG hardstands, meteorological masts, BESS, O&M facilities, substations, communication tower, switchyard and internal roads. These areas will not be suitable for agricultural use.	216.6 ha
WTGs		
Model	Vestas V162-6.2 MW	118 WTGs
Rotor diameter	162 m	
Blade length	81 m	
Uppermost blade tip	230 m	
Tower (hub) height	149 m	
WTG hardstand	During construction approximately 2.3 ha (temporary) and after rehabilitation this area will be reduced to approx. 0.8 ha (permanent).	
Ancillary Infrastructure		
High Voltage Transmission Line	330 kV single or double circuit twin conductor overhead transmission line	44 km
Medium Voltage Reticulation	Aboveground and underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substations (generally following site access tracks)	210.5 km
33/330 kV Substation	100 x 100 m (approx. 1 ha) containing transformers, switchgear, communication towers, control and protection equipment and drainage and oil containment systems with security fencing	2
Switchyard	160 x 120 m (approx. 2 ha) and 20 m asset protection zone	1
100 MW/200 MWh BESS	100 x 100 m (approx. 1 ha) and 20 m asset protection zone including a cooling system and automated control system	1

Project Component	Description	Quantity
Internal Access Tracks	Access tracks within the Project Area connecting to existing Council roads providing access to WTGs, ancillary infrastructure and transmission line, 5.5 m wide roadway on straights plus shoulders and drainage as required	115.3km
Permanent O&M Facility	50 x 40 m containing the control room, switch room, storage shed and workshops with water supply, waste facilities, car parking, electricity and Wi-Fi	1
Meteorological Monitoring Masts	Maximum height of 149 m, built on a concrete base supported by guy wires	Up to 2 permanent
Other Project elements		
Duration and start of construction phase	Construction over a period of 52 months	
Construction workforce	Up to 390 FTE	
Duration of operation phase	30 years	
Operational workforce	Approximately 16 long-term service and maintenance jobs	

The following temporary elements will be required during the construction phase of the Project:

- Site buildings and facilities for construction contractors / equipment, including site offices, car parking and amenities for the construction workforce;
- Mobile concrete batching plant/s to supply concrete for WTG footings and substation construction works;
- Earthworks for access tracks, WTG platforms and foundations, potentially including controlled blasting in certain areas;
- Rock crushing facilities for the generation of suitable aggregates for concrete batching and/or for access track and hardstand construction;
- Hardstand laydown areas for the storage of construction materials, plant, and equipment;
- Up to four temporary meteorological monitoring masts. The temporary monitoring masts will be located close to a WTG location with a maximum height of 149 m AGL;
- Groundwater supply, subject to appropriate licencing, and storage for concrete batching and construction activities;
- The transport, storage and handling of fuels, oils and other hazardous materials for construction and operation of wind farm infrastructure;
- Beneficial reuse of materials won from within the development footprint during cut and fill and WTG foundation excavation works for use in access track, hardstands and foundation material; and
- Addition of an onsite quarry, to supply raw construction materials for the Project. The quarry operations will be confined to Lot 95 DP 1128816 and have an annual extraction limit of up to 500,000 tonnes.



Legend

- Project Area
- Subject Land
- Turbines
- Site Access Points
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- National Parks
- State Forest

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

F2-3 Proposed Development Layout

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2.1.2.1 HAUL ROUTE

The Port of Newcastle will be utilised for the import of key wind turbine and substation components. The preferred transport route from the Port to the Project has been identified within a route study prepared by Rex J Andrews Pty Ltd (Appendix A of the Amended Traffic Impact Assessment [Amended TIA]) (Amber Organisation, 2025). Several road upgrades are required to facilitate transport of oversize and overmass vehicles to the site. The proposed upgrades are presented in Appendix A of the Amended TIA.

The Project proposes to rely on EnergyCo to complete all Port to REZ upgrades as per the NSW Government commitment specified in the Amended TIA. Specifically, all works from the Port of Newcastle to the New England Highway in Uralla shall be completed by EnergyCo. The vehicles proposed for the transport of the OSOM components are within the design envelopes of the vehicles utilised by EnergyCo for the Port to REZ project.

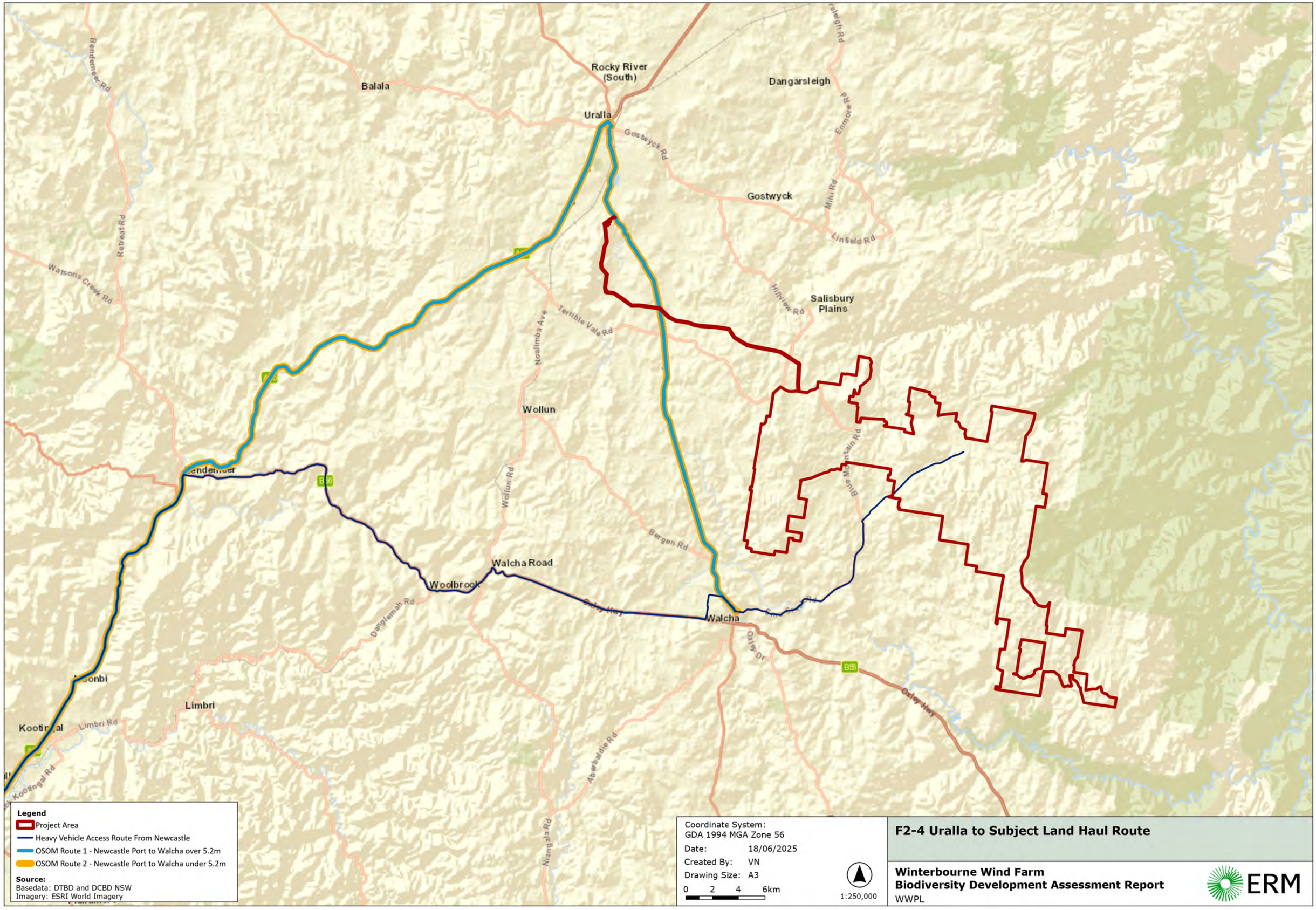
All other OSOM road upgrades between Uralla and the site would be undertaken by the Project (i.e., Staces Road and all local road upgrades) or Walcha Council as part of planned road upgrade works (i.e., Thunderbolts Way / Jamieson Street intersection upgrade).

The Project proposes to upgrade Staces Road including extension of the road to Thunderbolts Way to accommodate OSOM vehicles associated with the Project. The upgrade would form a new public road link allowing access between New England Highway and Thunderbolts Way for other non-project traffic.

Assessment and design of the proposed site access locations and road intersections has been undertaken (Appendix C of the Amended TIA) (Amber Organisation, 2025). An assessment of the local road network has been carried out and identifies proposed road upgrades to accommodate project traffic (Appendix D, Amended TIA) (Amber Organisation, 2025).

The proposed transport routes between Uralla and the Project are shown in **Figure 2-4**.

The route study was reviewed to determine the extent of impacts requiring assessment in this Updated BDAR. Removal of native vegetation is required in some sections of the haul route, and these impacts are to be assessed under the BOS and reported within this Updated BDAR. The ERM (2024) due diligence assessment comprised a desktop and field survey and was conducted to identify which locations subject to modification contain biodiversity values that could be impacted by the required works. The due diligence report concluded that the removal of native vegetation requiring to be assessed under the BOS and reported within this Updated BDAR occurs at several locations within the haul route. These assessable impacts are restricted to local roads generally east of Walcha and these affected lands have been included in the Subject Land.



F2-4 Uralla to Subject Land Haul Route

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2.2 METHODOLOGY

This section provides a detailed account of the methods used to measure biodiversity values across the Subject Land, which is necessary for informing the consideration of avoid and minimize direct impacts (see **Section 7.1**), assessing prescribed impacts (see **Section 7.2** and **Section 8.3**) and indirect impacts (see **Section 8.2**), and calculating residual direct impacts (see **Section 8.1**).

2.2.1 SITE CONTEXT

2.2.1.1 LANDSCAPE FEATURES

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken between November 2019 and March 2025 sought to verify the following landscape features (in accordance with Sections 4.2 and 4.3 of the BAM):

- IBRA bioregions and subregions, NSW landscape region and area (ha);
- Native vegetation extent and cleared areas within the buffer area;
- Rivers and streams (classified according to stream order);
- Wetlands within, adjacent to and downstream of the site;
- Connectivity features; and
- Areas of geological significance and soil hazard features.

2.2.1.2 NATIVE VEGETATION COVER

A desktop assessment was initially conducted to determine the extent (ha) of vegetation cover on the Subject Land and Assessment Area (500 m buffer of Subject Land). The following resources were used:

- Historic aerial imagery (NSW Spatial Services, 2025);
- Transitional NVR Map (NSW Government, 2025);
- NSW Landuse 2017 v1.2 (NSW DCCEEW, 2023);
- NSW Environmental Planning Instrument - Land Zoning (NSW DPHI, 2025);
- NSW Woody Vegetation Extent & FPC 2011 (NSW DCCEEW, 2015); and
- NSW State Vegetation Type Map (NSW Government, 2024b).

Desktop analysis and field surveys conducted between 2019 and 2025 were used to define the extent and condition of assessable vegetation cover within the Subject Land.

Native vegetation in the Assessment Area situated outside of the Subject Land was not ground-truthed and in some areas the assessment considered State Vegetation Type Mapping (SVTM) and Woody Vegetation Extent mapping that may be outdated and/or inaccurate. Consequently, there may be some minor additions or omissions to the actual extent of native vegetation as defined in the BAM.

2.2.2 NATIVE VEGETATION, THREATENED ECOLOGICAL COMMUNITIES AND VEGETATION INTEGRITY

Sections of the BAM relevant to vegetation mapping are:

- Section 4.1 Map native vegetation extent on Subject Land;
- Section 4.2 Identify and map plant community types and ecological communities; and

- Section 4.3 Map vegetation zones and assessment vegetation integrity (vegetation condition).

The SVTM (NSW DCCEEW, 2024d) and BioNet Vegetation Classification system (BioNet VIS) were used to identify candidate PCTs and threatened ecological communities (TECs) that may be present within the Subject Land. This was used as the basis for designing a sampling program to prepare a field verified vegetation map identifying PCTs and associated broad condition states (i.e., VZs).

Recent high-resolution imagery (ESRI basemaps) was used in ArcMap at a scale of 1:1,000 to generate vector data (i.e., polygons) to describe variation in vegetation structure, character and condition.

Field based data was obtained to assign vegetation classification and calculate condition states. Field surveys were performed during the following dates:

- Spring 2019 – 8-21 November 2019;
- Summer 2020 – 13-26 February 2020;
- Winter 2020 – 10-14 August 2020;
- Spring 2020 – 28 September to 2 October 2020;
- Autumn 2021 – 8 March to 1 April 2021;
- Spring 2021 – 10 October to 16 November 2021;
- Summer 2023 – 4-7 December 2023;
- Summer 2024 – 29 January to 3 February 2024;
- Winter 2024 –28-30 June, 23–25 July 2024 and 10, 11, 20 and 22 August 2024; and
- Summer 2025 – 29 November to 5 December 2024 and 17–23 February 2025.

Field surveys used to verify desktop mapping including one or both of the following scientific and objective methods:

- Plot-based vegetation integrity surveys (BAM Plots) including full floristic plots (see **Section 2.2.2.4**);
- Rapid data points (see **Section 2.2.2.5**); and
- Point intercept transects (see **Section 2.2.2.6**).

The following sections outline the approach taken in generating the vegetation map for the Subject land.

2.2.2.1 MAPPING NATIVE VEGETATION EXTENT

Section 4.1 of the BAM requires the extent of native vegetation to be mapped across the Subject Land. For clarity, the definition of native vegetation in the BAM is broad and reproduced below for clarity:

> **Native vegetation:** has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act, repeated here:
>
> (1) For the purposes of this Part, **native vegetation** means any of the following types of plants native to New South Wales:
>
> a. trees (including any sapling or shrub or any scrub),
>
> b. understorey plants,

c. groundcover (being any type of herbaceous vegetation),

d. plants occurring in a wetland.

(2) A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorize conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible.

(3) For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if:

a. the plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and

b. it would be native vegetation for the purposes of this Part if it were native to New South Wales.

(4) For the purposes of this Part, native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). A declaration under Section 14.7 of the BC Act that specified vegetation is or is not marine vegetation also has the effect for the purposes of this Part.

Native vegetation extent was mapped using aerial photography interpretation, existing maps of native vegetation in the area (i.e., SVTM) and field verification surveys from 2019 to 2025. Mapping initially sought to distinguish between unvegetated and vegetation surfaces, followed by the separation of woody from non-woody vegetation as the broadest forms of condition state. All mapping was performed at a capture scale of 1:1,000 or finer (Section 4.1(2) of the BAM) as outlined below.

Non-native Vegetation

A cognitive analysis of recent aerial imagery was initially used to map lands likely to comprise unvegetated surfaces (i.e., lands covered by water, human infrastructure [e.g., roads, buildings] and naturally unvegetated surfaces [e.g. rocks]). These areas are not native vegetation and do not form part of the assessable vegetation cover, thus do not require any further assessment in Section 4 of the BAM (i.e., Section 4.1.2(1)). These lands were assigned to the classification PCT = 0.

Woody Vegetation

The extent of woody vegetation (i.e., tree canopy cover in Section 4.1(1) of the BAM) was determined by examination of the latest available ArcGIS basemap imagery (May 2023) in ArcMAP (v8.5.2) using the following stepwise approach:

- Cognitively mapping the boundary of the tree canopy cover to map the extent of woody vegetation (i.e., woody vegetation extent layer). This approach is consistent with Cl113(1)(g) of the *Local Land Services Regulation 2014*;
- Use of a 15 m buffer to the woody vegetation extent layer and 'minimum bounding polygon' tool in ArcGIS (Convex Hull) to map woody matrix layer;
- Aggregation of woody extent and woody matrix layers to produce a woody vegetation patch layer; and

- Cognitive mapping to join closely adjoining woody vegetation patches.

A structural classification was assigned to woody patches to aid delineation of broad condition states or VZs (i.e., Section 4.3 of the BAM). Woody structural classifications adopted were:

- Open forest: Tree canopy separation less than 6 m;
- Woodland: Tree canopy separation 6 – 25 m;
- Open Woodland: Tree canopy separation of 26 – 49 m;
- Isolated: Tree canopy separation of 50 – 100 m; and
- Disconnected (scattered): Tree canopy separation of greater than 100 m.

Non-woody Vegetation

The residual unmapped area was further analysed to map lands comprising assessable native ground cover vegetation (i.e., Section 4.1.2 of the BAM). This included consideration of the LCA (**Appendix A**) where 'low conservation value grasslands' and/or significantly disturbed or modified lands were excluded.

Assessable vegetation cover was provisionally assigned as 'groundcover vegetation' (i.e., lands not comprising woody vegetation or lands not already assigned PCT = 0). Further analysis was undertaken to differentiate between native (e.g., secondary or derived grasslands) and exotic vegetation (e.g., planted exotic trees, exotic species incursions). This involved aerial photography interpretation and field surveys of the Subject Land over several seasons and years.

2.2.2.2 IDENTIFYING PLANT COMMUNITY TYPES AND ECOLOGICAL COMMUNITIES

Assessable vegetation is required to be classified into PCTs using quantitative methods (Section 4.2.3 of the BAM). This assessment has used legacy PCTs since 2020 and, for this reason, legacy PCTs have been used in this assessment in preference to the more recent eastern NSW PCT classification.

Best fit PCTs available from the NSW BioNet Vegetation Type Database were cognitively assigned to BAM plots as the first step in identifying the PCTs of the Subject Land. This is referred to as an *a priori*[13] classification, which was adopted in this assessment because of the considerable effect of land use on native vegetation. This process involved consideration of both floristic composition and structure evident in the BAM plots, landscape scale factors such as topographic position, elevation and climatic variables (e.g., average annual rainfall), and disturbance.

These *a priori* assignments were quantitatively tested using the Bray-Curtis similarity (dissimilarity) index (Bray-Curtis Index). A pairwise resemblance matrix was generated from the Bray-Curtis Index of each BAM plot pair (i.e., degree of similarity between plots) using the percentage cover values for each species observed in each BAM plot.

[13] *a priori*: cognitive assignment of samples (e.g. BAM plots) into groups (e.g. PCTs) prior to analysis through reasoned self-evident indicators (e.g., landscape indicators and similarities in tree, shrub and groundcover species) as per requirements specified in Section 4.3.1(3) of the BAM.

This analysis was limited to full floristic plots obtained from woody patches where all structural elements of the vegetation were present, and thus excludes BAM plots obtained from derived grasslands due to their substantially degraded status (e.g., missing important diagnostic growth forms such as trees). The inclusion of degraded vegetation in the analysis would diminish the reliability of the classification produced.

The Bray-Curtis Index value generated for each BAM plot pair is bounded between 0 and 1. A Bray-Curtis Index value of 0 means the two samples have the same species composition (i.e., they are similar or the same), whereas a value of 1 means the pairwise comparison indicates no similarity. The pairwise Bray-Curtis Index matrix was generated from PRIMER Version 7 with PERMANOVA Version 1.0.3 (Plymouth Marine Laboratory, Plymouth United Kingdom, Clarke and Gorley 2006). A square root transformation of percent cover values was performed to minimize the effect of high percentage covers on the analysis (e.g., eucalypt canopies). A dummy variable was added (value 0.1) to zero-adjust the Bray-Curtis coefficient and thus improve performance of classifying a sparse dataset (i.e., high disparity between alpha and beta diversity).

An analysis of similarities (ANOSIM) was performed to statistically test the *a priori* classification. This test calculates the Global R statistic that measures the strength of differences between *a priori* groups. Global R ranges from -1 to +1, with values closer to +1 indicating stronger differences between groups. A value of 0 suggests no significant difference, while a negative R value, though less common, can occur in specific natural assemblage scenarios. A p value was also generated to determine if the differences between *a priori* groups are significant or not (i.e., $p < 0.5$ is significant). To aid interpretation and iterative re-evaluation, pairwise R values were generated to compare between two *a priori* groups. Where justified, this analysis was used to adjust the assignment of PCTs to BAM plots thus improving the accuracy of the overall classification.

An agglomerative hierarchical clustering analysis (CLUSTER analysis) was performed to visualize the similarity (dissimilarity) resemblance matrix (i.e., dendrogram). This was accompanied by a non-metric multidimensional scaling (nMDS) plot to aid the interpretation of the classification produced. A SIMPER[14] analysis was performed to characterize species composition for each *a priori* PCT group. These characteristic/indicator species are reported in support of the best fit PCT assignment as listed in the BioNet Vegetation types database.

PCT mapping was informed by the CLUSTER analysis, aerial photographic interpretation (phototyping/cognitive imagery analysis), landscape factors such as terrain, aspect, topographic relief (e.g., areas of cold air drainage), data obtained from rapid vegetation points, and relevant literature.

2.2.2.3 VEGETATION ZONES AND VEGETATION INTEGRITY

A VZ represents an area of native vegetation comprising a PCT in a broad condition state. These were defined from the PCT map using the combined consideration of imagery phototyping and site investigation data (i.e., BAM plots, LCA transects and rapid data points).

Table 2-3 summarises the VZs and associated minimum BAM plot requirements for each zone.

[14] SIMPER (similarity percentage): A method for identifying the species responsible for observed differences between groups of samples (e.g. species differences between *a priori* groups)

TABLE 2-3 VEGETATION ZONES AND MINIMUM BAM PLOT REQUIREMENTS

VZ	PCT	Condition	Area (ha)	Minimum Plots Required	Plots Used in Assessment	Sampling Rate (BAM plot/ area) (ha)
1	510	VZ1_DC_woodland	3.94	2	5	0.78
2	510	VZ2_DC_openwoodland	0.38	1	2	0.19
3	510	VZ3_DC_grassland	8.72	3	4	2.18
4	510	VZ4_RC_grassland	2.4	2	3	0.80
5	510	VZ5_low_grassland	14.23	3	4	3.56
6	510	VZ6_RC_woodland	0.96	1	3	0.32
7	533	VZ7_DC_openwoodland	0.14	1	2	0.07
8	533	VZ8_DC_grassland	0.52	1	2	0.26
9	534	VZ9_DC_woodland	2.49	2	6	0.42
10	534	VZ10_DC_openwoodland	0.58	1	1	0.49
11	534	VZ11_mod_grassland	12.88	3	3	4.29
12	534	VZ12_low_grassland	31.88	4	10	3.18
13	534	VZ13_RC_woodland	3.26	2	4	0.8
14	565	VZ14_DC_woodland	5.13	3	5	1.03
15	565	VZ15_DC_openwoodland	0.17	1	1	0.17
16	565	VZ16_DC_grassland	11.94	3	5	2.39
17	567	VZ17_DC_woodland	16.58	3	5	3.32
18	567	VZ18_mod_grassland	29.63	4	5	5.92
19	567	VZ19_RC_woodland	0.34	1	1	0.34
20	568	VZ20_DC_openforest	4.48	2	2	2.24
21	568	VZ21_DC_woodland	28.47	4	8	3.56
22	568	VZ22_DC_openwoodland	1.30	1	1	1.30
23	568	VZ23_DC_grassland	50.29	5	5	10.06
24	571	VZ24_DC_openforest	14.12	3	3	4.71
25	571	VZ25_RC_woodland	1.36	1	2	0.68
26	766	VZ26_DC_sedgeland	1.18	1	1	1.18
27	766	VZ27_RC_sedgeland	0.4	1	1	0.40
28	965	VZ28_openforest	3.09	2	2	1.55
29	965	VZ29_woodland	12.21	3	4	3.05
30	965	VZ30_DC_shrubland	0.95	1	1	0.95
31	965	VZ31_low_grassland	26.13	4	4	6.53
32	501	VZ32_DC_woodland	2.65	2	3	0.88

VZ	PCT	Condition	Area (ha)	Minimum Plots Required	Plots Used in Assessment	Sampling Rate (BAM plot/ area) (ha)
33	1512	VZ33_DC_woodland	0.66	1	1	0.66
34	970	VZ34_DC_openforest	4.6	2	4	1.15
35	970	VZ35_DC_woodland	8.44	3	6	1.41
36	970	VZ36_DC_grassland	42.67	4	4	10.67
37	970	VZ37_RC_woodland	0.23	1	1	0.23
38	1192	VZ38_RC_grassland	1.22	1	1	1.22
39	1192	VZ39_DC_grassland	18.02	3	3	6.01
40	1192	VZ40_DC_woodland	2.82	2	2	1.41
41	1194	VZ41_DC_woodland	0.93	1	1	0.93
42	501	VZ42_low_grassland	6.35	3	3	2.12
43	568	VZ43_low_grassland	58.68	5	8	7.34
44	571	VZ44_low_grassland	26.71	4	5	5.34

The BAM specifies a minimum requirement of 101 BAM plots for the assessment of 44 VZs in this Updated BDAR. This represents a sampling rate of one BAM plot per 4.60 ha of assessable vegetation. This assessment has used 145 BAM plots, eclipsing the minimum requirement by 44 plots and represents one BAM plot per 3.20 ha. The greater number of BAM plots used in this assessment reflects a more appropriate sampling strategy for a linear Project where increased spatial representativeness is required to measure condition.

The concept of spatial representativeness has been applied to the measurement of VIS where partial impacts are proposed (i.e., tree canopy removal along transmission line easements). Replicate BAM plots often exceeding the minimum requirement were placed in these linear parts of the Subject Land to measure condition across a large area, thus reducing the potential for non-representative VIS calculations. A separate management zone was established for partial impacts to separate from total impact. An increased sampling rate among these VZs was completed to more accurately measure VIS.

As for partial impacts, replicate BAM plots often exceeding the minimum requirement were used to measure native vegetation habitat that has the potential to comprise high biodiversity values (e.g., critically endangered ecological communities).

A total of 49 BAM plots were used to measure VIS across three PCTs associated with CEECs comprising 16 VZ, representing a sampling rate of one BAM plot per 1.68 ha. This sampling rate has increased resolution in broad condition state mapping thus reducing the risk of inaccurate VIS calculations (i.e., identification of biodiversity values).

BAM plots used to assess VIS were located within the Development Footprint, where practicable, with some proximal BAM plots located outside the Subject Land used where reasonable (due to Project layout refinements). Where BAM plots were not located within the Development Footprint, they were located within a contiguous/representative patch of vegetation suitable for collection of data commensurate with the impacted VZs. This allows for the vegetation integrity scores to be included in the BAM-C to provide consistency with the area impacted in the Development Footprint.

2.2.2.4 PLOT-BASED VEGETATION SURVEY

BAM Plots performed in accordance with s.4.2.1 of the BAM are the basis for calculating the VIS of a VZ. They were established by walking a random distance into the VZ and establishing the plot on a random bearing. Each BAM Plot was established around a central 50 m transect and each included:

- A 20 m x 20 m plot sampled for the presence of flora species. The plots were carefully examined to identify all flora species present. This search continued until it was confident that all flora species within the plot were detected. Data collected for each species included:
  - Stratum and layers in which each species occurs;
  - Growth form for each species;
  - Scientific and common name for each species; and
  - Percentage foliage cover (PFC) across the plot, of each species rooted in or overhanging the plot.
- Abundance rating for each species;
- One 1000 m² (20 m x 50 m) plot to assess the functional attributes: number of large trees, stem size class, tree regeneration and length of logs; and
- Five 1 m² sub-plots to assess average litter cover (and other groundcover components).

BAM plot locations and other survey methods such as rapid vegetation assessments that informed the ground-truthed PCT mapping are shown in **Figure 2-5**.

2.2.2.5 RAPID DATA POINTS

Rapid vegetation assessments were conducted to supplement BAM plots when determining PCT occurrence (NGH RDPs = 548). Rapid vegetation assessments recorded the dominant canopy, mid stratum and ground stratum species present while also noting aspects of the landscape such as slope, nearby water sources, soil qualities and signs of disturbance.

A dichotomous key was applied at specified rapid data points to aid CEEC mapping refinements. These dichotomous keys are provided in Appendix A of the Land Category Assessment (ERM 2025) (**Appendix A**), with results used to evaluate land categorisation relative to s60I(2)(m) of the LLS Act.

Rapid vegetation assessments conducted across the Subject Land are shown in **Figure 2-5**.

2.2.2.6 POINT INTERCEPT TRANSECTS

Transects of 100 m length were performed to evaluate the percent native and exotic vegetation cover for degraded lands that may not constitute native vegetation. Treeless lands with groundcover vegetation cover comprising less than 50% native vegetation cover in rural zoned land is taken to be cleared (Section 60F(3) of the *Local Land Services Act 2013*). The location of point intercept transects conducted as part of the Land Category Assessment (ERM 2025) are shown in **Appendix A**.

Legend

Project Area
Subject Land
Vegetation Survey
BAM plot

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

1:56,000

F2-5 Vegetation Survey Locations

Map 1 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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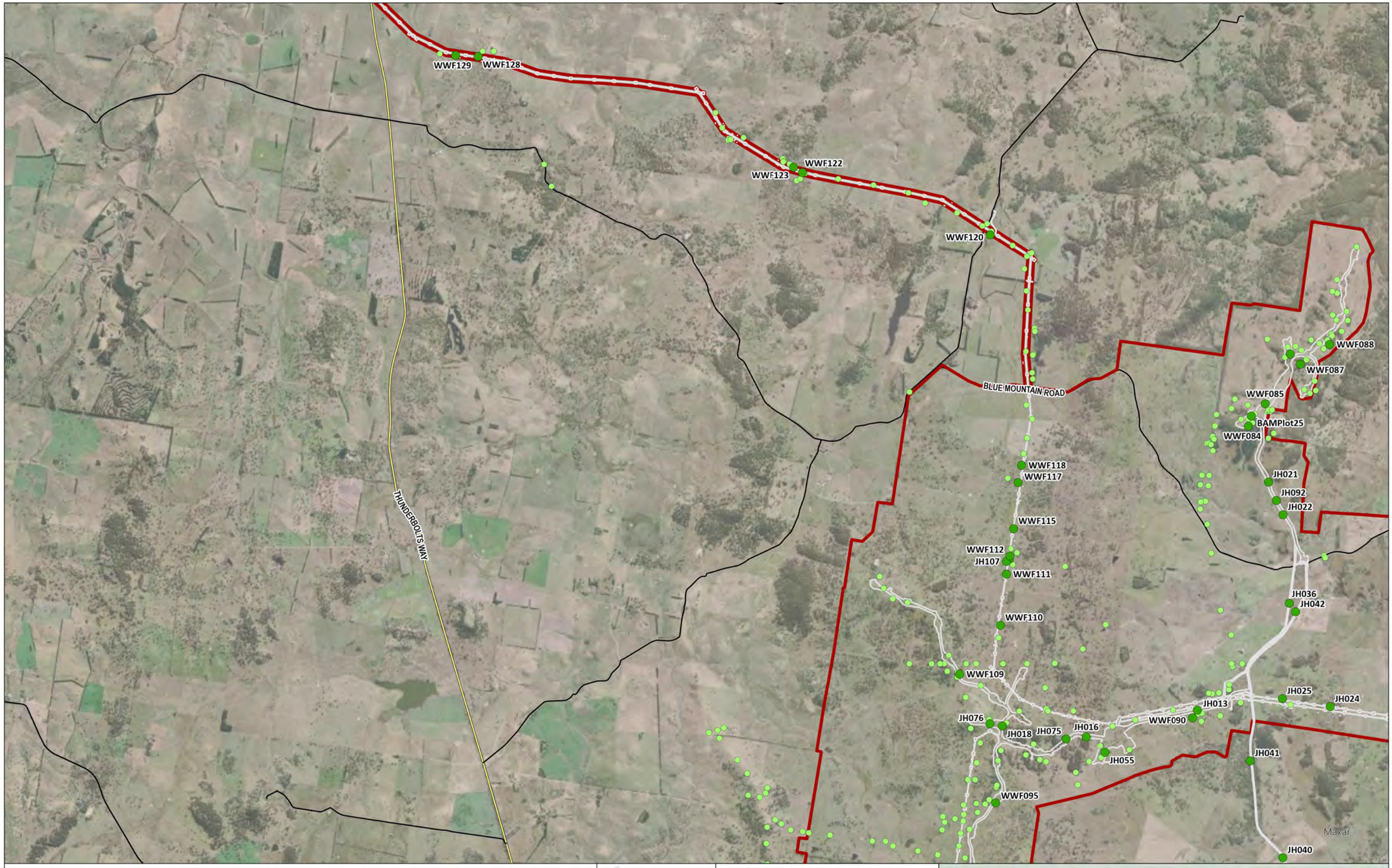

Legend

Project Area
Subject Land
Vegetation Survey
BAM plot

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:56,000

F2-5 Vegetation Survey Locations

Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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JH040
WWF104
JH117
JH08
JH118
JH073
JH070
JH010
WWF103
JH09
JH116
JH012
JH067
JH101
BLUE MOUNTAIN ROAD
JH121
WINTERBOURNE ROAD
WT153
WT152
WT151
JH095
JH094
WT149
EMU CREEK ROAD
THUNDERBOLTS WAY
DERBY STREET
OXLEY HIGHWAY
MOONA PLAINS ROAD
Maxar

Legend

Project Area
Subject Land
Vegetation Survey
BAM plot

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:56,000

F2-5 Vegetation Survey Locations

Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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0526676_WWF_BDAR_R7.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

WT140
JH027
JH026
JH111
WT143
JH034
JH033
JH032
JH029
JH031
BAMPlot19
WWF051
JH084
WWF076
JH037
JH059
WWF081
JH060
JH061
WT145
JH065
WT144
MA01
WWF045
WWF074
JH063
WWF062
WWF065
WWF068
WT138
WWF049
WWF044
BP22
BP21
WWF043
WWF059
WWF073
JH120
JH119
WWF058
WWF047
JH039
JH102
JH101
JH104
WT146
BAMPlot1
WWF055
JH079
WWF056
JH050
JH077
WWF041

Maxar

Legend

Project Area
Subject Land
Vegetation Survey
BAM plot

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:56,000

F2-5 Vegetation Survey Locations

Map 4 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

WWF041
WWF052
WT147
JH113
JH112
WWF037
JH114
WWF035
WWF032
MOONA PLAINS ROAD
JH124
BP24
WWF027
WWF026
WWF025
WWF020
JH122
BP27
OXLEY HIGHWAY
WWF017
WWF007
WWF005
WWF003
WWF002
JH098
Maxar

Legend

Project Area
Subject Land
Vegetation Survey
BAM plot

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:56,000

F2-5 Vegetation Survey Locations

Map 5 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

2.2.3 THREATENED FLORA SURVEY METHODS

2.2.3.1 REVIEW OF EXISTING INFORMATION

The BAM-C, BioNet Atlas Database and Atlas of Living Australia (ALA) were reviewed prior to the flora surveys conducted for this Updated BDAR. Threatened flora sightings recorded within the Subject Land were further investigated and considered throughout this Updated BDAR. Desktop review and field surveys within the Subject Land included the assessment of habitat constraints and microhabitats and their suitability for predicted species credit flora species.

2.2.3.2 HABITAT CONSTRAINTS ASSESSMENT

Desktop review and field surveys within the Subject Land included the assessment of habitat constraints and microhabitats and their suitability for predicted species credit flora species.

2.2.3.3 FIELD SURVEYS

The BAM-C identifies candidate species that require seasonal targeted searches to be undertaken across the Subject Land in accordance with the BAM and relevant guidelines. Targeted field surveys were undertaken in habitat throughout the broader Project Area prior to refinement of the current Subject Land. The Project Area includes the Subject Land. Threatened flora survey effort is shown in **Figure 2-6**.

The following targeted flora survey events were completed across the Project Area and Subject Land:

- Spring 2020: 28 September to 2 October and November 2020;
- Autumn 2021: 8-12 March and 29 March to 1 April 2021;
- Spring 2021: 10-29 October and 15-16 November 2021;
- Summer 2021: 6-17 December 2021;
- Spring 2023: 23-25October 2023;
- Summer 2023: 4-7 December 2023;
- Summer 2024: 29 January to 3 February 2024; and
- Summer 2025: 23 February to 5 March 2025.

Targeted flora survey methods conducted by NGH were described in and retrieved from the following documents:

- Biodiversity Development Assessment Report – Winterbourne Wind Farm (NGH, 2022);
- Field Survey Technical Memo 3 – Winterbourne Wind Farm (NGH, 2023c);
- Field Survey Technical Memo 4 – Winterbourne Wind Farm (NGH, 2023b); and
- Survey Technical Memo – Winterbourne Target Flora & BAM Plots Jan/Feb 2024 (NGH, 2024).

The technical memos are provided in **Appendix B**.

2.2.3.4 2020 – 2021 SURVEY METHODOLOGY

The following methodology was taken from the Biodiversity Development Report – Winterbourne Wind Farm, prepared by NGH in 2022. NSW Government DPIE *Surveying threatened plants and their habitats* (NSW DPIE, 2020) was used to establish the most effective survey methodology across the development site. A two-phase grid-based survey approach was adopted to maximise the likelihood of detection of targeted plants and apply survey techniques that aim to cover a large proportion of suitable habitat in a large site.

The targeted flora surveys were applied to land within the Development Footprint, and a grid spaced at 100 m^2 was overlayed onto the development site using a geographic information system (GIS). Surveys were proposed where the 100 m^2 intersected with suitable habitat for targeted flora species. Suitable habitat was considered to include all native VZs. Any areas of exotic vegetation or areas categorised as Category 1 – Exempt Land were not surveyed for threatened flora. A total of 3,030 grid points were within the development site, and 382 grid points intersected the Development Footprint, excluding Category 1 – Exempt Land. The grid points that were situated within the Development Footprint were then adjusted to target turbine locations and ensure coverage across the VZs. At the time of the flora surveys, additional assessment of exotic land was also undertaken.

The 328 grid points were targeted for threatened flora surveys. At each survey location point, a 40 m diameter area (1,256 m^2 circular area) was systematically surveyed for the target species by conducting parallel field traverses across the area with transects four metres apart (open vegetation) for all threatened flora species except for *Eucalyptus* species. All trees within the 40 m diameter area were inspected and identified to determine if they were the target species. Surveys for threatened eucalypts were only conducted in woodland VZs. Any threatened flora detected were recorded and a photo of the threatened species and other descriptive notes were also recorded with each sighting.

A matrix of the threatened flora species credit species was prepared from the BAM Candidate Species Report. This detailed the survey window for each species and was used to establish the optimum time of year for detecting the most threatened flora species. This was determined to be November with 15 of the 23 species able to be surveyed within November. Most surveys were carried out in November 2021, with additional flora surveys carried out in October and December 2021 and March 2022 to meet the requirements of the remaining species.

A total of 518 survey points were undertaken within the Subject Land as shown in **Figure 2-6** with any threatened flora detected recorded as a point datum. Some of the 518 survey points were duplicates as they were visited several times due to the different seasonal survey requirements of the threatened flora species. These 518 survey points resulted in a total of 65 hectares of potentially threatened flora habitat inspected across the Subject Land and represented approximately 670 survey hours.

Threatened flora survey effort conducted between 2020 and 2021 is displayed in **Figure 2-6**.

2.2.3.5 2023 – 2024 SURVEY METHODOLOGY

Additional targeted flora surveys were completed in 2023 and 2024, after consultation with BCD (now CPHR) regarding survey effort requirements and methodology. As described by the Survey Technical Memo - Winterbourne Targeted Flora & BAM Plots Jan/Feb 2024 issued by NGH (NGH, 2024) the following survey methods were conducted. In alignment with the Threatened Flora Survey Guidelines (NSW DPIE, 2020), there were two survey methods used for targeted flora surveys. The grid point method was used in PCTs that occurred over more than 50 ha of the Subject Land. Walking transects were undertaken in PCTs that occurred over less than 50 ha of the Subject Land.

Using QGIS (NGH 2022), grid points were overlayed on the project area in a 100 x 100 m grid pattern. These grid points were clipped to the relevant PCTs to which the threatened flora were associated. Each grid point was buffered by 20 m creating a 40 m diameter circle (n=204), which was used as the survey area. Surveys were completed in pairs, where parallel traverses were conducted within this circle at a separation distance of 10 m, at the recommendation of the BCD.

Within MerginMaps (NGH 2022), completion of grid points was recorded with "Flora Fauna Survey Locations" points. Presence of a targeted threatened species was recorded depending on whether it was an area or count species (surveys were conducted for three count species & five area species). Area species were mapped to their full extent with a "Threatened Flora Fauna Incidental Sightings Polygon" and count species were recorded with "Threatened Flora Fauna Incidental Sightings" points.

Table 2-4 provides a summary of the flora species credit species surveyed for within the Subject Land.

TABLE 2-4 THREATENED FLORA SURVEY SUMMARY (2023 – 2024)

Scientific Name	Common name	Associated PCT	Recommended Survey Period	Survey Method
Bertya ingramii	Narrow-leaved Bertya	567	All year	Two-phase grid-based survey approach
Boronia granitica	Granite Boronia	567, 970	All year	Two-phase grid-based survey approach
Callitris oblonga	Pygmy Cypress Pine	533, 534, 567, 965, 970	All year	Two-phase grid-based survey approach, grid point method
Chiloglottis anaticeps	Bird Orchid	965, 970, 1192, 1194	December – March	Two-phase grid-based survey approach
Chiloglottis platyptera	Barrington Tops Ant Orchid	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194	October	Two-phase grid-based survey approach
Cryptostylis hunteriana	Leafless Tongue Orchid	510, 533, 965, 970, 1194	November – January	Two-phase grid-based survey approach
Dichanthium setosum	Bluegrass	501, 510, 534, 567	November - May	Two-phase grid-based survey approach, grid point method

Scientific Name	Common name	Associated PCT	Recommended Survey Period	Survey Method
Diuris pedunculata	Small Snake Orchid	510, 533, 534, 567, 965, 970, 1192, 1194	September – October	Two-phase grid-based survey approach
Eucalyptus magnificata	Northern Blue Box	510, 533, 534, 567, 965, 970, 1192, 1194	All year	Two-phase grid-based survey approach
Eucalyptus nicholii	Narrow-leaved Black Peppermint	510, 533, 534, 565, 567, 568, 965, 970,	All year	Two-phase grid-based survey approach, grid point method
Eucalyptus oresbia	Small-fruited Mountain Gum	501	All year	Walking transect method
Euphrasia arguta	-	510, 533, 534, 565, 567, 568, 965, 1192, 1194	November – March	Two-phase grid-based survey approach, grid point method
Euphrasia ciliolata	Polblue Eyebright	565, 568, 766, 970, 1194	December – May	Two-phase grid-based survey approach
Grevillea beadleana	Beadle's Grevillea	567	All year	Two-phase grid-based survey approach
Haloragis exalata subsp. *velutina*	Tall Velvet Sea-berry	567, 568, 965, 970	All year	Two-phase grid-based survey approach
Picris evae	Hawkweed	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194	November – February	Two-phase grid-based survey approach
Prostanthera cineolifera	Singleton Mint Bush	510, 965, 970	September – October	Two-phase grid-based survey approach
Pterostylis elegans	Elegant Greenhood	510, 965, 970, 1194	February – April	Two-phase grid-based survey approach
Pterostylis riparia	-		November - December	Two-phase grid-based survey approach
Styphelia perileuca	Montane Green Five-corners	965, 970, 1192, 1194	All year	Two-phase grid-based survey approach
Swainsona sericea	Silky Swainson-pea	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194	September - November	Two-phase grid-based survey approach
Tasmannia glaucifolia	Fragrant Pepperbush		All year	Two-phase grid-based survey approach
Tasmannia purpurascens	Broad-leaved Pepperbush	534, 1194	All year	Two-phase grid-based survey approach
Thesium australe	Austral Toadflax	510, 533, 534, 567, 568, 965, 970, 1192, 1194	November - February	Two-phase grid-based survey approach, grid point method

2.2.3.6 2025 SURVEY METHODOLGY

Further targeted flora surveys were completed in 2025, after consultation with CPHR regarding survey effort requirements. The field survey included parallel transects as outlined in *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (NSW DPIE, 2020). Transects were conducted by teams of two ecologists spaced 10 – 20 m apart, depending on the target species and openness of the vegetation. Walking speeds were maintained at that which is suitable for the detection of target species. Threatened flora survey effort conducted in 2025 is presented in **Table 2-5**.

TABLE 2-5 THREATENED FLORA SURVEY SUMMARY (2025)

Scientific Name	Common name	Associated PCT	Recommended Survey Period	Survey Method
Bertya ingramii	Narrow-leaved Bertya	567	All year	Walking transect method
Boronia granitica	Granite Boronia	567, 970	All year	Walking transect method
Callitris oblonga	Pygmy Cypress Pine	533, 534, 567, 965, 970	All year	Walking transect method
Chiloglottis anaticeps	Bird Orchid	965, 970, 1192, 1194	December – March	Walking transect method
Dichanthium setosum	Bluegrass	501, 510, 534, 567	November - May	Walking transect method
Eucalyptus magnificata	Northern Blue Box	510, 533, 534, 567, 965, 970, 1192, 1194	All year	Walking transect method
Eucalyptus nicholii	Narrow-leaved Black Peppermint	510, 533, 534, 565, 567, 568, 965, 970,	All year	Walking transect method
Eucalyptus oresbia	Small-fruited Mountain Gum	501	All year	Walking transect method
Euphrasia arguta	-	510, 533, 534, 565, 567, 568, 965, 1192, 1194	November – March	Walking transect method
Grevillea beadleana	Beadle's Grevillea	567	All year	Walking transect method
Haloragis exalata subsp. *velutina*	Tall Velvet Sea-berry	567, 568, 965, 970	All year	Walking transect method
Picris evae	Hawkweed	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194	November – February	Walking transect method

Scientific Name	Common name	Associated PCT	Recommended Survey Period	Survey Method
Pterostylis elegans	Elegant Greenhood	510, 965, 970, 1194	February – April	Walking transect method
Styphelia perileuca	Montane Green Five-corners	965, 970, 1192, 1194	All year	Walking transect method
Tasmannia purpurascens	Broad-leaved Pepperbush	534, 1194	All year	Walking transect method
Thesium australe	Austral Toadflax	510, 533, 534, 567, 568, 965, 970, 1192, 1194	November - February	Walking transect method

2.2.3.7 SURVEY ADEQUACY

Project Area

This survey is considered suitable for all threatened flora species credit species listed above. A total of 328 flora survey points were required within the Subject Land plus additional parallel transects for identified survey gaps. A total of 518 flora survey points were conducted in the Subject land, with 258 conducted within the Development Footprint; some survey locations were visited more than once due to varied survey windows. This survey effort is considered sufficient due to the extensive survey hours applied across the Subject Land and all survey effort outside of the Development Footprint are representative of the surrounding vegetation. Survey points conducted outside the Development Footprint were a result of changes in the Project layout between 2020 and 2024. Ecologists experienced in the identification of threatened species and trained in the survey methodology conducted the threatened flora searches. Weather conditions over 2020 and 2024 varied greatly, therefore it is possible that some of the threatened flora, although expected to flower within certain windows, may not have flowered and thus may have gone undetected.

Local Road Reserve Network

A review of the local public road network and its ability to accommodate haulage to the Project Area identified a general need for roadside upgrade works in selected public roads east of Walcha. Upgrade works in the local road reserve works will be mostly limited to the highly degraded roadside shoulders where habitat values are degraded.

Surveys in October and December 2024 and February and March 2025 were completed in the affected road reserves to target Candidate species assessed in this report. The results of these surveys were used to determine the presence and extent of threatened flora species subject to assessment.

Legend

- Project Area
- Subject Land
- Flora Survey (2021)
- Flora Survey (2022)
- Flora Survey (2023)
- Flora Transects 2025
- Flora Survey Transects pre 2025 (NGH)
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

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F2-6 Targeted Threatened Flora Survey Effort

Map 1 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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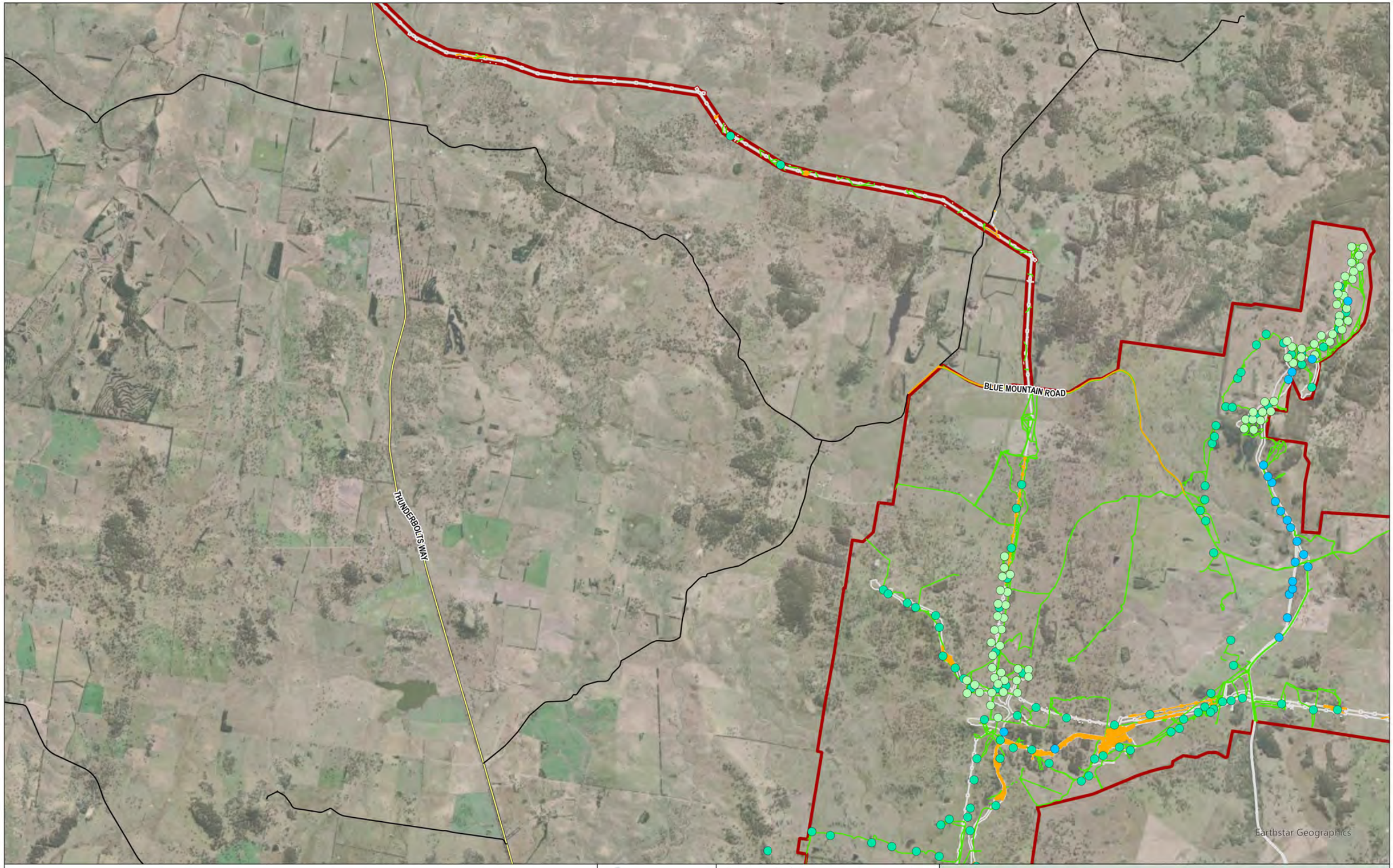

Legend

- Project Area
- Subject Land
- Flora Survey (2021)
- Flora Survey (2022)
- Flora Survey (2023)
- Flora Transects 2025
- Flora Survey Transects pre 2025 (NGH)
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

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1:56,000

F2-6 Targeted Threatened Flora Survey Effort

Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
THUNDERBOLTS WAY
EMU CREEK ROAD
OXLEY HIGHWAY
DERBY STREET
MOONA PLAINS ROAD
Earthstar Geographics

Legend

- Project Area
- Subject Land
- Flora Survey (2021)
- Flora Survey (2022)
- Flora Survey (2023)
- Flora Transects 2025
- Flora Survey Transects pre 2025 (NGH)
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F2-6 Targeted Threatened Flora Survey Effort

Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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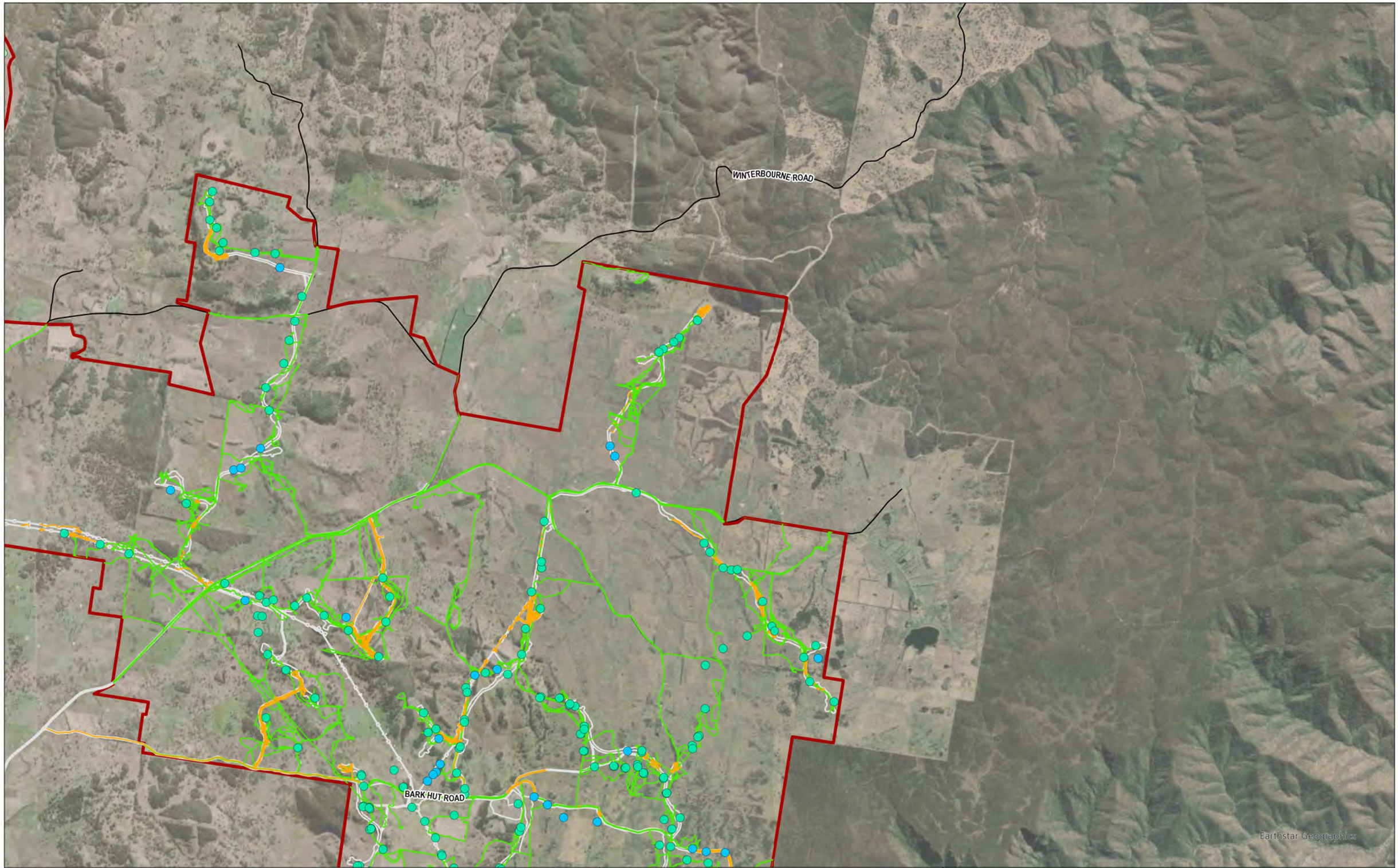

Legend

- Project Area
- Subject Land
- Flora Survey (2021)
- Flora Survey (2022)
- Flora Survey (2023)
- Flora Transects 2025
- Flora Survey Transects pre 2025 (NGH)
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 500 1,000 1,500m

1:56,000

F2-6 Targeted Threatened Flora Survey Effort

Map 4 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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MOONA PLAINS ROAD

OXLEY HIGHWAY

Earthstar Geographics

Legend

- Project Area
- Subject Land
- Flora Survey (2021)
- Flora Survey (2022)
- Flora Survey (2023)
- Flora Transects 2025
- Flora Survey Transects pre 2025 (NGH)
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:56,000

F2-6 Targeted Threatened Flora Survey Effort

Map 5 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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2.2.4 THREATENED FAUNA SURVEY METHODS

2.2.4.1 REVIEW OF EXISTING INFORMATION

The BAM-C, BioNet Atlas Database and ALA were reviewed prior to the fauna surveys conducted for this BDAR. All threatened fauna sightings recorded over the Subject Land were further investigated and considered throughout this Updated BDAR.

2.2.4.2 HABITAT CONSTRAINTS ASSESSMENT

Desktop assessments and field surveys within the Subject Land included assessment of habitat constraints and microhabitats and their suitability for predicted species credit fauna species. This included desktop assessment of the Assessment Area for features such as caves and waterways and field inspection of microhabitats including leaf litter, stick nests and hollow-bearing trees within the Subject Land. Threatened fauna species excluded from assessment because of habitat constraints are identified and justified.

2.2.4.3 FIELD SURVEYS

Targeted field surveys were undertaken in habitat throughout the broader Project Area prior to refinement of the current Subject Land. The Project Area includes the Subject Land.

The following targeted fauna survey events were completed across the broader Project Area and Subject Land:

- Spring 2019: 8-21 November 2019;
- Summer 2020: 13-26 February 2020;
- Winter 2020: 10-14 August 2020;
- Spring 2020: 5-16 October 2020;
- Autumn 2021: 8 March to 22 April 2021;
- Winter 2021: 23-27 August 2021;
- Spring 2021: 10-29 October 2021 and 15-16 November 2021;
- Summer 2021: 6-17 December 2021;
- Summer 2022: 3-8 January 2022;
- Autumn 2022: 14-16 March 2022;
- Autumn 2023: 22-25 May 2023;
- Winter 2023: 13-19 August 2023;
- Spring 2023: 18-25 September, 3-6 October and 6-10 November 2023;
- Summer 2023: 7 December 2023;
- Summer 2024: 29 January to 3 February 2024; and
- Summer 2025: 16-20 December 2024.

Requirements for targeted surveys include the survey months specified in the BAM-C, as well as the survey effort and methods described in the TBDC and other relevant survey guidelines. Relevant survey guidelines considered include the following:

- BAM 2020 (DPIE, 2020);
- 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (NSW DPIE, 2021);

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Department of Environment and Conservation (DEC) (NSW DEC, 2004);
- Survey Guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (Department of the Environment, Water, Heritage and the Arts (DEWHA), (DEWHA, 2010) ;
- Survey Guidelines for Australia's Threatened Mammals (Department of Sustainability, Environment, Water, Population & Communities (DSEWPC, 2011a);
- Survey Guidelines for Australia's Threatened Reptiles (DSEWPC, 2011b) ;
- NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE, 2020);
- The Spot Assessment Technique: A tool for determining localised levels of habitat use by Koalas *Phascolarctos cinereus* (Phillips & Callaghan, 2011);
- Threatened reptiles Biodiversity Assessment Method survey guide (DPE, 2022); and
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method survey guide (NSW DPE, 2022).

Survey effort across the Subject Land are detailed in **Table 2-6** and shown in **Figure 2-7** (amphibians), **Figure 2-8** (raptors), **Figure 2-9** (diurnal birds), **Figure 2-10** (nocturnal birds), **Figure 2-11** (bats), **Figure 2-12** (terrestrial mammals), **Figure 2-13** (arboreal mammals) and **Figure 2-14** (reptiles).

Fauna survey methods conducted by NGH and Nature Advisory were described and retrieved from the following documents:

- NGH Consulting Glossy Black Cockatoo Diurnal Survey Summary (NGH, 2021);
- Biodiversity Development Assessment Report – Winterbourne Wind Farm (NGH, 2022);
- Bird utilisation and raptors surveys 2020-2022 (Nature Advisory, 2022);
- Field Survey Technical Memo 1 – Winterbourne Wind Farm (NGH, 2023a);
- Field Survey Technical Memo 2 – Winterbourne Wind Farm (NGH, 2023b); and
- Field Survey Technical Memo 3 – Winterbourne Wind Farm (NGH, 2023c).

TABLE 2-6 FAUNA FIELD SURVEY EFFORT SUMMARY

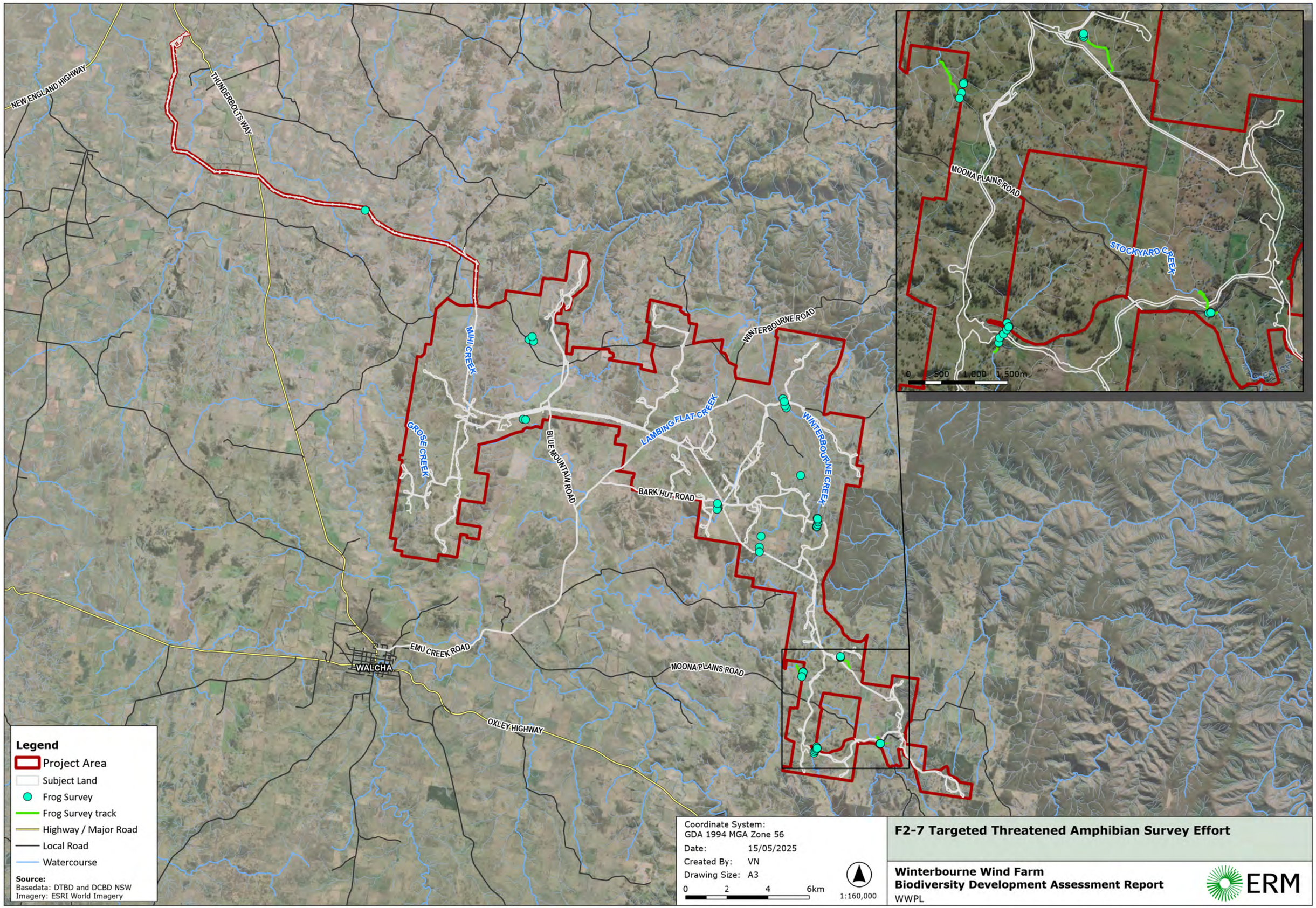
Target Species	Method	Survey Effort	Survey Adequacy
Amphibians Booroolong Frog (*Litoria booroolongensis*) Yellow-spotted Tree Frog (*Litoria castanea*) Peppered Tree Frog (*Litoria piperata*) Davies' Tree Frog (*Litoria daviesia*) Glandular Frog (*Litoria subglandulosa*) Tusked Frog (*Adelotis brevis*) Sphagnum Frog (*Philoria sphagnicolus*)	Nocturnal aural-visual surveys along a 500 m transect of suitable habitat (or pro-rata when less than 500 m of suitable habitat is present) commencing with a 5-minute listening period, 2-minute broadcast of target species calls, 2 minutes of listening for response, followed by a slow-paced walk visually scanning the area with a minimum 200-lumen torch to detect eyeshine walking 50 m over 5 minutes. Process repeated for the length of the transect. Areas of breeding habitat were identified and targeted for tadpole searches, involving sweeping a net backwards and forwards through the water for 10 minutes per every 50m^2 surface area of water from at least 2 m from the bank. Tadpole species are contained for identification and returned to their source.	Surveys were conducted from 6 to 14 December 2021 (nine nights) across 13 sites totaling 74 survey hours. Weather conditions ranged from 0 mm to 49.4 mm of rainfall. No target species were detected, the surveys resulted in the observation of 10 non-threatened frog species. 1-day assessment of suitable breeding habitat for the Sphagnum Frog conducted in February 2024 sufficient to exclude from further assessment. Aural-visual surveys were undertaken in Spring 2023 looking for potential threatened target species and breeding habitat. Additional aural-visual surveys were completed in Summer 2024, around the edges of potential breeding habitat, comprising 4 nights, 120 minutes each night for a total 480 minutes.	This survey is considered suitable for the frog species targeted. Although some sites were not given four survey nights, they were sites with lower habitat quality where less frog call activity was observed. Survey guidelines indicate that surveys should be conducted 2-3 hours after sunset, however some surveys were conducted late into the night to take advantage of personnel being onsite after dark. It was noted that calls started to reduce after about 10pm; however, the sites were visited in different order each survey night accounting for variation in call activity with time of evening. 2021 surveys were not carried out 14 days apart, surveys were conducted over nine nights but significant variation in weather conditions was achieved. Peppered Frog and Yellow Spotted Tree Frog did not have calls available to conduct call playback, however since all calls heard were identified this survey is considered suitable for ruling these species out. The days leading up to and during the frog surveys in Spring 2023 were mostly dry which may have reduced the detectability of the frog species surveyed. The Summer 2024 surveys were completed to cover the areas missed in the 'NGH Field Survey Technical Memo 2', completing the targeted surveys for candidate frog species in all areas of suitable habitat.
Raptors White-bellied Sea-eagle (*Haliaeetus leucogaster*)	Opportunistic observations of stick nests of suitable size for breeding of these species were recorded.	All survey events allowed for the opportunistic detection of stick nests of appropriate size for target species.	Despite extensive opportunity for the detection of stick nests suitable for the target species, only one suitable nest (~60 cm) was observed and was located outside of the Subject Land prior to the 2023 surveys.

Target Species	Method	Survey Effort	Survey Adequacy
Little Eagle (*Hieraaetus morphnoides*) Square-tailed Kite (*Lophoictinia isura*)	BUS were conducted using the fixed-point bird count method for between 15 and 30 minutes. Midday vantage point surveys.	4 midday vantage point surveys were undertaken in October 2023. 15 BUS locations were repeatedly surveyed (up to eight times per season) across four survey periods between 2020 and 2022 (1x Summer, 1x Autumn, 1x Winter, 1x Spring). 14 BUS locations were repeatedly surveyed (up to six times per season) across two survey periods in 2023 (1x Autumn, 1x Spring)	BUS survey effort is considered suitable for detection of threatened raptors Further discussion regarding the methodology of BUS conducted can be found in **Section 7.3**. Stick nests were recorded in Spring 2023 which are considered to be suitable nest trees for Little Eagle, however the nests had no signs of use (such as whitewash, debris at the base of the tree, or animals within or nearby the nest). As a result of no detection, species presence could not be utilised to prioritise habitat areas to survey. Due to the large area to cover, greater survey effort was undertaken within areas containing patches of large trees.
Diurnal Birds Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	Habitat transects were undertaken to record habitat trees and search for individuals and breeding pairs in areas that meet the requirement for breeding habitat as defined by the TBDC. Targeted area surveys were conducted in areas of identified foraging habitat for the species. Sites of 2 ha in size were selected for targeted surveys of the species for assessment of species presence, breeding habitat and foraging habitat. BUS were conducted using the fixed-point bird count method for between 15 and 30 minutes.	All survey events allowed for opportunistic detection of suitable breeding habitat for the species, surveys in Spring 2023 specifically targeted areas of identified potentially suitable habitat. 14 sites were selected for bird census surveys between 23rd – 27th August 2021, equating to 79.5 hours of survey effort for the species. 15 BUS locations were repeatedly surveyed (up to eight times per season) across four survey periods between 2020 and 2022 (1x Summer, 1x Autumn, 1x Winter, 1x Spring). 14 BUS locations were repeatedly surveyed (up to six times per season) across two survey periods in 2023 (1x Autumn, 1x Spring)	One site believed to contain suitable habitat for the species was unable to be accessed due to flooding. Additionally, breeding habitat was unable to be confirmed absent and therefore presence is assumed in both instances. BUS survey effort is considered suitable for detection of threatened raptors. Further discussion regarding the methodology of BUS conducted can be found in **Section 7**. 21 suitable hollow bearing trees for Glossy Black-Cockatoo were recorded in Spring 2023, however none of these hollows showed signs of use (such as whitewash, debris including *Allocasuarina* seeds at the base of the tree, or animals coming in or out of the hollow). As a result of no detection, species presence could not be utilised to prioritise habitat areas to survey. Due to the large area to cover, greater survey effort was undertaken within areas containing patches of large trees.

Target Species	Method	Survey Effort	Survey Adequacy
Nocturnal Birds Bush Stone-curlew (*Burhinus grallarius*) Barking Owl (*Ninox connivens*) Powerful Owl (*Ninox strenua*) Masked Owl (*Tyto novaehollandiae*) Sooty Owl (*Tyto tenebricosa*)	Spotlighting conducted from dusk (6:30pm onwards) using high wattage spotlights in areas of suitable habitat combined with call playback. Target species call was broadcast using an MP3 player and megaphone, followed by a period of listening for a response in 20-minute blocks with spotlighting of the area conducted before and after.	4 nights of spotlighting and call playback surveys were conducted in August 2020 and 8 nights in August 2021. 44 sites were surveyed for a total of 23 hours of effort.	Sites targeted for spotlighting and call playback were mostly restricted to roadsides as a result of flooding occurring across the Subject Land causing areas to be inaccessible. These roadside habitats may be subject to edge effects and potentially resulted in false negative results. With consideration to the extensive time spent on site allowing for opportunistic detection of these species, detectability of target species is believed to be >90% confidence.
Bats Grey-headed Flying-fox (*Pteropus poliocephalus*) Southern Myotis (*Myotis macropus*) Large Bent-winged Bat (*Miniopterus orianae oceanensis*) Little Bent-winged Bat (*Miniopterus australis*) Eastern Cave Bat (*Vespadelus troughtoni*)	Echolocation detection equipment was deployed in areas of suitable habitat for the target species. Bat calls recorded by the devices were analysed for species identification by suitably qualified and experienced personnel. Detectors were secured to trees or fence posts approximately 1.5 – 2 m above ground level and recorded from 30-minutes before dusk to 30-minutes after dawn. Detectors secured to met masts had three microphones connected, recording at 2, 30 and 70 m above ground.	8 devices were deployed in Spring 2020 recording for up to 55 nights. 8 devices were deployed in Spring 2021 in the same locations as Spring 2020, recording for up to 44 nights. 11 devices were deployed in Autumn 2023 in new locations, recording for up to 14 nights. 9 devices were deployed to met masts (3 met masts) recording at 3 different heights (2 m, 30 m and 70 m) in Spring 2023 recording for up to 45 nights.	Total number of survey nights far exceeds the minimum survey requirements. Surveys were conducted in appropriate seasons and site selection is representative of all suitable habitat available for the species. BCD were consulted prior to the 2023 surveys to inform the additional requirements for survey at the time, including deployment of devices to met masts at heights. Further discussion regarding the methodology and results of the bat surveys conducted can be found in **Section 7.3.2**.
Terrestrial Mammals Parma Wallaby (*Macropus parma*)	Diurnal targeted searches were undertaken in areas of suitable habitat (rocky escarpments, eucalypt forest) searching for individuals, scats, tracks and fur.	3 camera traps deployed in November 2019 recording for 6 days and 6 nights.	The survey coverage across the Subject Land, while not extensive in terms of number of sites surveyed, targeted high-quality habitat which should maximise detection of the threatened terrestrial mammals.

Target Species	Method	Survey Effort	Survey Adequacy
Brush-tailed Rock-wallaby (*Petrogale penicillata*) Rufous Bettong (*Aepyprymnus rufescens*) Spotted-tail Quoll (*Dasyurus maculatus*)	Camera traps deployed in areas of suitable habitat by attaching the devices to trees and a bait canister placed 2 m from the camera in frame. Bait mixture made of either sardines and chicken necks or honey, oats, peanut butter and truffle oil mixture with the canister sprayed in honey water. Hair tubes deployed in areas of suitable habitat using PVC pipe of varying sizes (90, 45 and 32 mm) with a bait canister planted at one end and double-sided tape at the other. Hair samples obtained were analysed by a specialist.	6 camera traps deployed, using 2 cameras per trap in conjunction with 105 hair tubes deployed across 4 sites, between 6th and 14th December 2021 (7 days and 7 nights effort per site). Spotlighting conducted as described for the nocturnal bird species also allowed for the detection of these species, equating to 23 hours of effort. 35 cameras were deployed for 34 days and 34 nights between September and October 2023 in areas of suitable habitat.	Only 10 hair samples were retrieved from the hair tubes, indicating they may not have been deployed long enough or that the high rainfall that occurred on 8-10 December 2021 affected the activity and hence the detection rate. The guidelines recommendation of 10 cameras per hectare was not considered practical for the extent of the Subject Land. Consultation with BCS resulted in a reduced survey effort of 21 days of camera trapping in conjunction with the other survey methods.
Arboreal Mammals Eastern Pygmy-possum (*Cercartetus nanus*) Squirrel Glider (*Petaurus norfolcensis*) Greater Glider (*Petauroides volans*) Koala (*Phascolarctos cinereus*)	Camera traps were deployed in areas of suitable habitat by attaching the devices to trees and a bait canister placed 2 m from the camera in frame. Bait mixture made of either sardines and chicken necks or honey, oats, peanut butter, and truffle oil mixture with the canister sprayed in honey water. Hair tubes were deployed in areas of suitable habitat using PVC pipe of varying sizes (90, 45 and 32 mm) with a bait canister planted at one end and double-sided tape at the other. Hair samples obtained were sent to a specialist for analysis. Opportunistic scat searches were undertaken on site targeting large hollow bearing trees and Koala food trees to detect Koala scats and individuals.	3 camera traps deployed in November 2019 recording for 6 days and 6 nights. 6 camera traps deployed, using 2 cameras per trap, in conjunction with 105 hair tubes deployed across 4 sites, between 6th and 14th December 2021 (7 days and 7 nights effort per site). Eight of the camera traps deployed in December 2021 were at heights suitable for detection of arboreal species. Spotlighting conducted as described for the nocturnal bird species also allowed for the detection of these species, equating to 23 hours of effort.	All target species except the Eastern Pygmy Possum were detected and therefore the effort is considered sufficient. The habitat within the Development Footprint does not contain significant resources for the Eastern Pygmy Possum with fragmented habitat composed of insufficient nectar producing plants. Only 10 hair samples were retrieved from the hair tubes, indicating they may not have been deployed long enough or that the high rainfall that occurred on 8-10 December 2021 affected the activity and hence the detection rate.

Target Species	Method	Survey Effort	Survey Adequacy
		20 cameras deployed in October 2023 at three locations of suitable habitat recording for 21 days and nights.	
Reptiles Pale-headed Snake (*Hoplocephalus bitorquatus*) Border Thick-tailed Gecko (*Uvidicolus sphyrurus*) Stephens Banded Snake (*Hoplocephalus stephensii*)	Timed nocturnal transect searches were conducted in areas of suitable habitat for 1 person-hour using standard spotlighting techniques with a focus placed on the tree trunks and other habitat likely to be used by the Pale-headed snake. Diurnal surveys were undertaken for Border Thick-tailed Gecko involving turning over partially embedded or surface rock to detect reptiles sheltering during the day.	Surveys were conducted between 13th and 16th December 2021. 12 timed nocturnal transect search sites, repeated across two nights. 30-minutes of rock turning conducted at 2 sites. 1-day assessment of suitable breeding habitat for Stephens Banded Snake conducted in February 2024 sufficient to exclude from further assessment.	The weather conditions were suitable and survey effort was targeted to suitable habitat with diurnal and nocturnal searches conducted at the right time of year. This survey is considered suitable for the purposes of this assessment. Humidity ranged between 44 and 83% and rainfall had occurred between 8 to 12 December 2021 resulting in suitable conditions.



F2-7 Targeted Threatened Amphibian Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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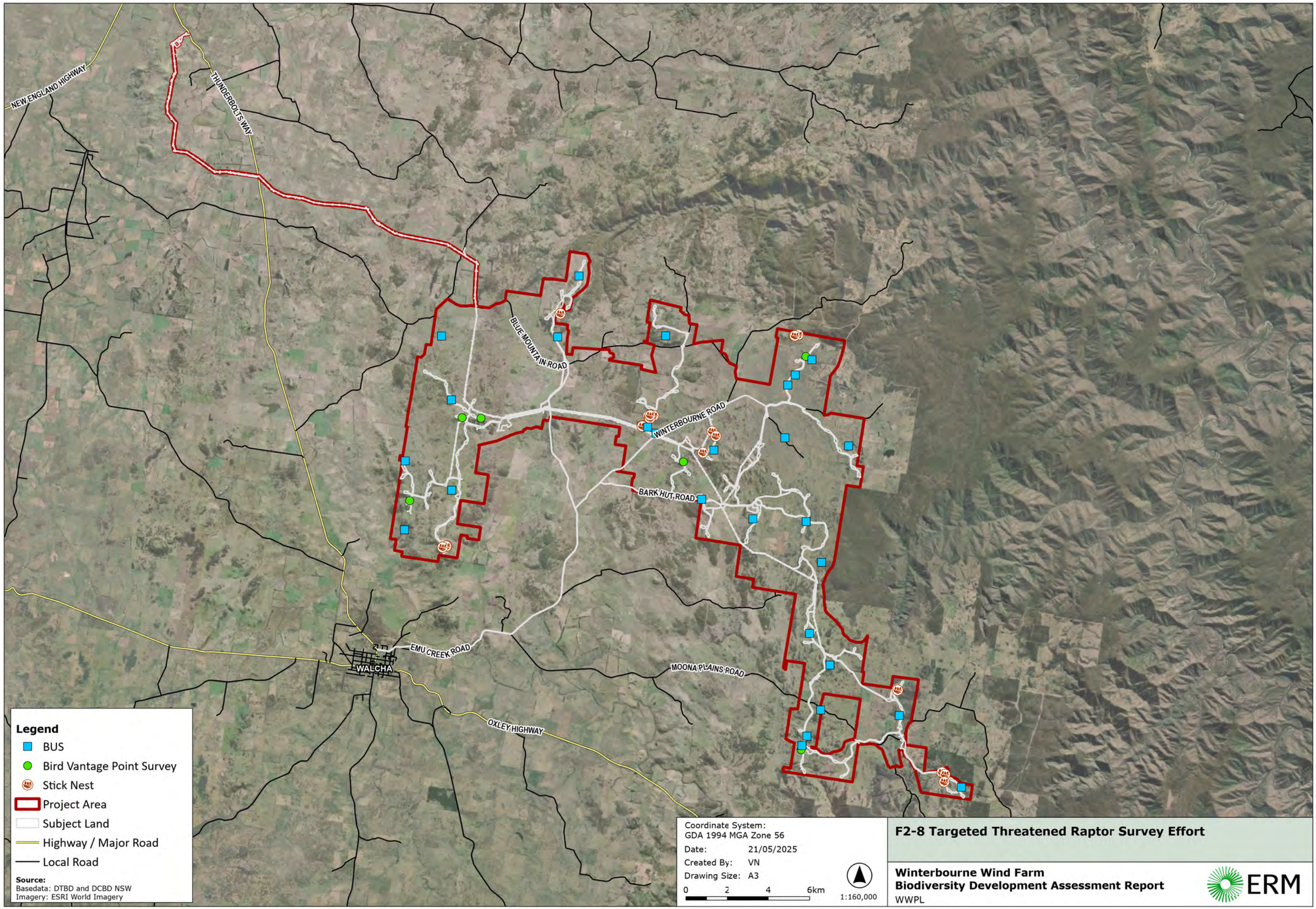

F2-8 Targeted Threatened Raptor Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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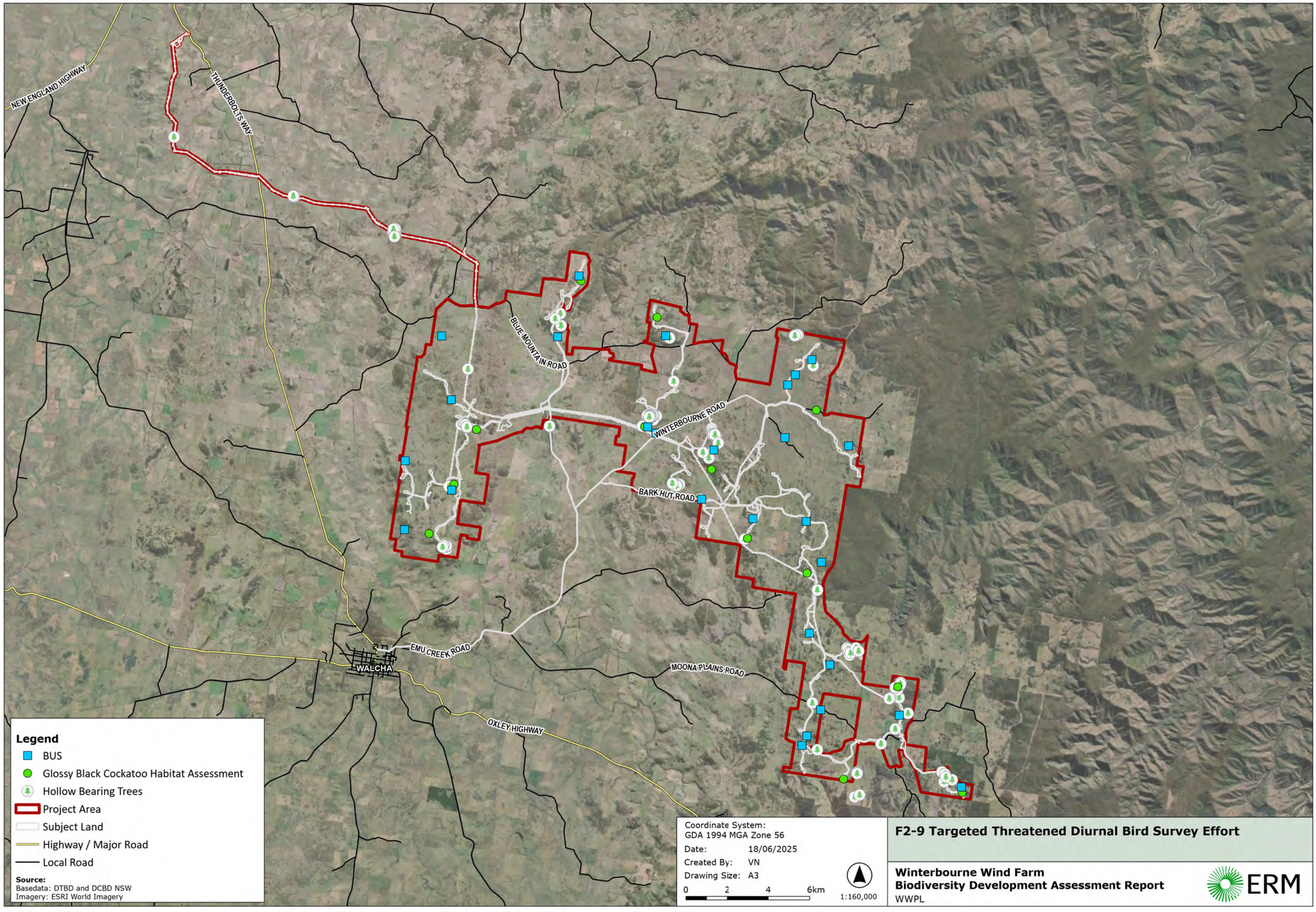

F2-9 Targeted Threatened Diurnal Bird Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY

Legend
- Hollow Bearing Trees
- Nocturnal Bird Call Playback/Spotlighting
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F2-10 Targeted Threatened Nocturnal Bird Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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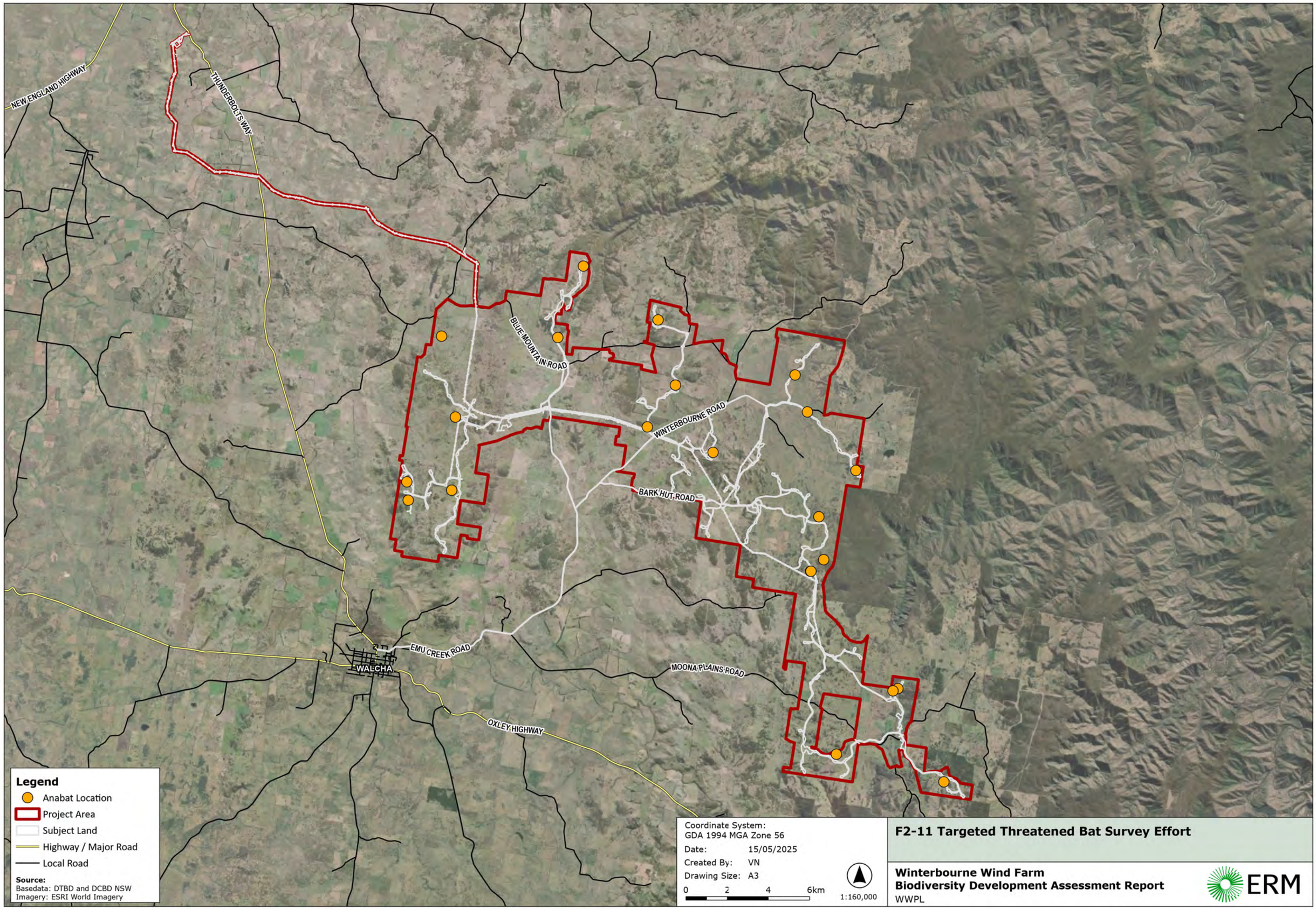

F2-11 Targeted Threatened Bat Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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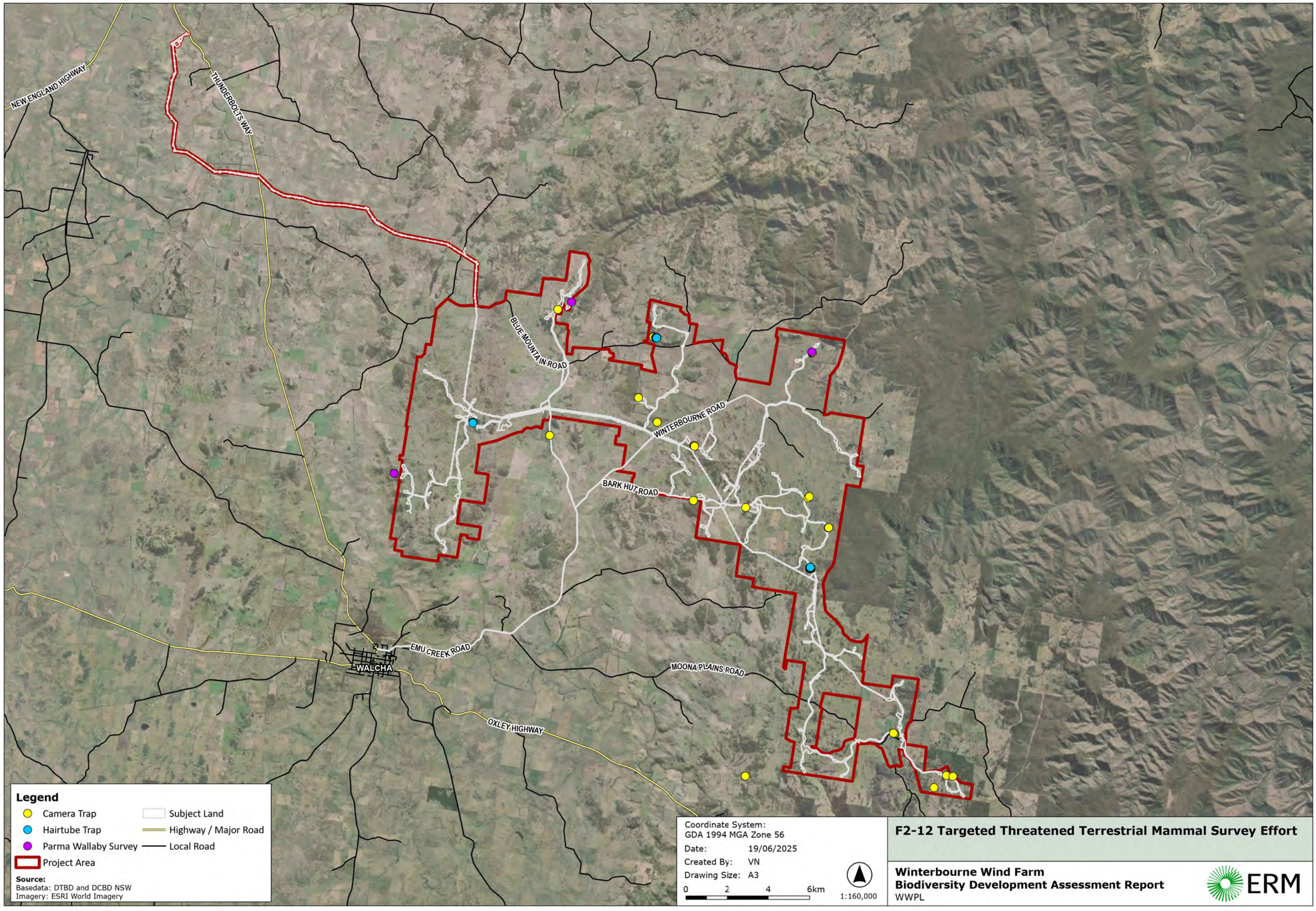

F2-12 Targeted Threatened Terrestrial Mammal Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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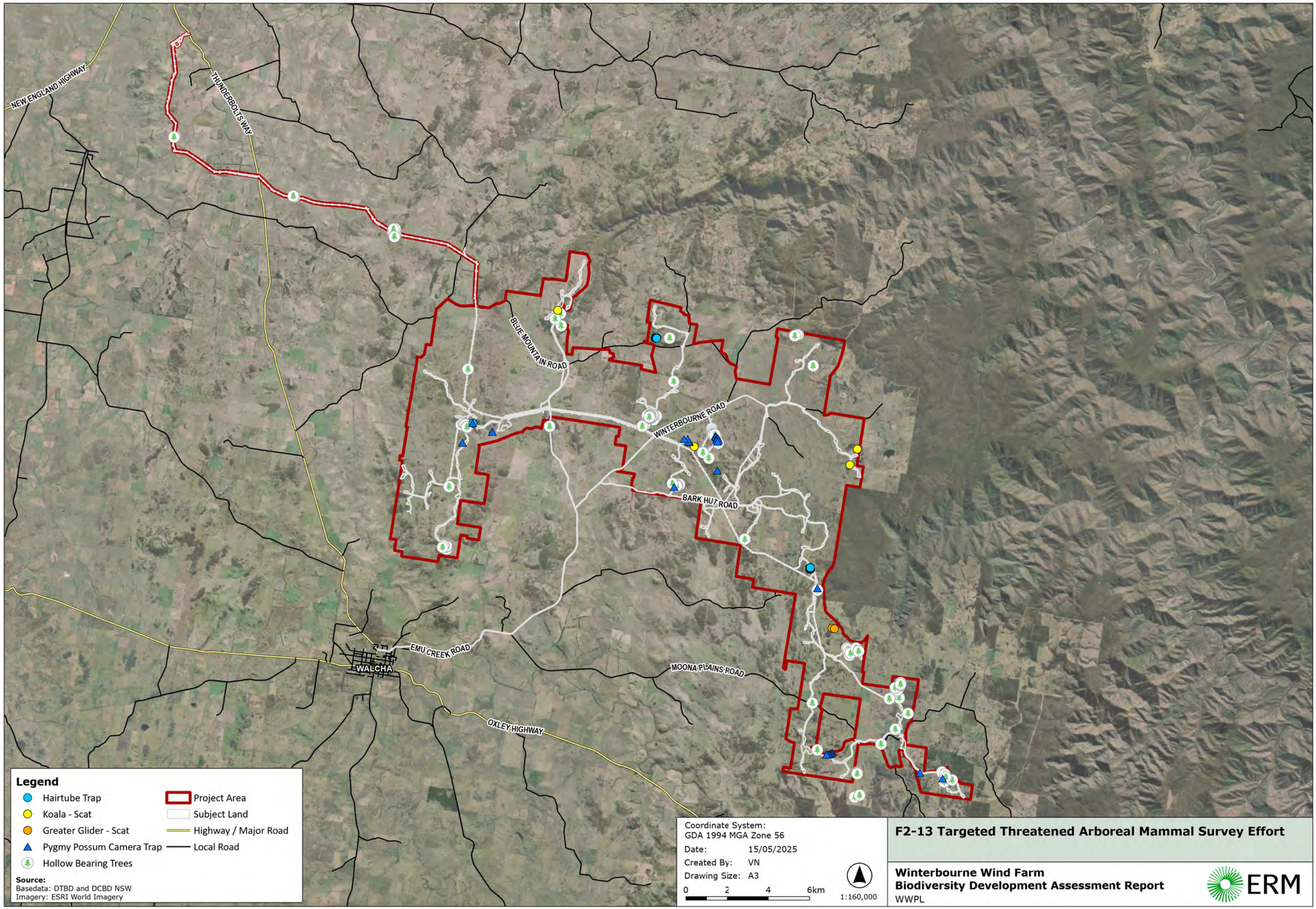

F2-13 Targeted Threatened Arboreal Mammal Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY

Legend

- Pale Headed Snake Survey
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F2-14 Targeted Threatened Reptile Survey Effort

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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2.2.5 BIRD AND BAT SURVEYS

2.2.5.1 BIRD UTILISATION SURVEYS

BUS were conducted over 30 minutes, repeated on six (6) occasions at each survey site. The six occasions were completed over the following periods:

- 2 x Morning (sunrise to 10:00am);
- 2 x Midday (10:00am to 2:00pm); and
- 2 x Afternoon (2:00pm to sunset).

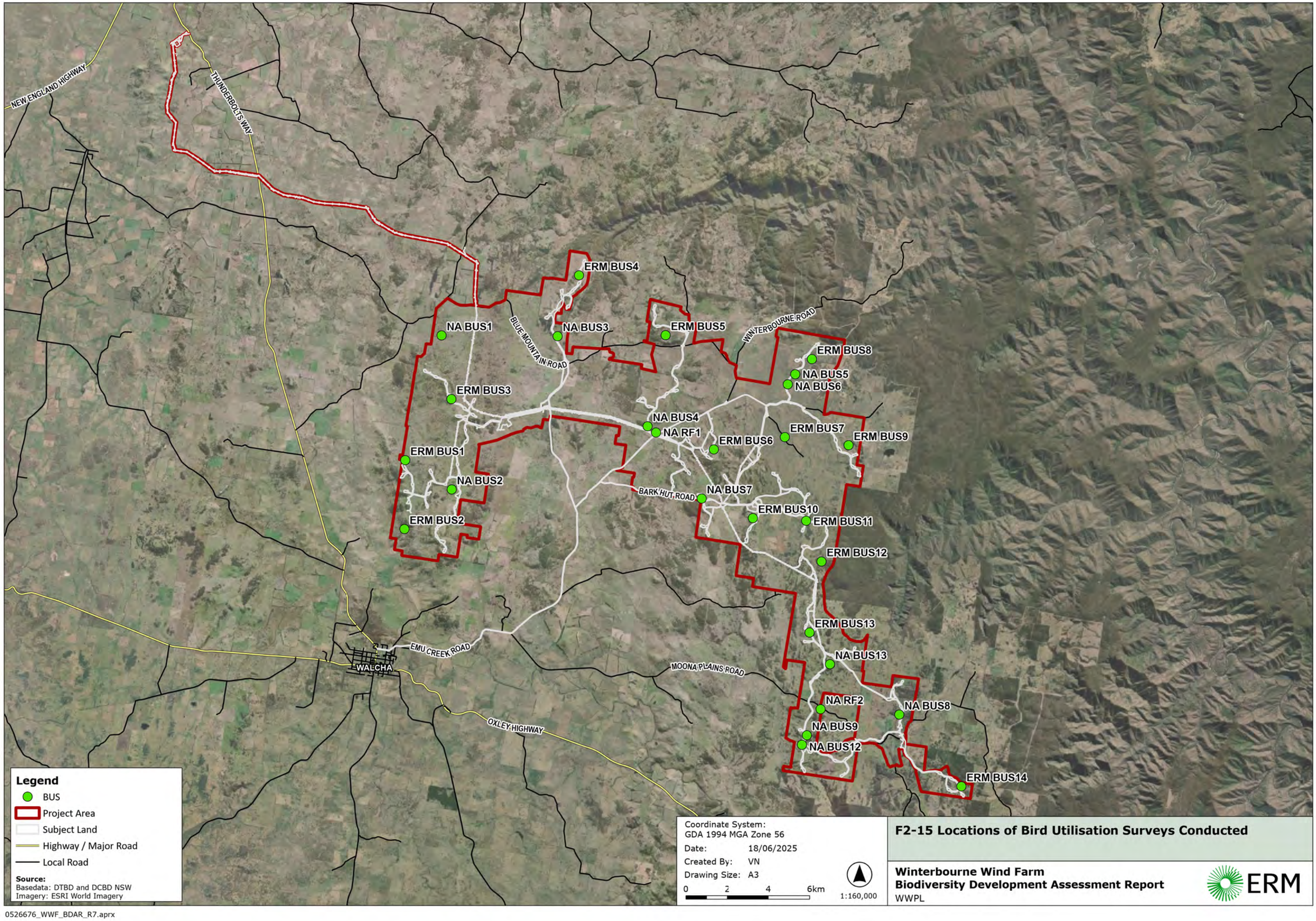
All detections of birds were recorded, irrespective of distance from the survey site, behaviour or flight height. BUS locations surveyed between Spring 2020 and Summer 2023 totalled 368 BUS surveys. Survey locations are presented in **Figure 2-15**.

2.2.5.2 BAT SURVEYS

Anabat devices were deployed across the broader Project Area to provide microbat community data. This included:

- 8 devices deployed in Spring 2020 recording up to 55 nights;
- 8 devices deployed in Spring 2021 in the same locations as Spring 2020, recording up to 44 nights;
- 11 devices deployed in Autumn 2023 in new locations, recording up to 14 nights; and
- 9 devices deployed to meteorological monitoring masts (met masts) recording at different heights (2 m, 30 m and 70 m).

Survey locations are presented in **Figure 2-16**.



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NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY

Legend
- Anabat
- Met Mast
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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1:160,000

F2-16 Locations of Anabat Detectors Deployed

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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ERM

0526676_WWF_BDAR_R7.aprx

2.2.6 WEATHER CONDITIONS

The weather conditions during the survey events were appropriate for the survey of a variety of flora and fauna species. Daily weather observations from nearby Woolbrook (Woolbrook Road) weather station (Station No. 055136) are presented in **Table 2-7**.

TABLE 2-7 WEATHER CONDITIONS DURING THE PROJECT SURVEY PERIODS

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
Spring 2019			
8/11/2019	9.2	26.3	0
9/11/2019	8.5	17.5	0
10/11/2019	4.2	21.6	0
11/11/2019	10.4	25.0	0
12/11/2019	7.0	28.0	0
13/11/2019	12.5	22.8	0
14/11/2019	7.5	24.5	0
15/11/2019	2.7	27.5	0
16/11/2019	5.6	28.0	0
17/11/2019	7.6	25.7	0
18/11/2019	13.6	25.2	0
19/11/2019	12.3	29.7	0
20/11/2019	8.2	33.0	0
21/11/2019	13.0	32.0	0
Summer 2020			
13/2/2020	17.6	20.7	35.4
14/2/2020	14.4	25.0	11.0
15/2/2020	12.5	28.0	0.2
16/2/2020	17.0	29.3	0
17/2/2020	11.0	25.5	10.6
18/2/2020	13.2	28.0	8.4
19/2/2020	16.2	24.0	14.4
20/2/2020	8.7	22.7	0.2
21/2/2020	13.5	25.2	0
22/2/2020	15.7	21.0	0
23/2/2020	14.9	21.0	0
24/2/2020	15.0	20.0	2.4
25/2/2020	14.5	25.0	0

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
26/2/2020	15.5	26.7	0
Winter 2020			
10/8/2020	1.5	9.0	9.9
11/8/2020	0.8	18.2	0
12/8/2020	3.5	16.6	0
13/8/2020	7.8	18.2	0
14/8/2020	1.0	16.0	0
Spring 2020			
28/9/2020	0.5	16.7	0
29/9/2020	3.8	17.8	0
30/9/2020	5.5	16.0	0
1/10/2020	10.5	18.0	4.8
2/10/2020	1.4	23.0	0.2
Autumn 2021			
8/3/2021	12.7	22.3	0
9/3/2021	10.5	25.2	12.0
10/3/2021	10.6	26.6	0
11/3/2021	16.4	24.0	1.0
12/3/2021	14.6	23.8	9.2
29/3/2021	8.2	22.5	0
30/3/2021	11.0	22.5	0
31/3/2021	6.5	20.2	0
1/4/2021	5.0	22.0	0
2/4/2021	7.0	23.7	0
6/4/2021	13.5	20.2	0
8/4/2021	11.8	20.4	0
20/4/2021	-0.7	19.0	0
22/4/2021	-3.6	15.2	0
Winter 2021			
23/8/2021	9.7	19.0	9.0
24/8/2021	4.6	6.6	23.6
25/8/2021	2.8	10.3	9.0
26/8/2021	-3.6	12.0	0.2
27/8/2021	-1.6	11.0	0

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
28/8/2021	-3.7	-3.0	12.7
29/8/2021	-4.0	19.5	0
30/8/2021	-2.5	-1.8	16.0
31/8/2021	-1.0	19.7	0
1/9/2021	0.2	23.0	0
Spring 2021			
10/10/2021	7.4	25.0	0
11/10/2021	7.5	16.0	29.2
12/10/2021	8.5	16.0	12.0
13/10/2021	9.0	19.7	4.0
14/10/2021	13.8	22.5	1.0
15/10/2021	11.5	16.6	7.4
16/10/2021	5.0	14.3	3.8
17/10/2021	0.2	18.6	0
18/10/2021	2.8	20.7	0
19/10/2021	2.2	22.0	0
20/10/2021	4.3	19.5	0.6
21/10/2021	7.0	21.0	0
22/10/2021	11.8	24.0	0
23/10/2021	9.0	28.2	0
24/10/2021	16.0	21.0	0.4
25/10/2021	6.0	19.6	0
26/10/2021	1.0	20.3	0
27/10/2021	6.5	24.2	0
28/10/2021	5.5	27.0	0
29/10/2021	11.8	22.5	11.8
15/11/2021	5.2	18.0	0
16/11/2021	1.2	18.0	0
Summer 2021			
6/12/2021	10.5	21.6	0
7/12/2021	14.3	23.5	9.2
8/12/2021	11.0	25.2	49.4
9/12/2021	11.3	23.0	23.2
10/12/2021	5.8	19.0	17.0

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
11/12/2021	6.2	22.0	0
12/12/2021	10.0	23.0	0
13/12/2021	9.5	24.0	0
14/12/2021	10.5	25.5	0
15/12/2021	6.7	29.0	0
16/12/2021	12.4	24.5	0
17/12/2021	14.5	28.0	0
Summer 2022			
3/1/2022	9.0	26.0	0
4/1/2022	16.2	27.0	0
5/1/2022	17.7	22.5	0
6/1/2022	19.4	27.2	0
7/1/2022	17.7	28.5	0
8/1/2022	20.0	30.0	0
Autumn 2022			
14/3/2022	9.2	25.0	0
15/3/2022	9.5	23.5	0
16/3/2022	12.5	25.0	0
Autumn 2023			
22/5/2023	-5.5	16.0	0
23/5/2023	-5.0	18.5	0
24/5/2023	-4.5	18.5	0
25/5/2023	-6.5	19.5	0
Winter 2023			
13/8/2023	-1.5	19.0	0
14/8/2023	4.0	19.0	0
15/8/2023	6.0	16.5	0
16/8/2023	-1.5	17.0	0
17/8/2023	0.0	17.5	0.2
18/8/2023	7.0	13.0	13.2
19/8/2023	0.5	11.0	0.2
Spring 2023			
18/9/2023	3.0	28.0	0
19/9/2023	3.0	26.0	0

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
20/9/2023	1.0	26.0	0
21/9/2023	3.0	24.0	0
22/9/2023	6.0	19.0	0
3/10/2023	6.5	29.0	0
4/10/2023	11.0	23.5	0
5/10/2023	5.0	16.0	13.0
6/10/2023	-2.5	20.5	0
23/10/2023	1.5	26.5	0
24/10/2023	2.0	31.0	0
25/10/2023	-	31.0	0
6/11/2023	10.0	22.5	5.4
7/11/2023	7.0	23.0	1.0
8/11/2023	9.5	24.0	0
9/11/2023	12.0	24.5	4.6
10/11/2023	9.0	24.5	43.0
Summer 2023			
4/12/2023	11.0	26.5	0
5/12/2023	10.5	29.0	0
6/12/2023	11.5	32.0	0
7/12/2023	14.0	33.5	0
Summer 2024			
29/1/2024	18.5	30	0
30/1/2024	20.5	31.0	0
31/1/2024	15.5	29.0	45.2
1/2/2024	14.0	30.5	4
2/2/2024	14.5	33.0	0
3/2/2024	17.5	35.0	0
Winter 2024			
28/6/2024	-6.5	17.0	0
29/6/2024	-4.5	17.0	0
30/6/2024	4.0	14.0	3.0
23/7/2024	-7.0	14.5	0
24/7/2024	-5.0	16.5	0
25/7/2024	-4.0	15.5	0

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
10/8/2024	-0.1	17.5	0
11/8/2024	-1.0	18.0	0
20/8/2024	4.0	19.5	0
22/8/2024	4.0	18.0	0
Summer 2025			
29/11/2024	15.5	25.0	0.8
30/11/2024	15.0	22.5	16.0
1/12/2025	15.0	26.0	4.0
2/12/2025	9.5	30.0	0
3/12/2025	15	25.5	0
4/12/2025	15.5	28.5	0
5/12/2025	15.0	31.0	1.0
16/12/2024	18.0	33.0	0
17/12/2024	14.0	32.5	0
18/12/2024	15.5	25.5	0
19/12/2024	10.0	27.0	0
17/2/2025	6.5	26.0	0
18/2/2025	10.0	26.5	0
19/2/2025	13.0	28.0	0
20/2/2025	15.0	27.5	0
21/2/2025	14.0	28.0	0
22/2/2025	12.5	28.5	0
23/2/2025	10.0	29.5	0

Source: Daily Rainfall - 055136 - Bureau of Meteorology (bom.gov.au)

2.2.7 LIMITATIONS

The field and desktop assessments undertaken to inform this report provide a detailed overview of the biodiversity values of the Subject Land; however, results are limited by the state and condition of native vegetation communities investigated at the time of survey.

Variation in flora composition and structure has been observed during survey events, likely due to natural seasonal variation, severe weather/climatic events (e.g., drought, floods and fire), land use history, pest vertebrate/invertebrate impacts and any other associated interaction effects. However, observer differences are also likely, noting the involvement of several observers over the course of all investigations (i.e., ecologists employed at Nature Advisory, NGH and ERM). All efforts have been made to minimise the effect of these factors on the assessment.

2.2.7.1 FALSE NEGATIVES

Fauna and flora diversity within the Subject Land should not be seen to be comprehensive, but rather a finding from sampling design and effort at the time of survey events. The potential for false negatives (i.e., not seeing a species that is present), was limited by the use of industry-published guidelines applicable to the assessment. The inclusion of seasonal and multiple year sampling has reduced the likelihood of not detecting species relevant to this assessment. Section 8.5 discusses findings of similar developments in the area to provide insight into false negatives.

2.2.7.2 VEGETATION CLASSIFICATION

The classification of native vegetation within the Subject Land is based on the best fit assignment of PCT to BAM plots (i.e., *a priori* classification), which was subsequently quantitatively reviewed and tested to determine the accuracy. Iterations in the classification were performed where the quantitative analysis supported revision.

This analysis involved the consideration of BAM plot data obtained from several seasons over several years and by several observers. These factors have influenced the data obtained and used in the analysis. Data management was required to minimize the effect of seasonality, weather extremes, land use and observer bias. This included adjusting species in the data matrix by removal or aggregation. The effect of land use disturbance was minimized, but not eliminated, by removing exotic species from the analysis.

The influence of broad ecotones generated from several environmental and anthropogenic influences has also been considered in this analysis. The corresponding PCT mapping has been guided by the quantitative analysis of floristic survey data, field observations and analysis of aerial imagery.

Inaccuracies in PCT and broad condition state boundary mapping may occur where aerial photography interpretation is required to extrapolate BAM plot datasets. Rapid data points have been used to minimize these inaccuracies, noting that the level of disturbance throughout the Subject Land presents a greater challenge to PCT and condition state assignment (Benson and Ashby 2000; Durrough et al 2006; Mitchell et al 2018).

2.2.7.3 TARGETED SURVEYS

Targeted field surveys for threatened flora and fauna have been conducted in habitat throughout the Project Area. The Project Area includes the Subject Land. A period of several seasons or years is often needed to identify all the species present in an area, especially as some species are only apparent at certain times of the year (orchids or migratory birds) and require specific weather conditions for optimal detection.

These potential limitations have been addressed by adopting a cautionary approach (assumed presence), applied where habitat was identified, or species were predicted to utilise habitat components at some stage during their life cycle.

2.2.7.4 DEGRADED LANDS

The Subject Land comprises large areas of low condition grassland and roadside vegetation that is in a heavily degraded state. A substantial part of these lands have been designated as Category 1 – Exempt Land, which do not require assessment for direct impacts. Notwithstanding, a considerable amount of targeted surveys have been performed within these degraded lands, with the results supporting the assumptions made with respect to degraded habitat.

2.2.8 LICENCING

Regarding the flora and fauna surveys conducted in this BDAR, ERM operated under the Scientific License of SL100196 and Animal Ethics Accreditation number 53055.

3. SITE CONTEXT

3.1 LANDSCAPE FEATURES

3.1.1 SITE CONTEXT

The following site context features discussed in **Table 3-1**, have been identified from an inspection of the Subject Land along with GIS assessment of available relevant digital mapping layers and aerial imagery.

TABLE 3-1 SUBJECT LAND LANDSCAPE FEATURES

Landscape feature	Description
IBRA Bioregions and Subregions	The Subject Land and Assessment Area occur within the New England Tablelands Bioregion and across three subregions: Armidale Plateau Walcha Plateau Yarrowyck – Kentucky Downs The Walcha Plateau covers a large majority of the Subject Land and was therefore used in the BAM-C.
NSW Landscape Regions (Mitchell)	The Subject Land is situated across four NSW Mitchell Landscapes: Moonbi – Walcha Granites Niangala Plateau and Slopes Tia Tops Uralla Basalts and Sands The Niangala Plateau and Slopes landscape description has been selected as it has the largest occurrence across the Subject Land. It is described as "Woodland of snow gum (*Eucalyptus pauciflora*) and black sallee (*Eucalyptus stellulata*) on western ridges, with manna gum (*Eucalyptus viminalis*) and mountain gum (*Eucalyptus dalrympleana*) on mid-slopes and New England peppermint (*Eucalyptus cinerea*) in the valleys on cold sites. Open forest of broad-leaved stringybark (*Eucalyptus caliginosa*), Yellow Box (*Eucalyptus melliodora*), narrow-leaved peppermint (*Eucalyptus radiata*), and narrow-leaved black peppermint (*Eucalyptus nicholii*) on better soils. Tall open forest of: New England blackbutt (*Eucalyptus andrewsii* ssp. *campanulata*), silver-top stringybark (*Eucalyptus laevopinea*), diehard stringybark (*Eucalyptus cameronii*), narrow-leaved peppermint, on moist margins of the plateau and grey box (*Eucalyptus molucanna*), Yellow Box (*Eucalyptus melliodora*), Youman's stringybark (*Eucalyptus youmanii*) on dry margins. Silvertop stringybark and lightwood (*Acacia implexa*) with white box (*Eucalyptus albens*) on northern slopes" (NPWS, 2003).
Rivers, streams, estuaries and wetlands	The Subject Land is located north-east of the Apsley River, west of the Macleay River and north-east of Ohio Creek. NSW Hydrography mapping (**Figure 3-1**) shows that 14 named creeks intersect the Subject Land as well as several unnamed ephemeral tributaries. Aquatic habitat associated with these creeks and tributaries and their associated canals/drains are assessed in **Section 3.1**. No Ramsar Wetlands or Important Wetlands as listed in the Directory of Important Wetlands of Australia occur within the Subject Land. Farm dams and drainage channels occur throughout the Subject Land. These artificial features possess relatively low-quality habitat with limited emergent, floating or submerged vegetation, however, still provide a valuable resource for fauna as a water source.

Landscape feature	Description
Habitat connectivity	The Subject Land has been historically cleared and altered for agricultural use however some vegetation has been retained and serves as habitat corridors and connectivity to nearby National Parks. The eastern portion of the Project Area has the highest concentration of remnant vegetation and connects with Oxley Wild Rivers National Park. The value of this connectivity is reduced because of fencing, overgrazing and land management practices occurring within the Subject Land. There is little connectivity between the eastern and western sides of the Project Area and the land beyond the western extent of the Project Area is consistent with the cleared, agricultural landscape seen within this portion of the Subject Land. **Figure 3-2** displays the extent of native vegetation within the Subject Land and the surrounding areas to demonstrate the habitat connectivity features present.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	The presence of habitat features including karst, caves, crevices and cliffs or other areas of geological significance were assessed throughout the Subject Land during detailed field surveys. There are no karsts, caves, crevices, cliffs or other geological features of significance within the Subject Land.
Soil hazard features	The soil erosion hazard for the majority of the Subject Land is moderate and the nearby sensitive soils of the Oxley Wild Rivers National Park should not be impacted by the Project (ERM, 2022). A search of the ASC Soil Type Map reveals that the Kurosol soil type dominates the Subject Land. Kurosols have strong texture contrast between A horizons and strongly acidic B horizons, and with low water holding capacity Kurosols are often sodic. They tend to have low fertility and land use is generally restricted to grazing pastures (ERM, 2022). A search of the NSW Environment Protection Authority Contaminated Sites Register returned no results for the Walcha Council LGA for current or former Declarations of Significantly Contaminated Land. The Uralla Shire Council returned one result for the Former Koppers Timber Treatment Plant which was repealed in 2012.
Areas of outstanding biodiversity value	The Subject Land is not identified as an area of outstanding biodiversity value, as defined under the BC Act.
Additional landscape features identified in SEARs	SEARs identified Gondwana Rainforests of Australia World Heritage Property and National Heritage Place as an additional landscape feature as the Oxley Wild Rivers National Park forms part of the World Heritage-listed Gondwana Rainforest. Indirect impacts to the Oxley Wild Rivers National Park are discussed in **Section 8.7.2**.

3.1.2 AQUATIC HABITAT

The Subject Land is located north-east of the Apsley River, west of the Macleay River and north-east of Ohio Creek. NSW Hydrography mapping (**Figure 3-1**) shows that 14 named creeks intersect the Subject Land as well as several unnamed ephemeral tributaries. The named creeks that occur within the Subject Land include:

- Boundary Creek;
- Brookmount Creek;
- Cook Station Creek;
- Dog Trap Creek;
- Draytons Creek;
- Graveyard Creek;

- Grose Creek;
- Jacks Creek;
- Lambing Flat Creek;
- Mihi Creek;
- Salisbury Waters;
- Snake Creek;
- Stockyard Creek; and
- Winterbourne Creek.

The NSW DPI Fisheries Spatial Data Portal was reviewed to determine aquatic values and potential presence of threatened species in the Subject Land listed under the EPBC Act, BC Act as well as the NSW *Fisheries Management Act 1994* (FM Act). No freshwater fish communities or threatened species are mapped within the Subject Land; however, many of the creek lines within the Subject Land are mapped as key fish habitat. Mitigation measures to prevent impact to these areas of key fish habitat are discussed in **Section 8.4**.

Other aquatic habitats present within the Subject Land include unnamed first and second Strahler stream order tributaries that occur as ephemeral gullies and have been observed to only hold water immediately after rainfall events, providing little habitat potential.

Farm dams and other artificial aquatic systems present have been subject to habitat quality assessments and targeted fauna surveys for amphibian species where suitable habitat was observed.

No aquatic endangered ecological communities would be affected by the Subject Land.

3.2 NATIVE VEGETATION COVER AND PATCH SIZE

The following landscape attributes were assessed to define the site context:

- Percent native vegetation cover in the landscape (Assessment Area); and
- Patch size.

3.2.1 PERCENT NATIVE VEGETATION COVER IN THE LANDSCAPE

The extent of native vegetation across the Assessment Area is shown in **Figure 3-2** and summarised in **Table 3-2**, which includes the parameters used in the BAM-C for percentage of native vegetation cover and the cover class which was found to be >30-70%.

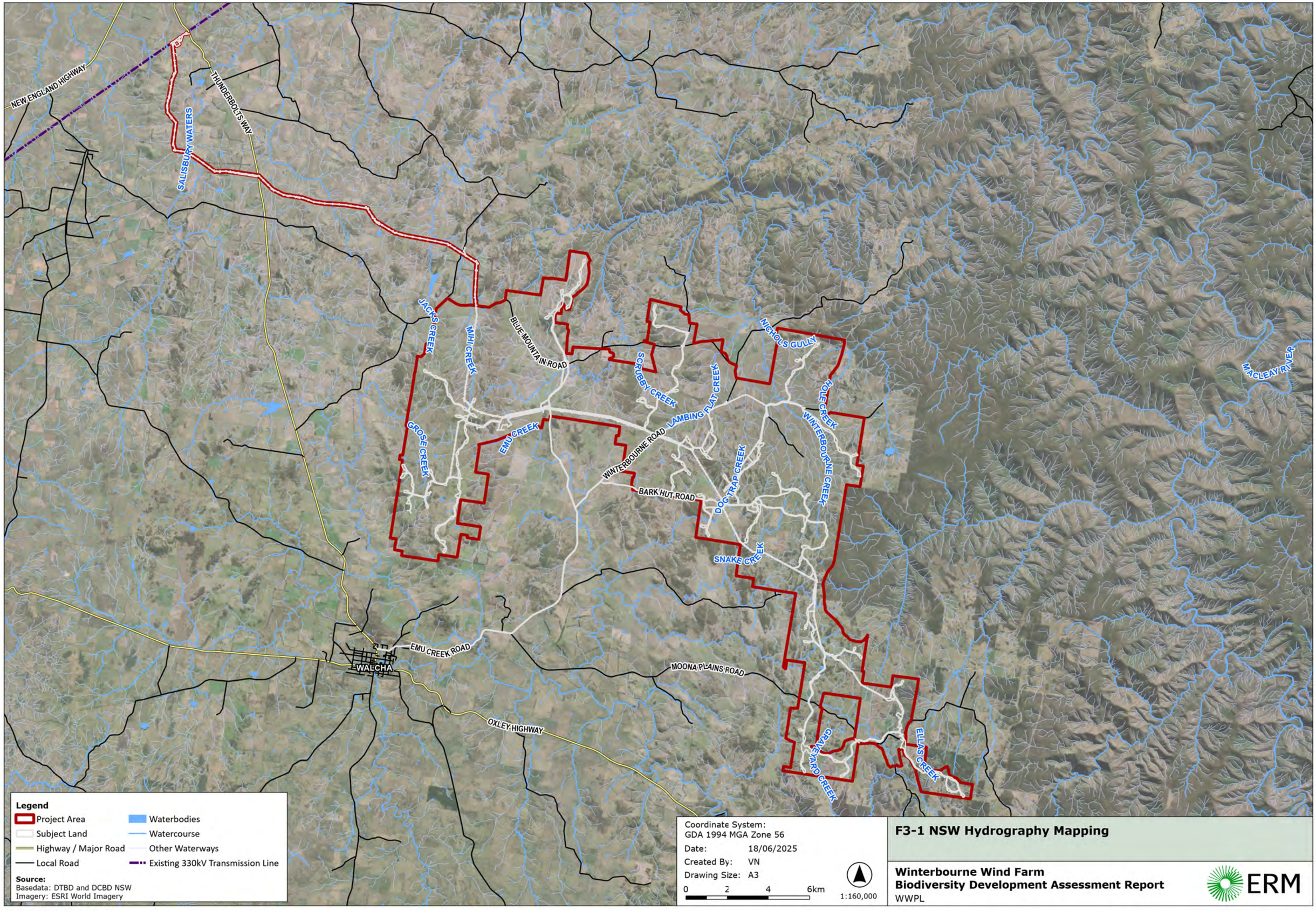
TABLE 3-2 NATIVE VEGETATION COVER IN THE ASSESSMENT AREA

Description	Value
Assessment Area	16,739 ha
Total area of native vegetation cover comprising: Woody vegetation Non-woody vegetation	6,780 ha 3,397 ha 3,383 ha
Percentage of native vegetation cover Woody vegetation Non-woody vegetation	40.6% 20.3% 20.3%
Class (0-10, >10-30, >30-70 or >70%)	>30-70%

Assessment of native vegetation cover in the Assessment Area has relied upon the non-field verified SVTM noting that this estimate is comprised of 50% woody vegetation cover estimated from the 2011 NSW Woody Vegetation Extent layer. The SVTM is likely to represent an overestimate of native vegetation cover; however, it has not been amended as there is limited field data to support such amendments. This overestimate represents a conservative assumption in this assessment.

3.2.2 PATCH SIZE

Patch size is defined in the BAM as an area of intact native vegetation that occurs on the development site and includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site. Each VZ within the Subject Land has been assigned to the 100+ ha patch size class.

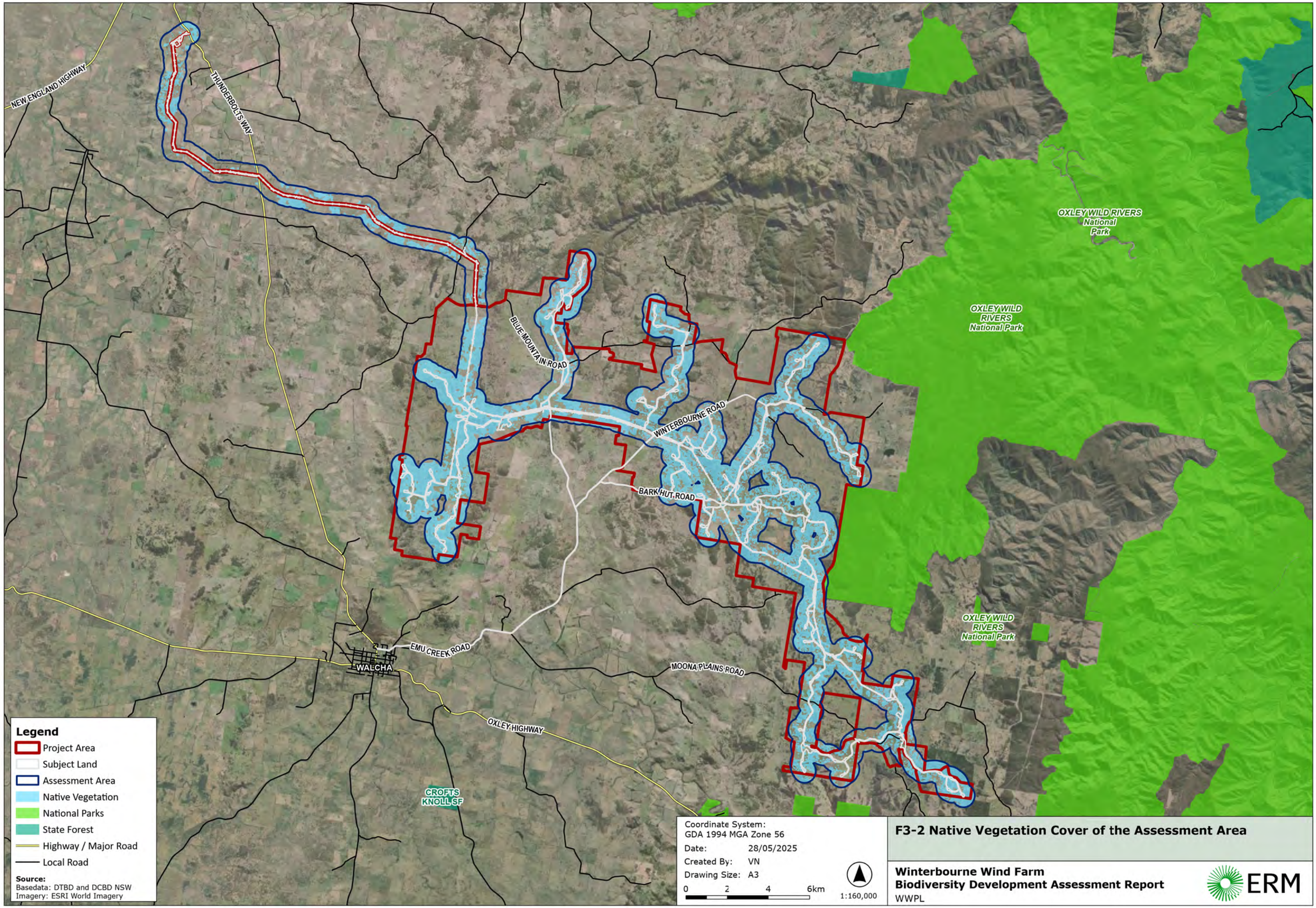


F3-1 NSW Hydrography Mapping

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx



F3-2 Native Vegetation Cover of the Assessment Area

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

4. NATIVE VEGETATION, THREATENED ECOLOGICAL COMMUNITIES AND VEGETATION INTEGRITY

4.1 NATIVE VEGETATION EXTENT

This section of the BDAR identifies the native vegetation occurring on the Subject Land (**Figure 3-2**) in accordance with the requirements of Section 4.1 of the BAM.

4.1.1 MAPPED NATIVE VEGETATION

The Subject Land comprises an area of approximately 882.08 ha with 464.13 ha or ~53% mapped as requiring assessment (i.e., Category 2 - Regulated Land or Excluded Land). A summary of the landcovers present within the Subject land is provided in **Table 4-1.**

TABLE 4-1 LANDCOVER SUMMARY OF THE DISTURBANCE AREA

Disturbance	Proposed Land Category	Landcover Character	Area (ha)
Surface (total loss)	Category 2 – Regulated Land	Woody	111.36[15]
		Non-woody	338.18[15]
	Category 2 – Vulnerable Regulated Land	Woody	0.47[15]
		Non-woody	5.67[15]
Transmission Line (partial loss)	Category 2 – Regulated Land	Woody	8.44

The mapped extent of native vegetation was determined in a GIS at a capture scale of 1:1,000 or finer using the latest available imagery in ESRI base imagery dataset (~2023). The extent of native vegetation shown in the SVTM (NSW Government, 2024b) was not relied on as the typology of this dataset was highly variable and did not accurately match the latest imagery used to phototype native vegetation extent (and type).

Ground truthing performed by several investigators since 2021 has not identified any substantive difference in the woody vegetation delineated. Some isolated trees are missing in places throughout the Subject Land, with their loss likely to be associated with natural causes (e.g., adverse weather events).

Refer to **Section 4.2.5.3** for further details on the mapped extent of native vegetation.

4.1.2 AREAS THAT ARE NOT NATIVE VEGETATION

A LCA Report has been completed for this assessment with the extent of Category 1 – Exempt Land mapped as shown in **Appendix A**. Other areas of non-native vegetation include planted trees (e.g., Poplar) and self-established species such as Willow (*Salix* sp.). These have been mapped as 'exotic planted' or 'exotic'.

[15] Includes some areas of non-native vegetation (exotic vegetation)

4.2 IDENTIFY AND MAP PCTS

The identification and mapping of PCTs, or the most likely PCTs, and all TECs within the Subject Land is to be completed in accordance with Section 4.2 of the BAM and is to be based on the outcomes of the plot-based floristic vegetation survey (Section 4.2.1(4)). This includes circumstances where the vegetation is missing structural layers and has no distinct linear boundary to determine difference between PCTs and planted native vegetation. PCT description is to include:

- PCT name and ID code;
- Class and formation;
- The area in hectares (ha);
- Species relied upon for identification of vegetation type;
- Use of BAM plots to identify a PCT (as outlined in Section 4.1.2(2) of the BAM);
- Estimate of percent cleared value of PCT (as outlined in Section 4.2.1(5) of the BAM); and
- TEC status (as outlined in Section 4.2.2 of the BAM).

4.2.1 NATIVE VEGETATION OF THE NEW ENGLAND TABLELANDS BIOREGION

Prior to European settlement, the natural vegetation of the eastern New England Tablelands mostly comprised a mosaic of grassy eucalypt woodlands and forests of montane to subalpine character with an average of 30 large trees per hectare (Benson and Ashby 2000). A landscape cross-section of the vegetated landscape that shows this character is provided in Benson and Ashby (2000) and is reproduced below for perspective.

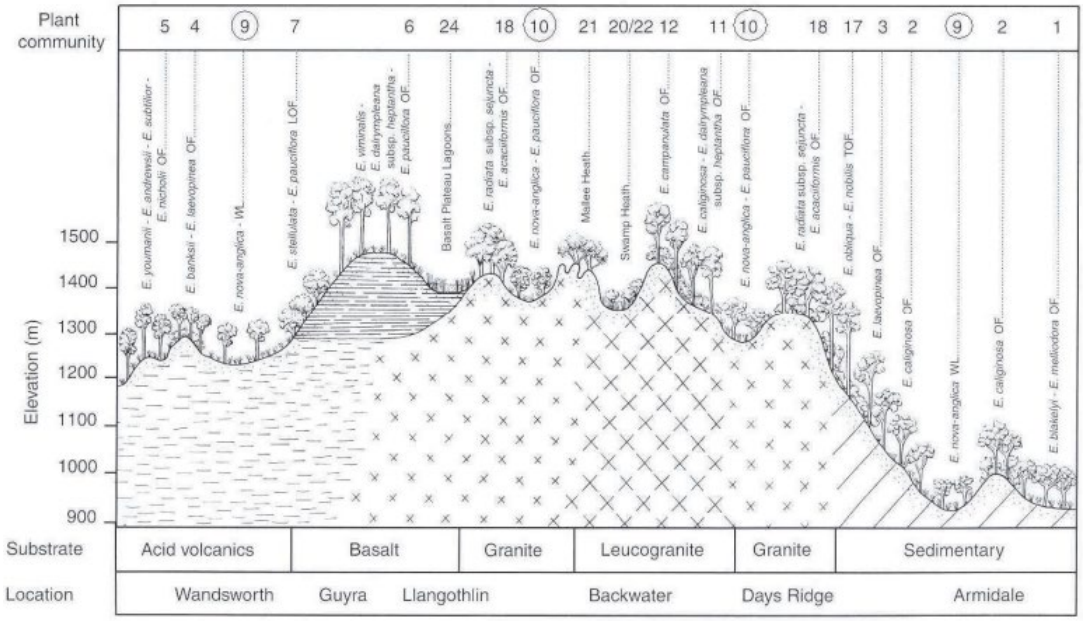


Fig. 1. Schematic transect of the landscapes present in the area covered by the Guyra 1: 100 000 map sheet showing the relationship between topographic position, elevation, substrate and plant communities. OF = Open-Forest, WL = Woodland, LOF = Low Open-Forest, TOF = Tall Open-Forest (after Walker and Hopkins (1990)). Reproduced with permission, from Benson and Ashby (2000). Plant communities 9 and 10, circled, are components of the national ecological community.

Naturally occurring non-woody vegetation of the New England Tablelands prior to European settlement is likely to have been of limited occurrence.

Identifiable naturally occurring non-woody vegetation is now restricted to carex fens and mires, with naturally occurring temperate grasslands now indistinguishable from those derived from modified/cleared woodlands and forests. These non-woody vegetated landscapes would have been restricted to broad valley flats especially at higher altitudes (i.e., frost hollows) and would have been flanked by grassy woodlands, many of which are now listed as threatened due to clearing for agricultural production (e.g., New England Peppermint Grassy Woodlands in frost follows at high altitude and Box Gum Grassy Woodlands in drier lower elevations).

East of Walcha and within the Project Area, this vegetation occurs on a high rolling plateau of elevation between 1050 to 1400 m with local relief of 100m. Vegetation is formed mainly on steeply dipping sedimentary geologies (Devonian slate, phyllite, tuff, sandstone, conglomerate, chert and jasper, faulted Permian conglomerate, sandstone and mudstone, Carboniferous sandstone, slate and schist) with small areas of Permian granite. These conditions give rise to low to moderate soil fertility, with higher soil fertility restricted to isolated occurrences of basaltic soils.

Areas at higher altitude, which are mostly in the eastern third of the Project Area, comprise vegetation communities dominated by messmate (*Eucalyptus obliqua*) and mountain gum (*Eucalyptus dalrympleana* ssp. *heptantha*), with snow gum (*Eucalyptus pauciflora*), black sallee (*Eucalyptus stellulata*) and ribbon gum (*Eucalyptus nobilis*). Tall open forest of New England blackbutt (*Eucalyptus andrewsii* ssp. *campanulata*), silver-top stringybark (*Eucalyptus laevopinea*), diehard stringybark (*Eucalyptus cameronii*), and narrow-leaved peppermint occurs (*Eucalyptus radiata*) on the moist margins of the plateau.

Central and western parts of the Project Area comprise woodland of snow gum and black sallee on western ridges, with manna gum (*Eucalyptus viminalis*) and mountain gum on mid-slopes and New England peppermint (*Eucalyptus nova-anglica*) in the valleys on cold sites. Open forest of broad-leaved stringybark (*Eucalyptus caliginosa*), Yellow Box (*Eucalyptus melliodora*), narrow-leaved peppermint, and narrow-leaved black peppermint (*Eucalyptus nicholii*) are on better soils.

Vegetation found on basalt-derived soils are uncommon in the Project Area. These consist of open forests and woodlands of manna gum, snow gum and black sallee. Cold-air drainage inverts the tree patterns in wide valleys, as the distribution of these species is largely determined by climate parameters. Vegetation communities growing on basaltic soils consist of broad-leaved stringybark, New England blackbutt, and narrow-leaved peppermint on the hills, with Yellow Box, wattle-leaved peppermint (*Eucalyptus acaciiformis*), New England peppermint, snow gum, black sallee and ribbon gum in the valleys.

4.2.2 AGRICULTURAL HISTORY

European settlement occurred soon after the first recorded European traverse of the region by the Surveyor General John Oxley in 1818 (Benson and Ashby 2000). This heralded the start of land development, which initially involved mining activity (i.e., gold and tin) soon followed by cattle grazing. By the late 1800's, sheep grazing became widespread following improved property fencing (NPWS 2003).

At the turn of the 20th century, up to 10% of the region had been cleared with other areas experiencing extensive ringbarking (Benson and Ashby 2000), which could have affected up to three-quarters of the region (Stubbs 1998).

Benson and Ashby (2000) note that ringbarking has had a disproportionate impact on grassy woodlands such as Blakely's Red Gum-Yellow Box Grassy Woodland and New England Peppermint communities, these being part of listed CEECs known to occur within the region.

By the late 1970s, the region hosted over 7 million sheep at a stocking rate of seven sheep per hectare, made possible by land clearing and pasture improvement (Benson and Ashby 2000), which they note the following in relation to the character of lands:

> "Pasture improvement, using a range of exotic grasses such as *Lolium perenne* and *Poa pratensis*, and legumes such as *Trifolium repens*, commenced in the 1920s but accelerated in the late 1940s. By 1973 19% of the region was sown to improved pasture. These imported grasses were aided in their establishment by the application of fertilizers, particularly superphosphate. Some of these pastures have been re-invaded by some native grasses and are termed natural pastures. Cultivation of crops has always been limited in extent."

Land use effects on remnant native vegetation have been profound, as noted in Benson and Ashby (2000):

> "While the tree species distribution is similar to that of today (Williams 1985), albeit reduced in extent, the understorey has changed significantly in disturbed areas".

The effects of agriculture on vegetation within the Subject Land have been considered in this assessment by way of land categorisation (see **Appendix A**). Category 1 – Exempt Land was mapped to identify areas of significantly disturbed/modified and/or low conservation value grasslands typical of agricultural precincts. These areas have been mapped as PCT 0 in this assessment, with such vegetation having high perennial exotic species cover and low native species diversity.

4.2.3 CLASSIFICATION

Noting the landscape drivers for vegetation patterns in the area (Benson and Ashby 2000), the classification of native vegetation within the Subject Land has been based on relevant available desktop resources (e.g., SVTM, BioNet vegetation types database, woody vegetation extent, annual average rainfall and digital elevation models) and datasets obtained from site investigations. The results was an *a priori*[16] assignment of full floristic plots (BAM plots) to the most likely PCT listed in the BioNet vegetation type database. A total of 14 PCTs were identified and assigned to BAM plots used in this assessment.

The quantitative analysis of the above *a priori* classification was limited to seventy-five (75) BAM Plots that were obtained from woody vegetation.

BAM plots excluded from this quantitative analysis are those obtained from non-woody vegetation, which is heavily modified vegetation that is missing structural layers that would otherwise confound the analysis (i.e., highly homogenized species composition, lack of tree and shrub canopy species and high abundance of exotics).

[16] *a priori*: cognitive assignment of samples (e.g. BAM plots) into groups (e.g. PCTs) prior to analysis through reasoned self-evident indicators (e.g., landscape indicators and similarities in tree, shrub and groundcover species) as per requirements specified in Section 4.3.1(3) of the BAM.

Prior to the analysis, all exotic species were removed as these are not informative for determining the type of native vegetation being present.

Several native species were also removed from the analysis to minimize (but not eliminate) the effects of observer bias (i.e., varying identifications for the same taxa), time of sampling (i.e., season and year) and disturbance (i.e., grazing, pasture modification). These were:

- *Aristida* spp. (some variation in identification and disturbance related species – relatively unpalatable to livestock);
- *Bothriochloa* spp. (i.e., some identification differences and seasonal species);
- *Cynodon dactylon* (i.e., widely cultivated native species);
- *Microlaena stipoides* (i.e., widespread throughout all BAM plots and responds to disturbance and is also seasonal);
- *Rytidosperma* spp. (i.e., varying identification differences);
- *Sporobolus creber* (i.e., widespread and disturbance related species – relatively unpalatable to livestock); and
- Selected species identified to genus only where only a few observations were noted.

The floristic analysis utilised the modified dataset and Bray-Curtis similarity index to produce a resemblance (dissimilarity) matrix, with a CLUSTER analysis (i.e., dendrogram) produced from this resemblance matrix to visually display BAM plot similarity (**Chart 4-1**). The three-dimensional (3D) nMDS plot showing the PCT groups is displayed in **Chart 4-2**.

An ANOSIM[17] was performed to statistically test the *a priori* assignment of BAM plots to PCTs. The test identified statistically greater similarity among BAM plots assigned to a PCT group than BAM plots between PCT groups (i.e., Global Sample Statistic (R) of 0.425 p <0.1). This quantitative assessment supports the *a priori* assignment of BAM plot to the most likely PCT as used in this assessment. The refined quantitative assessment of BAM plot classification in this BDAR represents an iterative improvement over the classification used in the Amended BDAR (ERM 2024) (i.e., Global R of 0.388 p <0.1) and the EIS BDAR (NGH 2022) (i.e., Global R of 0.203 p <0.1).

[17] ANalysis Of SIMilarities (ANOSIM) is a statistical test used to determine if there are significant differences in the similarity of groups based on a resemblance (dissimilarity) matrix. It is used to determine if two or more groups have different species compositions or other characteristics.

CHART 4-1 DENDROGRAM OF THE BAM PLOT DATA BY *A PRIORI* PCT ASSSIGNMENT

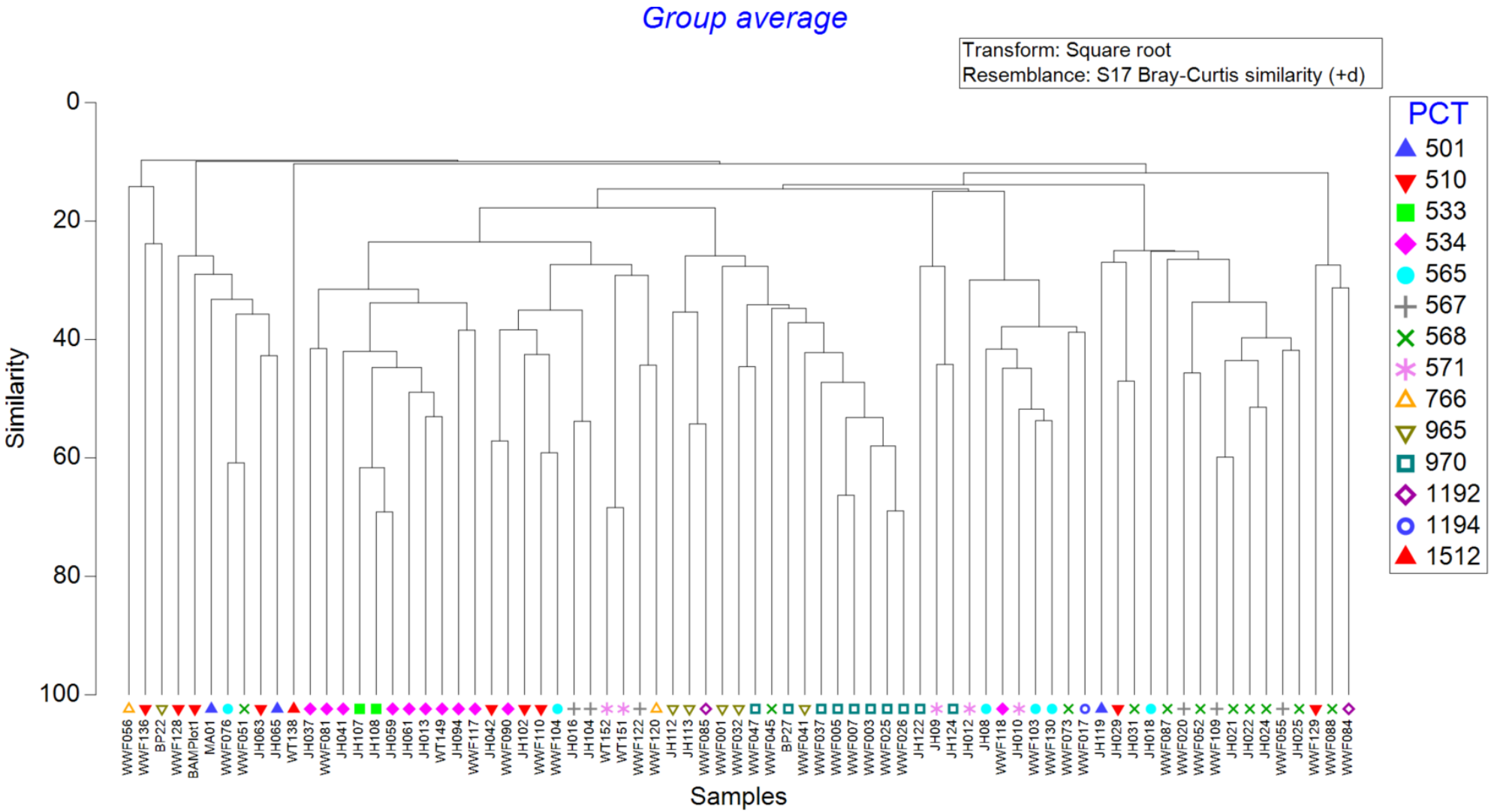
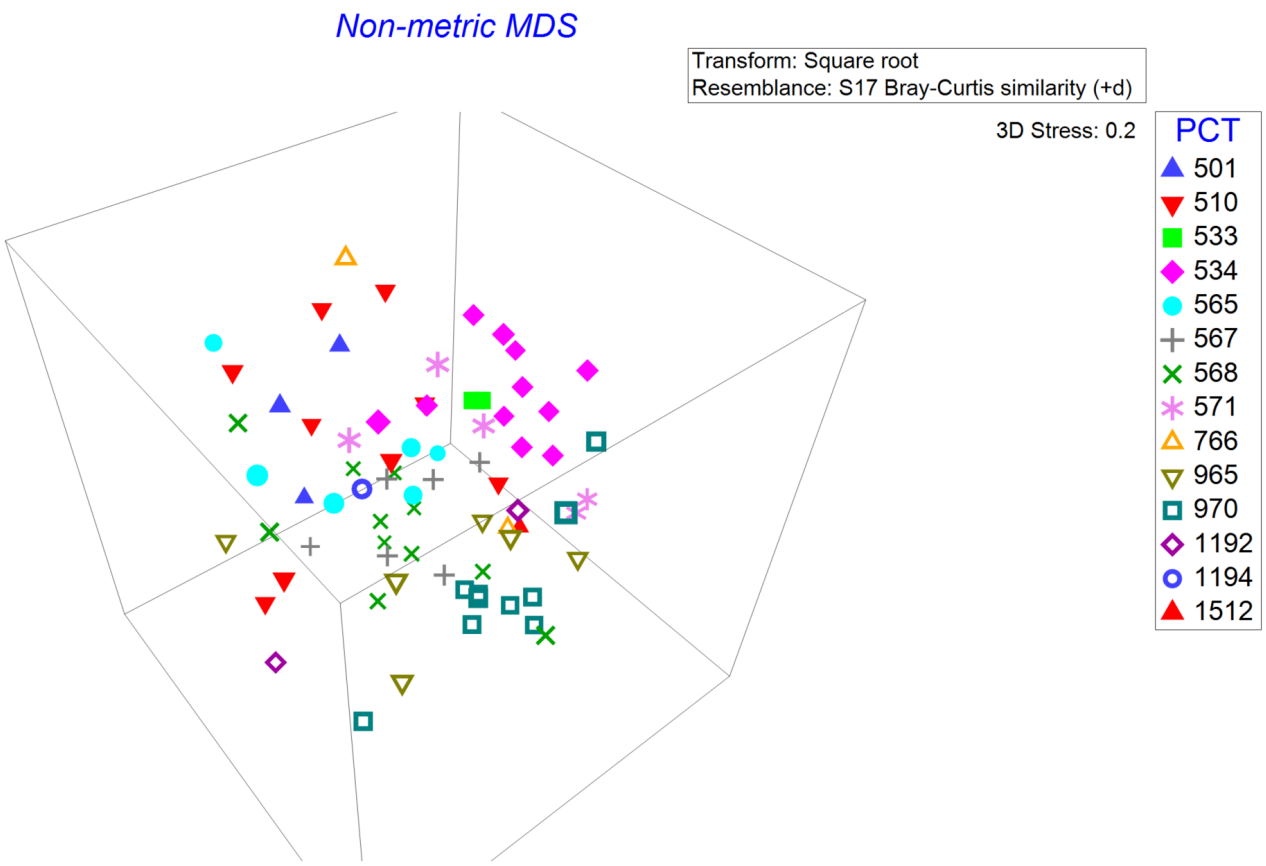


CHART 4-2 3D NMDS PLOT OF BAM PLOTS BY *A PRIORI* PCT ASSIGNMENTS



While the nMDS plot stress[18] is high (i.e., 0.20), the three-dimensional visualization of BAM plot similarity (dissimilarity) shows informative groupings by PCT assignment. Notable in the nMDS plot is the scattered arrangement of BAM plots for grassy woodland PCTs (i.e., PCTs 510, 565, 567, 571). This scattering demonstrates similarity between PCT 510 and several other grassy woodland PCTs and primarily reflects the effect of agricultural activity on native vegetation, as observed by Benson and Ashby (2000) in similar vegetation.

Agricultural land use impacts on native vegetation is the main reason for a Global R value not exceeding 0.50 (i.e., Global R > 0.50 is indicative of a strong classification demonstrating considerable difference between *a priori* PCT groups). The modification of native plant assemblages by removing/suppressing woody vegetation, pasture improvement and livestock grazing has reduced species diversity within the groundcover stratum (i.e., see discussion on species diversity in **Appendix A**), thereby lessening floristic contrast between PCTs within the same vegetation formation (i.e., grassy woodlands).

Notwithstanding, a Global R of 0.425 ($p<0.01$) indicates the *a priori* classification has meaningful structure. Any overlapping inter-group (PCT) similarity is explainable by the effect of agricultural land use. Similarities among PCTs point to the homogenizing effect of agricultural land use on groundcover and woody species composition and structure.

[18] Stress is a measure of the "goodness of fit" of the nMDS ordination. It quantifies how well the distances between points (in this case BAM plots) in the reduced ordination space match the original dissimilarities in the data (i.e., resemblance matrix). A lower stress value suggests a better representation, and generally, stress values less than 0.2 are considered acceptable. However, there's no absolute cutoff, and the interpretation can depend on the specific context and data.

Following the historical effect of land clearing to remove woody species, the long-term effect of agricultural activity has modified relative abundance of non-woody groundcover species to the detriment of shrubs and eucalypt regeneration. The altered occurrence and relative abundance of longer-lived woody species across the landscape impairs the important compositional elements of a PCT that act to discriminate between related plant assemblages.

Livestock grazing, aided by fertilizer applications, modifies vegetation structure and often leads to an increase in the abundance of unpalatable grass species at the expense of more palatable grasses and herbs and can eliminate shrub and regenerating eucalypt species (Dorrough et al 2006; Mitchell et al 2019). This effect has been quantitatively observed in vegetation of the New England Tablelands (Benson and Ashby 2000), which includes vegetation types identified within the Subject Land.

Variation among BAM plots within a PCT assignment can also be explained by factors such as year/season the BAM plot was surveyed (i.e., four years of sampling in differing seasons) and differences between observers (i.e., several observers were involved in obtaining BAM plot data). These artifacts in the dataset were minimized where possible but cannot be completely removed from the analysis (i.e., supervised review of species identifications, removal of seasonal grass species and acquisition of additional BAM plots by a single observer).

The effect of disturbance on the native vegetation classification in this assessment cannot be completely overcome, despite efforts to minimize where possible. This is because the BAM requires the acquisition of BAM plots from vegetation impacted by the Project, not from less disturbed vegetation unaffected by the Project where more natural and PCT indicative species assemblages would be likely to occur.

Natural sources of floristic variation, such as those listed below, are likely to have had interaction effects with anthropogenic influences, thus amplifying the effects of disturbance:

- Natural ecotones;
- Altitudinal variation;
- Topographic variation from west to east;
- Varying influence of cold air drainage from west to east;
- Changes in local hydrological regimes; and
- Decreasing rainfall gradient from east to west.

Irrespective, the data collected for the assessment is informative and sufficiently reliable to not only identify PCTs but also calculate the vegetation integrity of broad condition states mapped across the Subject Land.

4.2.4 FLORISTIC COMPOSITION

Species typical of a PCT were quantified using the SIMPER (i.e. SIMilarity PERcentages) analysis tool in PRIMER. This has been used to aid PCT identification and descriptions. The SIMPER output for each PCT group is provided in **Table 4-2**, which lists the species with the greatest contribution to the PCT group. A full list of species by BAM plot is provided in **Appendix C**.

TABLE 4-2 SIMPER ANALYSIS OF PCT GROUPS

Species	Average Abundance[19]	Average Similarity	Sim/SD	Contribution %	Cumulative %
PCT 501: Average similarity 22.72					
Eucalyptus melliodora	1.56	6.41	0.58	28.23	28.23
Eucalyptus malacoxylon	2.04	3.64	0.58	16.01	44.24
Geranium solanderi	0.4	2.16	3.66	9.52	53.76
Juncus australis	0.32	1.95	2.9	8.57	62.33
Amyema pendula	0.21	0.91	0.58	3.99	66.32
Poa sieberiana	0.25	0.91	0.58	3.99	70.31
Carex inversa	0.52	0.89	0.58	3.92	74.23
Rumex brownii	0.33	0.74	0.58	3.27	77.5
Solanum vicinum	0.3	0.74	0.58	3.27	80.77
Schoenus apogon	0.62	0.73	0.58	3.2	83.97
Dichondra repens	0.21	0.52	0.58	2.31	86.28
Group 510: Average similarity 19.61					
Eucalyptus melliodora	2.6	8.39	1.07	42.78	42.78
Eucalyptus blakelyi	1.55	2.09	0.43	10.65	53.43
Poa sieberiana	1.98	1.85	0.39	9.43	62.87
Geranium solanderi	0.52	1.31	0.86	6.66	69.53
Themeda triandra	1.16	0.81	0.29	4.14	73.67
Rumex brownii	0.21	0.74	0.78	3.76	77.44
Asperula conferta	0.57	0.72	0.68	3.68	81.11
Cotula australis	0.6	0.33	0.28	1.66	82.77
Crassula sieberiana	0.35	0.3	0.43	1.52	84.29
Cymbonotus lawsonianus	0.17	0.29	0.42	1.47	85.76
Group 533: Average similarity 65.01					
Eucalyptus nova-anglica	3.52	19.47	SD=0![20]	29.95	29.95
Poa sieberiana	2.65	16.29	SD=0![20]	25.06	55
Schoenus apogon	2.12	12.31	SD=0![20]	18.94	73.94
Asperula conferta	0.85	4.35	SD=0![20]	6.7	80.64
Euchiton sphaericus	1.14	3.37	SD=0![20]	5.19	85.83
Group 534: Average similarity 30.86					
Eucalyptus nova-anglica	3.48	12.48	1.31	40.45	40.45

[19] Value obtained from square-root transformed data
[20] Value not generated as only two plots in group

Species	Average Abundance[19]	Average Similarity	Sim/SD	Contribution %	Cumulative %
Poa sieberiana	3.14	8.12	1.25	26.32	66.77
Asperula conferta	0.67	1.8	1.16	5.83	72.6
Panicum effusum	0.96	0.87	0.24	2.81	75.42
Eragrostis leptostachya	0.99	0.85	0.31	2.76	78.18
Themeda triandra	1	0.65	0.34	2.11	80.29
Carex inversa	0.52	0.63	0.42	2.04	82.32
Geranium solanderi	0.23	0.62	0.75	2.02	84.35
Hydrocotyle laxiflora	0.63	0.62	0.54	2.01	86.35
Group 565: Average similarity 22.22					
Eucalyptus laevopinea	3.58	11.02	0.71	49.62	49.62
Geranium solanderi	0.73	2.51	1.82	11.28	60.89
Poa sieberiana	1.65	1.88	0.48	8.46	69.35
Eucalyptus melliodora	0.9	1.14	0.26	5.13	74.48
Hydrocotyle laxiflora	0.4	0.73	0.72	3.3	77.78
Dichondra repens	0.32	0.73	0.75	3.29	81.08
Oxalis perennans	0.21	0.7	0.75	3.16	84.24
Pteridium esculentum	0.66	0.65	0.35	2.93	87.17
Group 567: Average similarity 29.61					
Eucalyptus caliginosa	3.77	12.49	0.98	42.19	42.19
Poa sieberiana	3.12	8.31	1.19	28.07	70.26
Geranium solanderi	0.93	2.54	1.19	8.58	78.84
Eucalyptus melliodora	0.78	0.63	0.26	2.13	80.97
Hydrocotyle laxiflora	0.39	0.57	0.79	1.91	82.88
Dichondra repens	0.45	0.52	0.45	1.75	84.63
Carex inversa	0.31	0.5	0.46	1.7	86.32
Group 568: Average similarity 20.00					
Eucalyptus caliginosa	3.5	8.64	0.9	43.19	43.19
Poa sieberiana	1.46	2.33	0.71	11.63	54.82
Olearia viscidula	1.1	1.47	0.4	7.36	62.18
Austrostipa scabra	0.9	1.01	0.31	5.07	67.25
Geranium solanderi	0.42	0.94	0.45	4.71	71.95
Lissanthe strigosa	0.74	0.92	0.58	4.58	76.53
Austrostipa verticillata	0.81	0.46	0.24	2.32	78.86
Rumex brownii	0.17	0.45	0.59	2.26	81.12

Species	Average Abundance[19]	Average Similarity	Sim/SD	Contribution %	Cumulative %
Crassula sieberiana	0.38	0.44	0.34	2.2	83.32
Dichondra repens	0.37	0.43	0.4	2.14	85.46
Group 571: Average similarity 28.19					
Poa sieberiana	2.93	5.39	0.79	19.13	19.13
Eucalyptus laevopinea	1.57	3.7	0.59	13.14	32.26
Hydrocotyle laxiflora	0.75	2.89	3.4	10.26	42.53
Eucalyptus viminalis	1.36	2.79	0.62	9.9	52.43
Acacia filicifolia	1.41	1.6	0.32	5.68	58.11
Asperula conferta	0.77	1.37	0.59	4.86	62.97
Euchiton sphaericus	0.25	1.18	1.14	4.2	67.17
Einadia nutans	0.28	1.18	1.14	4.17	71.34
Dichondra repens	0.28	1.11	1.13	3.94	75.28
Austrostipa rudis	0.63	1.08	0.32	3.82	79.1
Pteridium esculentum	0.79	1.03	0.32	3.64	82.74
Lissanthe strigosa	0.22	0.61	0.61	2.15	84.89
Grona varians	0.19	0.54	0.62	1.9	86.79
Group 766: Average similarity 6.80					
Geranium solanderi	0.51	3.34	SD=0![20]	50.00	50.00
Poa sieberiana	2.39	3.34	SD=0![20]	50.00	100.00
Group 965: Average similarity 20.01					
Poa sieberiana	1.92	4.08	0.48	20.4	20.4
Eucalyptus radiata	1.81	3.47	0.47	17.33	37.73
Pteridium esculentum	1.48	3.2	1.11	15.97	53.71
Geranium solanderi	0.86	3.04	1.03	15.19	68.89
Dichondra repens	0.62	1.83	0.64	9.13	78.02
Eucalyptus stellulata	1.39	1.63	0.26	8.16	86.18
Group 970: Average similarity 33.18					
Eucalyptus radiata	3.75	12.43	1.18	37.61	37.61
Poa sieberiana	3.27	9.29	1.06	28.09	65.7
Pteridium esculentum	1.26	3.57	1.26	10.79	76.49
Eucalyptus obliqua	1.56	1.55	0.49	4.69	81.18
Geranium solanderi	0.7	1.33	0.62	4.04	85.22
Group 1192: Average similarity 16.38					
Eucalyptus stellulata	1.98	9.99	SD=0![20]	57.79	57.79

Species	Average Abundance[19]	Average Similarity	Sim/SD	Contribution %	Cumulative %
Acaena novae-zelandiae	0.32	1.82	SD=0![20]	10.55	68.35
Echinopogon ovatus	1.02	1.82	SD=0![20]	10.55	78.9
Geranium solanderi	0.32	1.82	SD=0![20]	10.55	89.45

SIMPER outputs were not generated for PCTs 1194 and 1512 as neither of these PCTs had two or more plots in the analysis.

4.2.4.1 SIMILARITIES AMONG PCTS

Grassy woodlands of the Subject Land have experienced agricultural activity for at least 150 years. This land use has substantially modified the composition and structure of native species within present day plant communities, particularly those routinely used for livestock grazing (Benson and Ashby 2000). Long term agricultural land use has had a homogenizing effect on flora composition and structure (e.g., reduced species diversity by reducing species richness and increasing relative abundance of some species over others) (Benson and Ashby 2000), which has had the effect of reducing differences between naturally occurring PCTs.

The quantitative distinctions found between PCTs 510, 567 and 568 exemplify this. These PCTs occur across the entire landscape gradient present within the Subject Land (i.e., valley floor to ridgeline). Understanding the effect of land use has implications for mapping PCTs, their broad condition states and associated TECs as the boundaries are not distinct.

At the landscape scale, grassy woodlands such as PCT 510 typically occur on the relatively fertile lower slopes and valley floor of the region. This vegetation is typically dominated by Yellow Box and, to a lesser extent, Blakely's Red Gum and Rough-barked Apple. Increased soil moisture aids the development of a predominantly grassy groundcover. Shrubs are either absent or very uncommon.

The ridges and upper slopes are often hallmarked by less fertile/shallower soils and reduced soil moisture, resulting in a substantial change in tree canopy dominance and greater presence of woody vegetation (i.e., increased shrubbiness) at the expense of the grassy groundcover stratum. PCT 568 typifies this part of the landscape where the tree canopy is dominated by Broad-leaved Stringybark, with closer tree crown canopies often resembling open forest structure in places. The understory comprises several woody shrub species notably Wallaby Bush (*Olearia viscidula*), which is absent in vegetation on the valley floor.

The intervening midslopes that topographically separate PCTs 510 and 568 typically comprise PCT 567, which remains relatively grassy with plant species composition not unlike that seen in ecotones (e.g., sharing of species composition between two communities). Putting aside the effect of land use, PCT 567 naturally shares species found in both PCTs, with plant assemblage difference expressed mostly through relative abundance. Generally, there is an increased diversity in shrub in PCT 567 as soil fertility and moisture fall, together with a change in tree canopy (i.e., reduction in Yellow Box abundance) and groundcover species composition.

The pairwise ANOSIM results between PCTs 510, 567 and 568 demonstrate this effect. A significant difference in floristic composition and structure was found between PCTs 510 and both 567 and 568, yet no such difference was found between the PCTs 567 and 568.

That is, there is significant difference in floristic composition and/or structure between vegetation of the valley floor and the adjoining mid slopes and ridges, with vegetation of the latter two landscape positions having no significant floristic difference.

Land use has played a significant role in identifying the natural boundaries between these PCTs, notably the boundary between PCT 510 and 567.

The top 10 plant species that quantitatively discriminate between these PCTs (i.e., species dissimilarity between PCTs) are listed in **Table 4-3**.

TABLE 4-3 PLANT SPECIES THAT DIFFERENTIATE PCTS 510, 567 AND 568

Species	Mean Abundance (% cover)			Contribution (%) (between PCTs 510 and 567)
	PCT 510	PCT 567	PCT 568	
Eucalyptus caliginosa	0.1	14.2	12.3	13.03
Poa sieberiana	3.9	9.7	2.1	9.43
Eucalyptus melliodora	6.8	0.6	0.0[21]	7.37
Eucalyptus blakelyi	2.4	0.0[22]	0.1	4.38
Themeda triandra	1.3	0.0[21]	0.0[22]	3.21
Austrostipa rudis	0.0[21]	1	0.3	3.04
Geranium solanderi	0.3	0.9	0.2	2.35
Eragrostis leptocarpa	0.4	0.0[21]	0.2	2.29
Eucalyptus dalrympleana	0.2	0.1	0.0[21]	2.2
Angophora floribunda	0.2	0.0[21]	0.0[2221]	1.99

The contribution column shows that ~34% of the differences between PCT 510 and PCT 567 are found in the mean percent cover of three eucalypts (*Eucalyptus caliginosa*, *Eucalyptus melliodora* and *Eucalyptus blakelyii*) and one grass species (*Poa sieberiana*). As expected, Broad-leaved Stringybark (*E. caliginosa*) is present and dominant in PCT 567 with only minor contribution to PCT 510. Broad-leaved Stringybark is described as occasionally occurring in PCT 510 and is the dominant tree canopy of PCT 568, which is found upslope of PCT 567.

Yellow Box (*E. melliodora*) has high mean percent cover in PCT 510 and locally is the dominant canopy species of this community. Blakely's Red Gum (*Eucalyptus blakelyi*), which is also listed as a canopy dominant for this PCT, has lesser incidence in PCT 510 where mapped in the Subject Land. Both Yellow Box and Blakely's Red Gum are two of the three tree canopy species that characteristically dominate the TEC known as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (Box Gum Woodland TEC) (see Part 4.1 and Part 4.5 of NSW TSSC 2020). In PCTs 567 and 568, Yellow Box is present as a minor associate and never dominates nor is characteristic, with Blakely's Red Gum being absent from PCT 567.

The varying abundance of *Poa seiberiana* is likely the consequence of several effects be it of anthropogenic or natural causation.

[21] Species present; however, mean percent cover is less than the recordable level in a BAM plot (i.e., <0.1% cover)
[22] Species absent

This grass species is naturally more abundant in grassy woodlands (i.e., PCTs 510 and 567) than in dry sclerophyll forest (i.e., PCT 568), thus explaining the relatively low abundance of this species in PCT 568. However, the high relatively abundance of this species in PCT 567 and lower abundance in PCT 510 likely reflects the effects of land use.

The diminished incidence of this species in PCT 510 is likely due to pasture modification practices (i.e., removal), while the higher incidence in PCT 567 is likely a consequence of livestock grazing (Tasker and Bradstock 2006). Supporting this conclusion is the low incidence of palatable grasses (e.g., *Themeda triandra*) and herbs (e.g., *Microseris lanceolata* and *Pimelea curviflora*) in the grassy woodlands of the Subject Land, combined with a shift in the dominance of pasture species to a relative overabundance of less palatable grasses such as Wallaby Grasses (*Rytidosperma* spp.) and *Bothriochloa macra*.

Except for *Lissanthe strigosa*, shrub species are absent from PCT 510 yet are present in PCTs 567 and 568. This is an expected observation, as PCTs 567 and 568 occur on less fertile soils with lower soil moisture content. An approximate 1% contribution is made by each of the following shrub species to the differences between PCTs 510 and 567:

- *Acacia dealbata*;
- *Bursaria spinosa*; and
- *Olearia viscidula*.

The latter is a diagnostic species of PCT 568 and is the most frequently occurring and abundant shrub species in that community.

These observations, which are consistent with the literature, validate the consideration of land use in PCT mapping. For example, TSSC (2011) describes the condition of vegetation on the Walcha Plateau as "pastures heavily developed with sown pastures widespread. Dieback moderate and limited to the most developed areas". This supports observations made by Benson and Ashby (2000) where they note that most of the understorey of New England Tableland vegetation has been grazed over the last 130 years, and is now moderately to severely disturbed, with continuous grazing leading to the depletion of the shrub understorey and lack of regenerating trees.

For the reasons discussed above, the mapping of PCTs and associated broad condition states has considered the effect of land use on plant species incidence and abundance, as land use has altered (simplified) much of the groundcover stratum of native vegetation in the Subject Land. In the example given, vegetation mapping has separated similar PCTs by important features such as the presence and abundance of Eucalypts, notably Yellow Box. Vegetation comprising Yellow Box as a characteristic canopy species have been assigned to PCT 510, as this is a characteristic tree canopy species for the nationally-listed White Box Yellow Box Blakely's Red Gum Grassy Woodland TEC. This represents a conservative approach to the mapping of PCTs within the Subject Land (i.e., preferential assignment of vegetation to PCT 510 over PCT 567) and thus assignment of TECs.

4.2.4.2 LOW VERSUS MODERATE CONDITION GRASSLANDS

The non-woody vegetation of the Subject Land is described as comprising low and low-moderate condition grasslands (n=70 plots). A significant difference exists between these two condition states (ANOSIM: Global R = 0.037 p: 3.9%), which supports the separation of these grasslands into distinct vegetation zones for assessment.

Moderate condition grasslands generally contained higher native species richness/composition (Mean = 15.0 ±5.1) and percent native vegetation cover/structure (i.e., Mean = 83.1% ±28.7%) than did low condition grasslands (Mean = 12.7 ±5.3 for species richness and Mean = 70.2% ±36.2% for percent cover). A statistically significant difference between the VISs of moderate (mean = 21.9 ±8.9) and low (mean = 12.0 ±5.4) condition grasslands (t(56) = -5.54, p= <0.01), which is consistent with land use induced differences found in the natural pastures of the New England Tablelands (Reseigh *et al.*, 2003).

Species most frequently observed in moderate or low condition grasslands (i.e., ≥20 observations from 70 BAM plots) are listed **Table 4-4**, with frequency by grassland condition state reported.

TABLE 4-4 GROUND COVER SPECIES OBSERVED IN MODERATE AND LOW CONDITION GRASSLANDS WITH ≥ 20 OBSERVATIONS

Species	Moderate Condition (n=35)	Low Condition (n=35)	Comment
Asperula conferta[23]	16	9	Important Box Gum Species
Carex inversa	5	15	-
Cymbonotus lawsonianus	15	11	Flat growing species resistant to grazing
Eragrostis leptostachya	8	12	-
Euchiton sphaericus	14	20	Flat growing species resistant to grazing
Geranium solanderi[24]	21	17	Palatable New England Peppermint Woodland species
Haloragis heterophylla[2323,2424]	11	17	Important Box Gum Species and palatable New England Peppermint Woodland species
Juncus australis	9	15	-
Microlaena stipoides	27	22	Tolerant to fertilizer and responds positively to phosphorous use
Oxalis perennans	17	8	-
Poa sieberiana	28	18	Mature stands of this species are tolerant to livestock grazing
Rumex brownii	15	10	-
Schoenus apogon	12	14	-
Sporobolus creber	23	20	Abundance increases with overgrazing. Coloniser of reverting sown pastures

Grasslands were generally characterised by a combination of the following grazing tolerant grass species:

- Weeping Grass (*Microlaena stipoides*);
- Rat tail Grass (*Sporpobolus creber*); and
- Snowgrass (*Poa sieberiana*).

[23] Important Box Gum Woodland species (TSSC 2020)
[24] Palatable species (TSSC 2011)

The relative dominance of these species appears related to parent PCT; although, there is limited difference across the Subject Land.

Weeping Grass and Snowgrass have high abundance across all grasslands of the Subject land. Weeping Grass responds positively to phosphate fertilizers (Clark *et al.,* 2014; Mitchell *et al*., 2018) and rainfall (Mitchell et al., 2016), with its high abundance across the Subject Land likely associated with graziers preferencing its growth as a valuable pasture species.

Like Weeping Grass, Kangaroo Grass (*Themeda triandra*) is a valued pasture species; however, is sensitive to overgrazing (Benson and Ashby 2000; Reseigh *et al*., 2003; Durnin *et al.*, 2025). Further, phosphorous applications to native pastures are negatively associated with Kangaroo Grass occurrence (Mitchell *et al*., 2018; Dorrough *et al.* 2006). Kangaroo Grass is not frequently observed throughout the Subject Land with only nine recorded occurrences in 70 BAM plots. Native Sorghum (*Sarga leiocladum*), another grazing sensitive species, was only observed in three BAM plots. These findings support the conclusion that low and moderate condition grasslands are degraded.

Two species identified as important in Box Gum Woodland (i.e., *Asperula conferta* and *Haloragis heterophylla*) and palatable in New England Peppermint Grassy Woodland (i.e., *Geranium solanderi* and *Haloragis heterophylla*) were observed in both grassland condition states. This is a low representation of these kinds of species for these two TECs.

The high abundance of two flat growing forbs (i.e., *Cymbonotus lawsonianus* and *Euchiton sphaericus*) is noteworthy and symptomatic of the grazing pressure evident in these grasslands. This supports the view that most grasslands of the Subject Land are relatively degraded.

Examples of low condition grasslands are provided in **Plate 4-1** and **Plate 4-2**.

PLATE 4-1 LOW CONDITION GRASSLAND (PCT 1192)

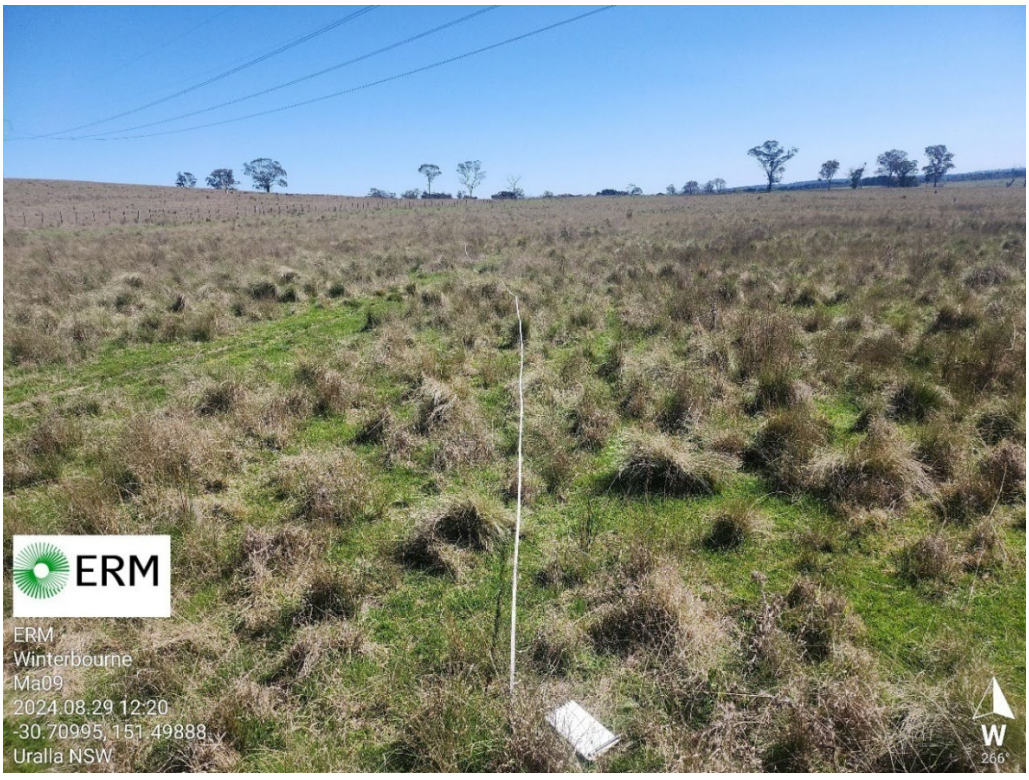
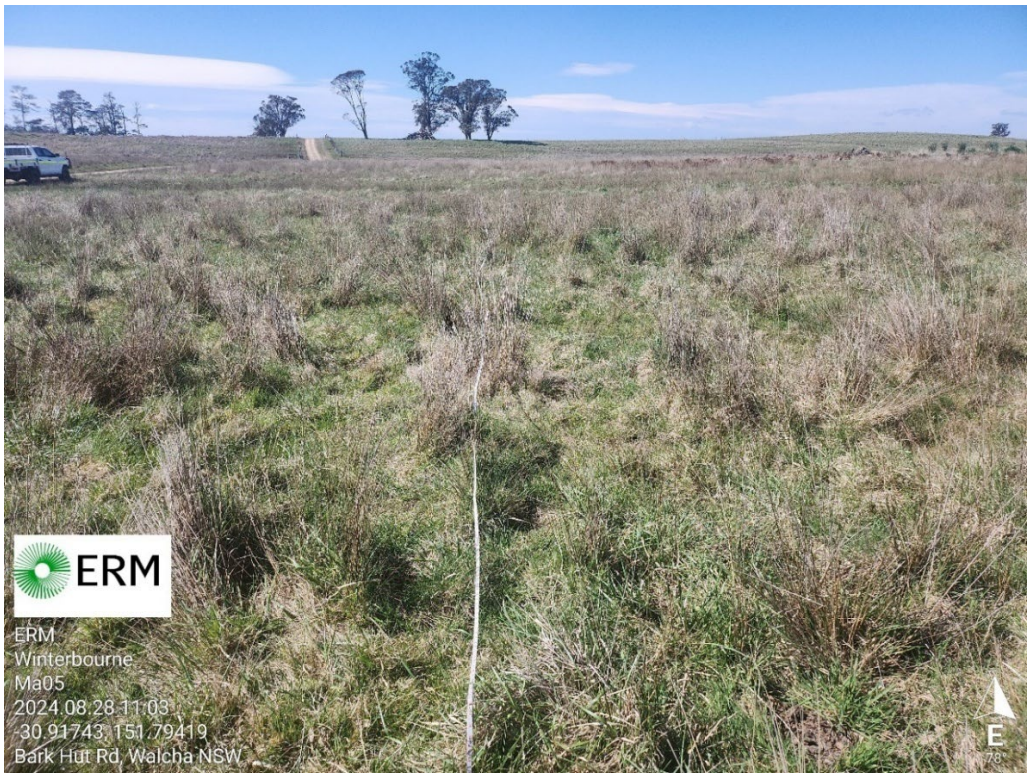


PLATE 4-2 LOW CONDITION GRASSLAND - ROADSIDE



4.2.5 PLANT COMMUNITY TYPES

4.2.5.1 ASSESSABLE VEGETATION

Table 4-5 identifies the mapped PCTs of the Subject Land with extent shown in **Figure 4-1**.

TABLE 4-5 PCTS IDENTIFIED WITHIN THE SUBJECT LAND

PCT ID	PCT name	Area (ha)
501	Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	9.00
510	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	30.68
533	New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	0.66
534	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	51.12
565	Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	17.24
567	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	46.57
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	143.24
571	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	42.18
766	Carex sedgeland of the slopes and tablelands	1.58

PCT ID	PCT name	Area (ha)
965	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	42.38
967	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	55.94
1192	Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	22.06
1194	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	0.93
1512	Fuzzy Box open forest of the New England Tableland Bioregion	0.66

A description of each PCT is provided in **Table 4-9** to **Table 4-22** together with a rationale supporting its selection as the most appropriate PCT in this assessment.

4.2.5.2 PCT 0

Category 1 – Exempt Land has been mapped as PCT 0, as determined by the LCA prepared for the Subject Land (**Appendix A**). These are lands that are either significantly disturbed or modified and/or are low conservation value grasslands (e.g., cropped lands or improved pastures). Planted exotic vegetation is also present within this classification (e.g., exotic trees such as pine trees or willow).

Most of the Category 1 – Exempt Land comprises vegetation dominated by Cocksfoot Grass (*Dactylis glomerata**[25]), which according to the NSW Department of Primary Industries is *'a tussocky perennial grass suited to low fertility soils'.* Other exotic species co-occurring with Cocksfoot Grass include Clover (*Trifolium* spp.) and Ryegrass (*Lolium* spp.). These species are all indicative of modified pastures and are identified in the final determination as weeds that invade the community and result in the loss of the native understory (NSW Scientific Committee 2013).

Other pasture types also occur. One type is dominated by perennial brome grasses *(Bromus* spp.), which is cultivated for grazing, hay and silage. Another is dominated by Silver Grass (*Vulpia myuros**), which is a weedy grass species capable of overtaking pastures and displacing productive plant species. Both these species are identified in the final determination as weeds that invade the community and result in the loss of the native understory (NSW Scientific Committee 2013).

A widely cultivated native, Common Couch (*Cynodon dactylon*) co-occurs with Silver Grass throughout the Subject Land. Few native species occur in either of these pasture types.

Some patches of non-woody groundcover vegetation are characterized by an assemblage comprising *Juncus australis* (a native), Yorkshire Fog (*Holcus lanatus**), Flat weed (*Hypochaeris radicata**) and Sweet Vernal Grass (*Anthoxanthum odoratum**). The latter three weed species are identified in the final determination as weeds that invade the community and result in the loss of the native understory (NSW Scientific Committee 2013).

[25] * denotes exotic species

4.2.5.3 MAPPING THE EXTENT OF NATIVE VEGETATION INCLUDING CONDITION

The mapping protocols used to define PCT extent and broad condition states are in accordance with the BAM. The BAM specifications for mapping native vegetation extent are provided in Section 4.1 of the BAM, PCTs in Section 4.2 of the BAM and VZs in Section 4.3 of the BAM.

The mapping vegetation presented in this Updated BDAR accurately delineates the distribution of biodiversity values by floristic assemblage (PCTs) in different broad condition states[26] (VZs). Examples of this include the presence of individual trees where surrounded by grasslands or separation of low condition grasslands from higher condition grasslands and woody vegetation. This separation of broad condition states has facilitated an effective Project design process involving the avoidance and minimization of impacts, this being a core objective of the BC Act.

The method for mapping native vegetation to PCT level is specified in Section 4.1 of the BAM. The relevant part of the BAM is reproduced below for clarity:

> The native vegetation extent on the subject land includes all areas of native vegetation; this extends to native ground cover and tree canopy cover.
>
> The assessor must map the extent of native vegetation cover on the subject land, using:
>
> a. digital aerial photography (such as ADS40 imagery) or the best available imagery of the subject land
>
> b. a capture scale consistent with the Site Map and the Location Map (recommended scale of 1:1000 or finer). Where the map scale exceeds 1:10,000, the Site Map should be split into separate maps that capture the entire area.
>
> The assessor may undertake a field assessment on the subject land or use existing maps of native vegetation in the area, provided such maps identify vegetation as a recognised PCT, are based on field survey and are of an appropriate scale

This Updated BDAR has complied with each of the above requirements, noting:

- The use of a 1:1,000 capture scale or finer; and
- The Updated BDAR has not used existing maps (e.g., SVTM) as this is an inappropriate vegetation mapping product for the assessment as it has been produced at a scale of 1:10,000 or courser).

Additionally, mapping has considered broad condition states (i.e., vegetation zones), as stated in Section 4.3 of the BAM with the relevant part of the BAM reproduced below for clarity:

> The assessor must:
>
> a. use the PCT map from Section 4.2 to identify and map the area of each PCT into a vegetation zone on the subject land
>
> b. delineate areas of each PCT that are in different broad condition states into separate vegetation zones. Disturbance to growth form groups for tree, shrub and ground cover or extent of exotics (or combinations of these) can be used to identify areas of similar condition.

[26] Broad condition state: areas of the same PCT that are in relatively homogeneous condition. The assessment of broad condition state is used to stratify areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.

A vegetation zone may have discontinuous (fragmented) patches of vegetation (Subsection 4.3.2(1.)), provided the vegetation within the discontinuous areas are the same PCT and in a similar condition state.

This Updated BDAR has complied with each of the above requirements, as did the Amended BDAR (ERM 2024). With respect to (1)(b) above, the Updated BDAR has used disturbances to growth form groups to map areas of similar condition. This approach is outlined in **Table 4-6**.

TABLE 4-6 PARAMETERS USED TO MAP VEGETATION ZONES

Vegetation character	Structure (phototyping)	Vegetation Zone descriptor
Tree canopy intact in natural density	Open Forest (~30-70% cover) Woodland (~10-30% cover)	Open forest Woodland
Tree canopy disturbed	Open Woodland (~<10% cover) Isolated trees (~<5% cover)	Open Woodland (including most isolated trees)[27]
No tree canopy Shrubs present	Shrubland	Shrubland
No tree canopy Ground cover present	Sedgeland Grassland	Moderate condition sedgeland Low condition sedgeland Moderate condition grassland Low condition grassland

The mapping of moderate and low condition vegetation was based on species composition and structure, which used the BAM plot data collected for this assessment as required by the BAM. Map units were initially delineated by a combination of aerial photography interpretation (i.e., photo typing) and BAM plot data, but later verified by VIS review (i.e., condition state). Mean VIS by vegetation condition map units across all vegetation zones is presented in **Table 4-7**.

TABLE 4-7 MEAN VIS BY CONDITION STATES FOR ALL VEGETATION ZONES

Vegetation zone condition	Mean VIS across all Vegetation Zones
Open forest	59.5 (Standard deviation = 11.1)
Woodland	51.0 (Standard deviation = 18.2)
Sedgeland	52.3 (Standard deviation = 23.8)
Open woodland[28]	30.5 (Standard deviation = 13.1)
Grassland: moderate condition[28]	21.9 (Standard deviation = 8.9)
Grassland: low condition[28]	12.0 (Standard deviation = 5.4)

A clear quantitative difference exists between broad condition states, in particular those that have been substantially modified by agriculture. This verifies the parameters used to map vegetation zones as the basis for assessing vegetation integrity across the Subject Land.

Clause 113(1)(g) of the *Local Land Services Regulation 2014* (LLS Regs) refers to the use of tree canopies or drip line of woody vegetation to delineate the extent of Category 2 – Regulated Land (i.e., native vegetation).

[27] Some patches of vegetation phototyped as 'open woodland' or 'isolated trees' was occasionally aggregated into open forest or woodland vegetation zones. The BAM plots for these zones are likely to have inferred a higher VIS for these patches, representing a conservative assessment of loss.
[28] Vegetation zone modified by land clearing and grazing (e.g., removal of trees and shrubs)

This is relevant to this assessment, as the grasslands adjoining woody vegetation are generally in low condition, with the mean VIS for low and moderate condition grasslands being more than a quarter to a half the mean VIS reported for woodlands and open forest. For this reason, canopy driplines represent an appropriate mapping rule to separate woody from non-woody broad condition states using the growth form disturbed by past an ongoing agriculture (i.e., removal of trees). Where appropriate, this process was augmented by a supervised woodland matrix mapping.

Several native vegetation extent maps exist for the Subject Land each having varying purpose, scale and resolution. A broad comparison of these is presented in **Table 4-8**.

TABLE 4-8 NATIVE VEGETATION EXTENT DIFFERENCES BY MAPPING SOURCE

Mapping	Native/ Category 2 Regulated Land			Category 1 Exempt Land	Unclassified/ PCT 0/Excluded Land
	Native	Woody	Non-woody		
SVTM	289.80	n/a	n/a	n/a	592.52
2011 Woody Extent	n/a	104.90	n/a	n/a	777.34
Draft NVR Map	443.59	n/a	n/a	437.10	1.48
Updated BDAR	464.13	*119.32*[29]	*344.80*[292929]	415.34	2.61

The relevance of these mapping differences to this assessment are outlined below.

The SVTM was found to generally overestimate the extent of native vegetation within the Subject Land. Approximately 83.28 ha of Category 1 – Exempt Land mapped in this assessment (**Appendix A**) coincides with SVTM mapped PCTs (excluding PCT = 0). This demonstrates the SVTM has overestimated the extent of native vegetation by ~29%.

The SVTM was mapped at a course scale using course GIS analytical techniques to estimate the 'woodland matrix'. The 1:10,000 - 1:25,000 scale mapping is an order of magnitude courser than the capture scale required under the BAM. Thus, the SVTM has only served as a guide as mapping produced for this assessment at a capture scale of 1:1,000 used higher resolution imagery and site scale investigations to overcome the many inaccuracies generated at the courser scale.

[29] Portion of the native extent

Conversely, the relatively small difference in land categorisation mapping between the Updated BDAR (i.e., **Appendix A**) and the draft NVR map generally supports the native vegetation mapping in this assessment. A difference of ~21 ha or 5% is evident between these two maps, which was expected as the draft NVR map did not include site-scale investigations. In difference to the SVTM, the draft NVR map used various resources such as land use mapping to distinguish 'low conservation value grasslands' from higher condition state grasslands. While the draft NVR map does not generate PCT classifications, it has produced a more reliable indication of assessable native vegetation extent.

The extent of woody vegetation mapped in this Updated BDAR is approximately 16 ha greater than that produced by the 2011 Woody Extent map. This difference can be explained by mapping scale (i.e., 1:10,000 versus 1:1,000) and method. At a 1:10,000 scale, small patches of woody vegetation such as individual trees would likely be missed, with scale effects also expected at the edges of larger patches. The greater quantum of woody vegetation mapped in this Updated BDAR, inclusive of adjustments made to integrate the 'woodland matrix', reflects the use of finer resolution imagery. This mapping also allows for the cognitive exclusion of imagery aberrations such as tree canopy shadows along the drip line of woody vegetation, which can be pronounced in undulating terrain (e.g., southern aspects) and difficult to exclude from vegetation maps generated purely from automated remote sensing processes.

The BAM states that differences in vegetation growth forms, which are a function of disturbance and degradation, is a valid basis for vegetation zone mapping thus warranting their separation. By comparison, the indiscriminate use of buffers to map the extent of woody vegetation is coarse and has the potential to perversely degrade the effectiveness of design processes where the objective is to avoid and/or minimize impacts (e.g., greater potential for the clearing of woody vegetation through courser mapping). Buffering disregards the quantifiable VIS differences that exist between woody and non-woody vegetation as shown in Table 4-8. Nowhere in the BAM is there a specification for the use of buffering to map PCTs and vegetation zones.

Benson and Ashby (2000) support the mapping approach adopted in this assessment by pointing out the considerable adverse effect of agriculture on species patterns noting:

> "Over 150 years of grazing, pasture improvement and clearing of forests has altered the species composition of the vegetation. This has particularly affected plant communities 1, 2, 3, 6, 7, 8, 9 and 19 which occur on high to medium nutrient soils and contain a grassy ground cover."
>
> and
>
> "Continuous grazing of most grassy woodland or forest remnants (communities 1, 2, 3, 6–10 & 19) has probably led to a depletion of the shrub understorey and a lack of regeneration of trees (Curtis 1989)."
>
> and
>
> "Many native grass and forb species have declined under high grazing pressure because of their growth habit or palatability. In extreme cases the natural ground cover has been completely altered through ploughing and sowing of exotic species creating an appearance of a manicured park."

The effect of mapping differences that arise from the use of tree growth form as a boundary discriminator is best understood by reviewing the 'Function' values calculated as part of the VIS for each vegetation zone. This metric, which relates primarily to the woody elements of the native vegetation being assessed, starkly differs between woody vegetation zones (i.e., 55.6) and grasslands (5.6). This large discrepancy is a fundamental support for the application of Clause 113(1)(g) of the LLS regs to separate condition states using canopy or vegetation driplines.

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 1 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

Map 2 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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THUNDERBOLTS WAY

Maxar

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 3 of 43

Winterbourne Wind Farm
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0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- Non-indigenous vegetation cover
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m

1:10,000

Maxar

F4-1 Plant Community Types

Map 4 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 5 of 43

Winterbourne Wind Farm
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ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m

1:10,000

Maxar

F4-1 Plant Community Types

Map 6 of 43

Winterbourne Wind Farm
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WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 7 of 43

Winterbourne Wind Farm
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0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

Map 8 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- 533,New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 533,New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 10 of 43

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Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

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Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

Map 12 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 13 of 43

Winterbourne Wind Farm
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WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 14 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

Map 15 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

BLUE MOUNTAIN ROAD

Maxar

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- Exotic planted
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

BLUE MOUNTAIN ROAD

Maxar

Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 17 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m

1:10,000

F4-1 Plant Community Types

Map 18 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F4-1 Plant Community Types

Map 19 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

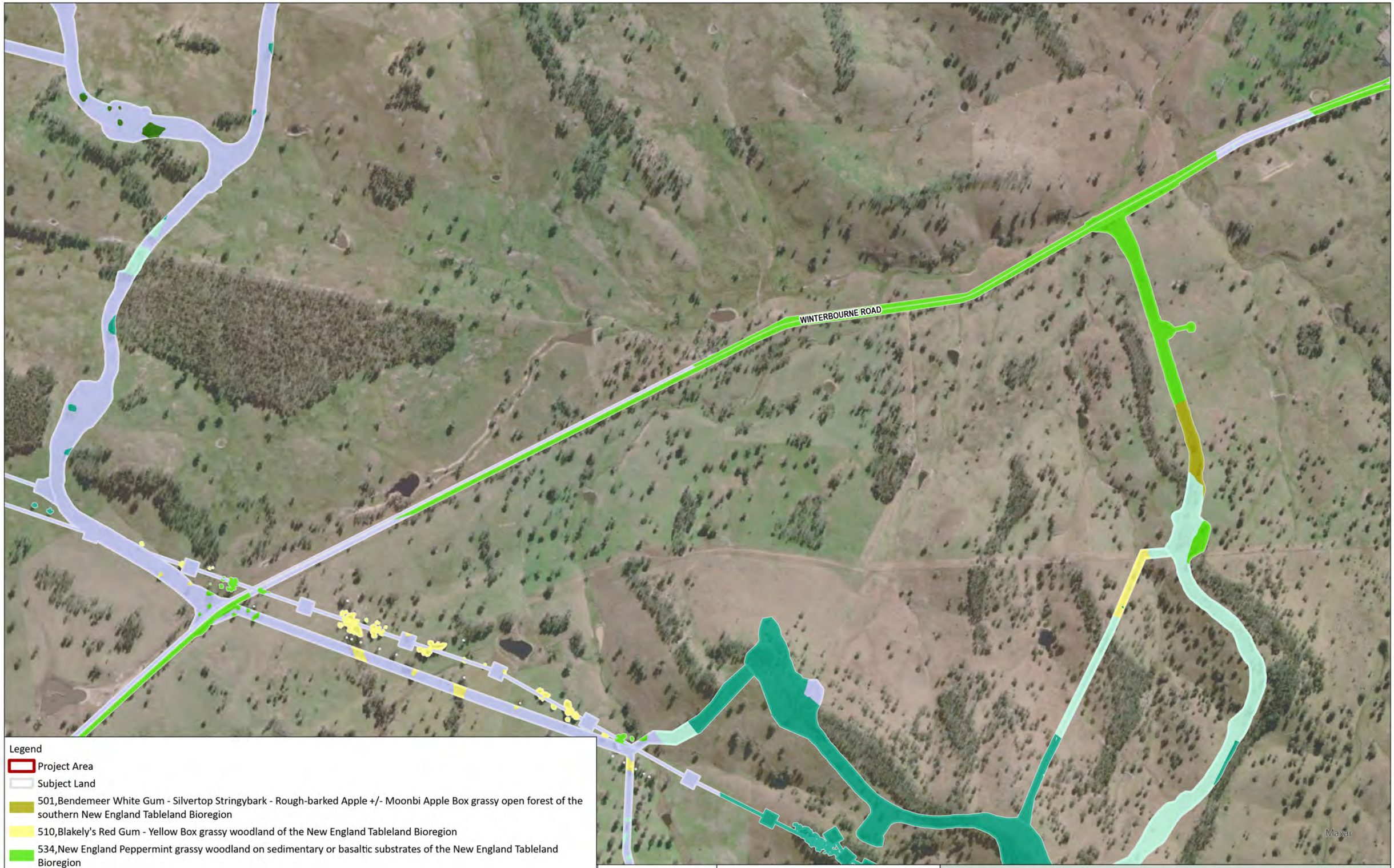
F4-1 Plant Community Types

Map 20 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx



Legend

- Project Area
- Subject Land
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 1512,Fuzzy Box open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
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F4-1 Plant Community Types

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Winterbourne Wind Farm
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WINTERBOURNE ROAD

BARK HUT ROAD

Maxar

Legend

- Project Area
- Subject Land
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 1512,Fuzzy Box open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

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F4-1 Plant Community Types

Map 22 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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WINTERBOURNE ROAD

Maxar

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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WINTERBOURNE ROAD

EMU CREEK ROAD

Maxar

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

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Drawing Size: A3

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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
- Non-indigenous vegetation cover
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
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Drawing Size: A3
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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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URALLA ROAD

DERBY STREET

WALCHA

EMU CREEK ROAD

Maxar

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
- Non-indigenous vegetation cover
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

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F4-1 Plant Community Types

Map 27 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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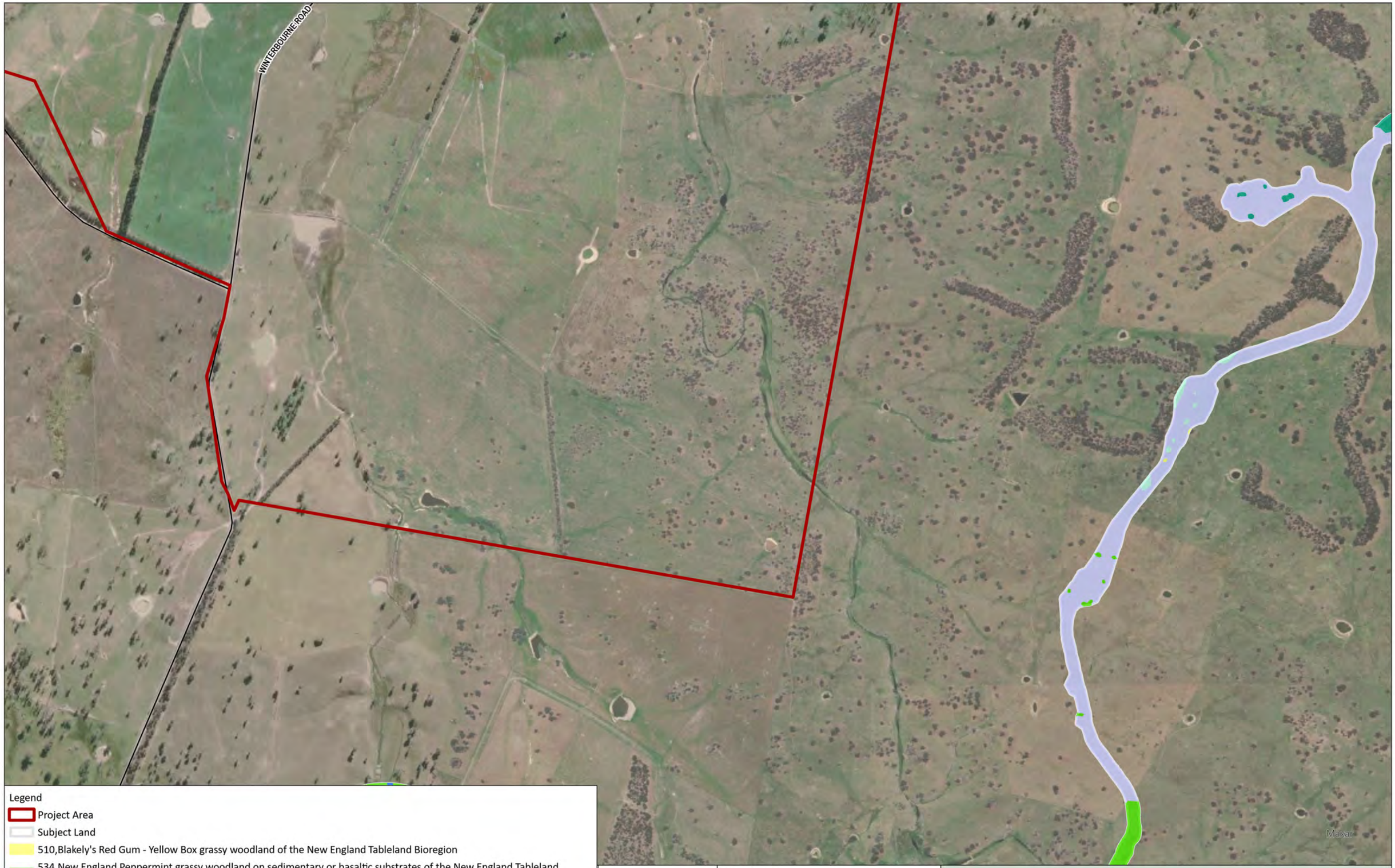

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
Created By: VN
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F4-1 Plant Community Types

Map 29 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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Legend

- Project Area
- Subject Land
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
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F4-1 Plant Community Types

Map 30 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
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F4-1 Plant Community Types

Map 31 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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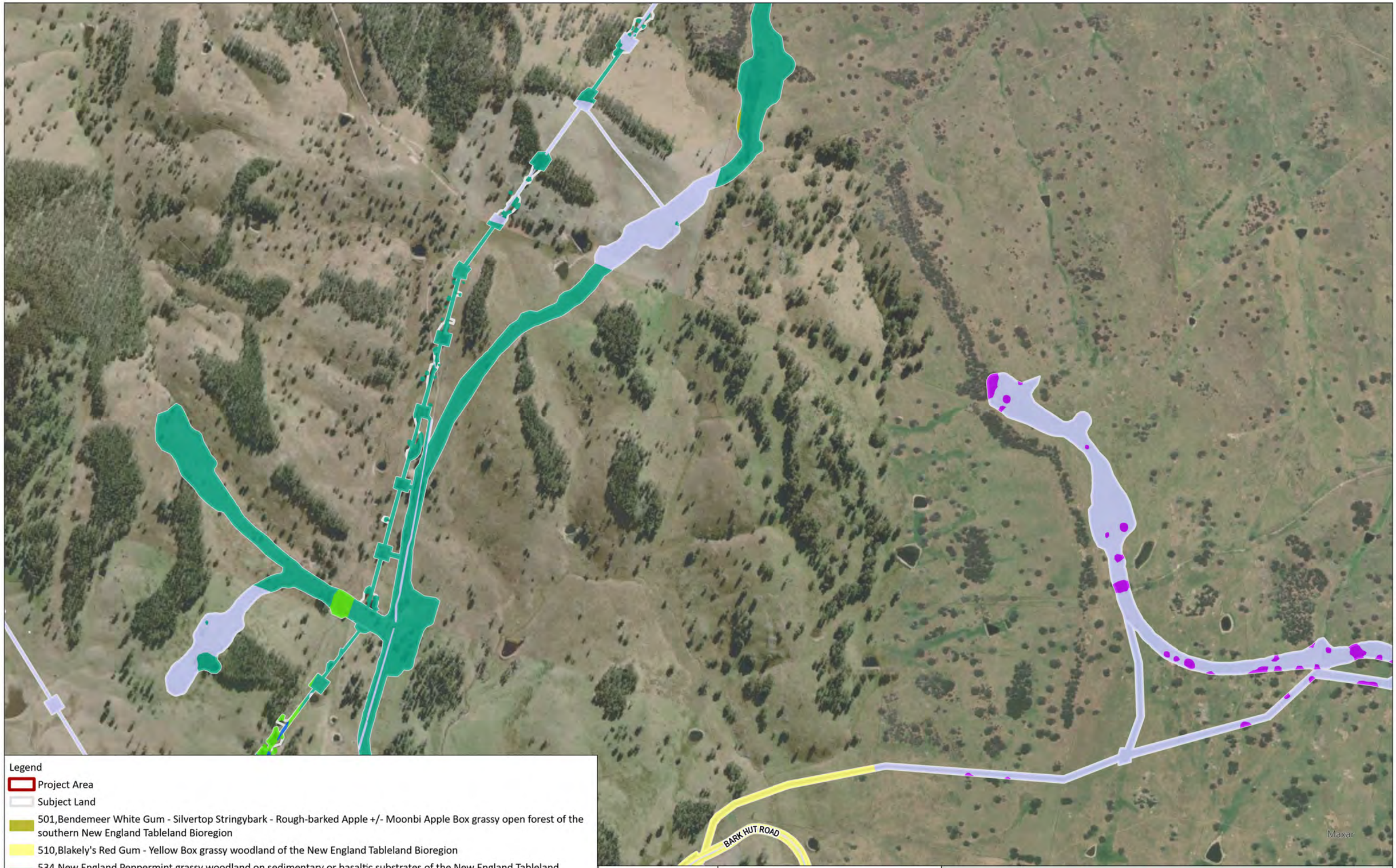

Legend

- Project Area
- Subject Land
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
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F4-1 Plant Community Types

Map 32 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
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F4-1 Plant Community Types

Map 33 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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BARK HUT ROAD

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- Non-indigenous vegetation cover
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
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F4-1 Plant Community Types

Map 34 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F4-1 Plant Community Types

Map 35 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
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F4-1 Plant Community Types

Map 36 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F4-1 Plant Community Types

Map 37 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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MOONA PLAINS ROAD

Maxar

Legend

- Project Area
- Subject Land
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

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F4-1 Plant Community Types

Map 38 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 766,Carex sedgeland of the slopes and tablelands
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Maxar

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F4-1 Plant Community Types

Map 39 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

MOONA PLAINS ROAD

Legend

- Project Area
- Subject Land
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
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F4-1 Plant Community Types

Map 41 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Project Area
- Subject Land
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- 1194,Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
Created By: VN
Drawing Size: A3

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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
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F4-1 Plant Community Types

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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TABLE 4-9 PCT 501 DESCRIPTION

PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Associated TECs	PCT 501 is not associated with any TEC
Cleared (%)	83.00%
BioNet VIS PCT Description	Tall to mid-high open forest to woodland generally between 15-20 m high dominated by Bendemeer White Gum (*Eucalyptus elliptica*) with stringybark eucalypts including Silvertop Stringybark (*Eucalyptus laevopinea*) along with Rough-barked Apple (*Angophora floribunda*), Ribbon Gum (*Eucalyptus viminalis*) and often boxes such as Moonbi Apple Box (*Eucalyptus malacox*ylon), Apple Box (*Eucalyptus bridgesiana*) or Nortons Box (*Eucalyptus nortonii*). The shrub layer is sparse or very sparse and includes *Olearia viscidula*, *Melichrus urceolatus*, *Lissanthe strigosa* subsp. *subulata*, *Bursaria spinosa*, *Rubus parvifolius*, *Pimelea curviflora* var. *curviflora*, *Melicytus dentatus*, *Pultenaea microphylla* and *Daviesia genistifolia*. The ground layer is a mix of grasses and forbs. Grasses include Snow Grass (*Poa sieberiana* or *Poa labillardierei*), *Echinopogon ovatus*, *Austrodanthonia racemosa* var. *racemosa*, *Bothriochloa macra* and *Themeda australis*. Forbs include *Acaena novae-zelandiae*, *Ranunculus lappaceus*, *Rumex brownii*, *Geranium solanderi* var. *solanderi*, *Asperula conferta*, *Hydrocotyle laxiflora*, *Hypericum gramineum*, *Swainsona galegifolia*, *Euchiton gymnocephalus*, *Mentha satureioides*, *Pratia purpurascens*, *Plantago debilis*, *Viola betonicifolia* and *Galium migrans*. Scrambers include *Desmodium varians*, *Desmodium gunni* and *Glycine clandestina*. This community is distinguished by the occurrence of two restricted eucalypt species, the Bendemeer White Gum and Moonbi Apple Box. Occurs on cream to yellow clay to loam soils derived from a range of substrates on hillslopes and hillcrests in hilly to undulating terrain at mid to high elevation in the south-eastern part of the Nandewar and southern New England Tablelands Bioregions. It is estimated that about 80% of the pre-European extent of this community has been cleared, with most remaining occurrences of this community on private land or in Travelling Stock Routes or road reserves.
Description within Subject Land	This PCT occurs in the eastern third of the Subject Land and is at the eastern known limit of distribution. It occurs on dry north-facing slopes, with rocky surfaces on metasediments. Moonbi Apple Box is frequently observed due to the shallow rocky substrate this PCT is found on. Bendemeer White Gum (*Eucalyptus elliptica*) is irregularly observed but found nowhere else within the locality. Presence of Yellow Box at associate level (i.e., never dominating). Groundcovers are highly variable due to the extensive grazing activity. Weeping grass (*Microlaeana stipoides*) is common.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. Several PCTs comprise *Eucalytpus elliptica* (i.e., PCT 501, 530, 559, 568 and 606). Those comprising Nandewar Box, New England Blackbutt, Youman's Stingybark, Mountain Gum and Ribbon Gum were excluded as these do not occur within this vegetation (i.e., PCT 530, 559 and 606). PCT 568 is a possibility, but was excluded because of Moonbi Apple Box abundance (high). Otherwise, these two PCTs are similar in the understorey constituents.

PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion

PHOTOGRAPH 1 PCT 501

TABLE 4-10 PCT 510 DESCRIPTION

PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Associated TECs	PCT 510 is associated with: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverine Bioregions – Critically Endangered (BC Act) (part) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered (EPBC Act) (part)
Cleared (%)	79.00%
BioNet VIS PCT Description	Tall open forest or woodland that occurs on undulating areas at intermediate to high altitudes, with local stands in the Horton area east of Mount Kaputar. Similar to ID599 Yellow Box - Blakelys Red Gum grassy woodland of Brigalow Belt South and Nandewar Bioregions, it occupies deep, relatively fertile soils on several different geologies, but mainly sedimentary rocks and basalt. Dominated by Rough-barked Apple (*Angophora floribunda*), Yellow Box (*Eucalyptus melliodora*) and/or Blakelys Red Gum (*Eucalyptus blakelyi*). Ribbon Gum (*Eucalyptus viminalis*), Apple Box (*Eucalyptus bridgesiana*) and Broad-leaved Stringybark (*Eucalyptus caliginosa*) are sometimes present, and the vulnerable *Eucalyptus rubida* subsp. *barbigerorum* can occur within this unit east of Inverell. The shrub layer is either sparse or absent, with typical species including *Acacia implexa, Acacia fimbriata, Cassinia quinquefaria* or *Olearia elliptica* subsp. *elliptica*. The ground layer is well developed with dominant species including Kangaroo Grass (*Themeda australis*), Snow Grass (*Poa sieberiana*), *Cymbopogon refractus* and *Lespedeza juncea* subsp. *sericea*. Less frequent groundcover species include *Aristida ramosa, Sorghum leiocladum, Dianella revoluta* var. *revoluta, Microlaena stipoides* var. *stipoides, Desmodium brachypodum, Viola betonicifolia, Chrysocephalum apiculatum, Glycine tabacina, Lomandra longifolia, Bothriochloa macra* and *Carex breviculmis*.
Description within Subject Land	This PCT occurs mainly in the central and western parts of the Subject Land where annual rainfall is less than the eastern parts. A grassy vegetation type generally dominated by Yellow Box with Blakely's Red Gum occurring less commonly, with New England Peppermint occasionally present which is dominates in downslope areas. Stringybarks are rare to absent. Typically found on the lower slopes adjacent to and upslope of New England Peppermint woodlands in areas of cold air drainage and below stringybark communities typically dominated by Broad-leaved Stringybark. The understory is highly variable owing to land use and typically grassy with shrubs being absent. The groundcover species richness has been modified by pasture modification and livestock grazing. Present as small patches and isolated trees in an overcleared landscape used for livestock grazing. Species richness is compromised by land use, with large areas now characterised by low condition grasslands. Mapping uncertainties associated with undefined ecotonal areas that exist between adjoining PCTs were resolved by assigning midslope vegetation to this PCT rather than the adjoining stringybark PCTs. Distinctions between PCTs 533 and 534 are less easily discerned.

PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A search of the BioNet VIS using vegetation class yielded 23 potential PCTs for consideration, which was narrowed down to 13 candidate PCTs after including *Eucalyptus melliodora* as a search species. Geographic indicators eliminated a further five PCTs leaving eight (i.e., PCTs 510, 567, 571, 704, 734, 1118 and 1171). A further three candidate PCTs were eliminated as *Eucalyptus melliodora* is a characteristic dominant of the vegetation within the Subject Land, whereas it is not for PCTs 734, 1118 and 1171. The very low abundance of stringybarks (i.e., PCT 567) and ribbon gum (i.e., PCT 571) reduced the suitability of these two PCTs. PCTs 510 and 704 are very similar. PCT 510 was selected over PCT 704 as the classification confidence level cited in the database was greater for this PCT.

PHOTOGRAPH 2 PCT 510 OPEN WOODLAND

PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

PHOTOGRAPH 3 PCT 510 LOW CONDITION GRASSLAND

TABLE 4-11 PCT 533 DESCRIPTION

PCT 533 New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Associated TECs	PCT 533 is associated with: New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion – Critically Endangered (BC Act) (Equivalent) New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands – Critically Endangered (EPBC Act) (Part)
Cleared (%)	70.00%
BioNet VIS PCT Description	Mid-high to tall woodland or open forest which occupies flats and lower slopes subject to cold air drainage, on coarse sandy soils overlying granite and leucogranite substrates. It is dominated in the overstorey by *Eucalyptus nova-anglica* usually with *Eucalyptus pauciflora* as a co-dominant or associate species. Other occasional overstorey species include *Eucalyptus stellulata, Eucalyptus radiata* subsp. *sejuncta* and *Eucalyptus dalrympleana* subsp. *heptantha*. The shrub layer is sparse to mid-dense, with *Brachyloma daphnoides* subsp. *glabrum, Monotoca scoparia, Bursaria spinosa* subsp. *spinosa* and *Leucopogon fraseri* the most frequent species. Other shrub species recorded include *Mirbelia confertiflora, Hovea heterophylla, Dillwynia sieberi, Bossiaea neo-anglica, Petrophile canescens, Persoonia procumbens, Bursaria spinosa* subsp. *spinosa, Leptospermum polygalifolium* subsp. *transmontanum, Aotus subglauca* var. *subglauca, Grevillea scortechinii* subsp. *sarmentosa, Logania albiflora, Hibbertia riparia, Grevillea juniperina* subsp. *allojohnsonii, Dodonaea viscosa, Choretrum pauciflorum, Bossiaea scortechinii* and *Baeckea omissa*. Climbers and twiners include *Rubus parvifolius, Glycine tabacina* and *Glycine clandestina*. Ground cover is mid-dense to dense and dominated by *Themeda australis, Pteridium esculentum, Lomandra longifolia, Poa sieberiana, Scleranthus biflorus, Imperata cylindrica* var. *major, Acaena novae-zelandiae* and *Poa labillardierei* var. *labillardierei*. Other groundcover species recorded include *Brachyscome nova-anglica, Dichelachne micrantha, Stylidium graminifolium, Dichelachne inaequiglumis, Hypericum gramineum, Lomandra multiflora, Microlaena stipoides* var. *stipoides, Goodenia hederacea, Austrodanthonia racemosa* var. *racemosa, Adiantum aethiopicum, Wahlenbergia communis, Sorghum leiocladum, Poranthera microphylla, Helichrysum scorpioides, Aristida ramosa, Trachymene incisa, Stackhousia viminea, Opercularia diphylla, Gonocarpus tetragynus, Entolasia stricta, Echinopogon caespitosus, Dichondra repens, Dichelachne crinita, Veronica arcuata, Calandrinia* sp. and *Austrostipa rudis* subsp. *nervosa*. The groundcover of this community often supports weed species including *Hypochaeris radicata, Trifolium repens, Holcus lanatus* and *Acetosella vulgaris*. This community has been mostly cleared, and the remaining remnants have been severely degraded by dieback, weed invasion, and continued clearing, grazing and burning.
Description within Subject Land	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. This PCT is restricted to a small occurrence in the central west of the Subject Land where outcropping granite occurs in areas of cold area drainage. Dominated by New England Peppermint with snowgrass (*Poa sieberiana*) and *Sporobolus creber.*

PCT 533 New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	
	Similar but differs to PCT 534 by the absence of species such as Yellow Box, Blakely's Red Gum, Ribbon Gum *Austrostipa verticillata*, and higher relative abundance of *Sporobolus creber*, *Schoenus apogon* and *Juncus australis*. Occurs as a moderately disturbed patch in grazed lands.
Justification	A search of the BioNet VIS using vegetation formation (i.e., Grassy Woodlands) and *Eucalyptus nova-anglica* yielded six potential PCTs for consideration (i.e., PCTs 513, 533, 534, 539, 554 and 704). This was narrowed down to two PCTs using tree canopy dominants as the determinant (i.e., PCTs 533 and 534). The vegetation mapped within Subject Land is located on an isolated area of granite geology, thus eliminating PCT 534, which occurs on sedimentary or basaltic soils.

PHOTOGRAPH 4 PCT 533

TABLE 4-12 PCT 534 DESCRIPTION

PCT 534 New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	Tableland Clay Grassy Woodlands
Associated TECs	PCT 534 is associated with: New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion – Critically Endangered (BC Act) (Equivalent)
Cleared (%)	90.00%
BioNet VIS PCT Description	Mid-high open forest or woodland that occurs at high elevations on valley flats and depressions on plateaus that are subject to cold air drainage on poorly drained loam-clay soils derived from basalt, fine-grained sedimentary and acid volcanic substrates. Usually, 10 to 20m tall and dominated by *Eucalyptus nova-anglica*, occasionally in association with other tree species including *Eucalyptus pauciflora, Eucalyptus dalrympleana* subsp. *heptantha, Eucalyptus blakelyi* and *Eucalyptus radiata* subsp. *sejuncta*. The shrub layer is either sparse or absent. When present, species such as *Leucopogon fraseri, Leucopogon lanceolatus* var. *lanceolatus, Dillwynia sieberi, Melichrus urceolatus, Pimelea curviflora* var. *divergens, Pimelea glauca, Olearia viscidula, Lissanthe strigosa, Melicytus dentatus* or *Pultenaea microphylla* may occur at low frequency. There is a dense ground layer of various grasses and herbs including *Poa sieberiana, Asperula conferta, Themeda australis, Juncus filicaulis, Dichondra repens, Veronica calycina, Carex inversa, Acaena novae-zelandiae, Rumex brownii, Acaena ovina, Desmodium varians, Geranium solanderi* var. *solanderi, Poa labillardierei* var. *labillardierei, Cymbonotus lawsonianus, Lespedeza juncea* subsp. *sericea, Viola betonicifolia, Gonocarpus tetragynus, Chrysocephalum apiculatum, Echinopogon ovatus, Microlaena stipoides* var. *stipoides, Haloragis heterophylla, Austrodanthonia racemosa* var. *racemosa, Echinopogon caespitosus, Sorghum leiocladum, Austrodanthonia pilosa, Hardenbergia violacea, Hypericum gramineum, Lomandra multiflora* subsp. *multiflora, Luzula densiflora, Mentha satureioides, Wahlenbergia communis, Wahlenbergia planiflora* var. *longipila* and *Wahlenbergia planiflora* var. *planiflora*. An endangered community with an estimated 10% of its pre-European extent remaining. Most remnants are regrowth, heavily disturbed and threatened by weed invasion, grazing by stock, continued clearing and dieback.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A search of the BioNet VIS using vegetation formation (i.e., Grassy Woodlands) and *Eucalyptus nova-anglica* yielded six potential PCTs for consideration (i.e., PCTs 513, 533, 534, 539, 554 and 704). This was narrowed down to two PCTs because of tree canopy dominant (i.e., PCTs 533 and 534). The vegetation mapped within Subject Land is located on sedimentary geology, thus eliminating PCT 533, which occurs on granitic soils.

PCT 534 New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	
Description within Subject Land	This PCT is widespread throughout the central and western parts of the Subject Land in areas of cold air drainage. It is almost solely dominated by New England Peppermint, although other associated level species may be observed such as Yellow Box (where adjoining PCT 510) and Snow Gum (*Eucalyptus pauciflora*) where it grades into upslope patches of PCT 1192. The understory is typically shrub less with a grassy herbaceous groundcover. Groundcover differences between adjoining grassy woodland formations are subtle, which is likely due to the extensive livestock related disturbance history associated with this overcleared part of the landscape. Typically occurs as scattered trees in an open woodland or even sparser canopy cover, with most of the PCT represented by derived grasslands in low a condition state.

PHOTOGRAPH 5 PCT 534 OPEN WOODLAND

PCT 534 New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

PHOTOGRAPH 6 PCT 534 LOW CONDITION GRASSLAND

TABLE 4-13 PCT 565 DESCRIPTION

PCT 565 Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation class	New England Dry Sclerophyll Forest
Associated TECs	PCT 565 has no associated TECs
Cleared (%)	44.00%
BioNet VIS PCT Description	Tall open forest that occurs on steeper slopes on rich to relatively fertile, fine-grained soils derived from basalt, granite or acid volcanic rocks. Overstorey dominated by *Eucalyptus laevopinea* and *Eucalyptus dalrympleana* subsp. *heptantha* with common associate species including *Eucalyptus bridgesiana, Eucalyptus melliodora, Angophora floribunda* and *Eucalyptus caliginosa*. There is usually a sparse to mid-dense shrub/small tree layer with *Acacia dealbata, Bursaria spinosa* subsp*. spinosa, Lissanthe strigosa* subsp. *strigosa, Hibbertia linearis* and *Olearia viscidula*. The groundcover is a mid-dense to dense mixture of grasses, forbs and herbs with *Poa sieberiana, Dichondra repens, Microlaena stipoides* var*. stipoides, Hydrocotyle laxiflora, Glycine clandestina, Viola betonicifolia, Veronica calycina, Desmodium varians, Geranium solanderi* var*. solanderi, Acaena novae-zelandiae* and *Elymus scaber* var*. scaber*.
Description within Subject Land	This PCT is restricted to the western parts of the Subject Land. It comprises vegetation dominated by Silvertop Stringybark with *Acacia dealbata* and *Olearia viscidula* in the midstory and grassy understory dominated by Snowgrass (*Poa sieberiana*) and Weeping grass (*Microlaena stipoides*). Yellow Box occurs as an associated tree canopy species. A suite of herbs is present in the groundcover layer occurring in low densities, with Kidneyweed (*Dichondra repens*) being common. The fern Bracken (*Pteridium esculentum*) is often observed.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A search of the BioNet VIS using vegetation class (i.e., New England Dry Sclerophyll Forest) and *Eucalyptus laevopinea* and *Acacia dealbata* yielded three potential PCTs for consideration (i.e., PCTs 495, 558 and 565). The presence of Brittle Gum in PCT 495 and its geography (i.e., Liverpool Range) eliminate this PCT. PCT 559 was eliminated as it has Youman's stringybark as a dominant, with *Eucalyptus laevopinea* only occurring as an associated species. Understorey species composition is similar to PCT 565.

PCT 565 Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion

PHOTOGRAPH 7 PCT 565 WOODLAND

TABLE 4-14 PCT 567 DESCRIPTION

PCT 567 Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Associated TECs	PCT 567 is associated with: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverine Bioregions – Critically Endangered (BC Act) (part) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered (EPBC Act) (part)
Cleared (%)	62.00%
BioNet VIS PCT Description	Very tall woodland or tall open forest, widespread on tablelands low hills on a variety of substrates. Can be either shrubby (e.g. *Daviesia latifolia*) or grassy. Occupies the mid slope between stringybark communities on ridges and grassy box-gum woodlands on flats and lower slopes. Overstorey dominated by *Eucalyptus caliginosa* with common associates including *Eucalyptus melliodora, Eucalyptus bridgesiana, Eucalyptus blakelyi, Angophora floribunda, Eucalyptus laevopinea* and *Eucalyptus dalrympleana* subsp. *heptantha*. Sparse to sometimes mid-dense shrub layer with *Lissanthe strigosa* subsp. *subulata, Daviesia latifolia, Melichrus urceolatus, Jacksonia scoparia, Acacia filicifolia, Acacia implexa, Cassinia quinquefaria, Bursaria spinosa* subsp. *spinosa* and *Olearia elliptica* subsp. *elliptica*. The groundcover is sparse to mid-dense and includes *Poa sieberiana, Dichondra repens, Scleranthus biflorus, Themeda australis, Aristida ramosa, Pteridium esculentum, Lomandra multiflora subsp. multiflora, Goodenia hederacea* subsp*. hederacea, Viola betonicifolia, Lagenifera stipitata, Glycine clandestina, Poranthera microphylla, Rumex brownii, Veronica calycina, Hypericum gramineum, Bothriochloa macra, Sporobolus creber* and *Chrysocephalum apiculatum*. A vulnerable community, with much of the remaining extent being regrowth from previous clearing, and in poor condition because of livestock grazing.

PCT 567 Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
Description within Subject Land	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. Broad-leaved Stringybark and Yellow Box shrub/grass open forest occurs on midslopes in the Subject Land, between open forests dominated by Broad-leaved Stringybark and downslope grassy woodlands dominated by Yellow Box, supporting the transitional nature of this vegetation at the landscape scale. Broad-leaved Stringybark dominates with occurrences of Yellow Box at an associated level status (i.e., not a dominant species). Blakely's Red Gum is absent. Other eucalypts observed in lower densities include Mountain Gum (*Eucalytpus dalrympleana*), *Eucalyptus nicholii* and *Eucalyptus williamsiana*. Snowgrass dominates the groundcover stratum, with herbs such as *Geranium solanderi* and *Dichondra repens* are also commonly observed. Vegetation with increasing abundance of Yellow Box and presence of Blakely's Red Gum in a grassy woodland formation have been mapped as part of PCT 510, with stands exhibiting increasing occurrence of *Olearia viscidula* included as part of PCT 568.
Justification	A grassy woodland dominated by Broad-leaved Stringybark with occasional *Eucalyptus melliodora*. A search of the BioNet VIS using vegetation class (i.e., New England Grassy Woodlands), *Eucalyptus caligulosa* and *Eucalyptus melliodora* yielded four potential PCTs for consideration (i.e., PCTs 510, 567, 704 and 734). PCT 510 occurs in the lower parts of the Subject Land and is dominated by *Eucalyptus melliodora* with *Eucalyptus blakelyii*. *Eucalyptus caliginosa* is a rare/uncommon constituent in that community, thus eliminating PCT 510. Similarly, PCT 704 is dominated by Blakely's Red Gum and Yellow Box and was also eliminated. PCT 734 is a compositive of *Eucalyptus blakelyi* and *Eucalyptus caliginosa,* which is not characteristic of the vegetation within the Subject Land. Rather, the vegetation is described as dominated by *Eucalyptus caliginosa* with associated level occurrence of *Eucalyptus melliodora*. PCT 734 was eliminated for this reason. Patches of this PCT within the Subject Land have been mapped where *Eucalyptus caliginosa* dominates, with patches of vegetation comprising higher abundance of *Eucalyptus melliodora* assigned to PCT 510 which adjoins downslope on more fertile soils.

PCT 567 Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

PHOTOGRAPH 8 PCT 567

TABLE 4-15 PCT 568 DESCRIPTION

PCT 568 Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation class	New England Dry Sclerophyll Forests
Associated TECs	PCT 568 has no associated TECs
Cleared (%)	59.00%
BioNet VIS PCT Description	Tall to very tall open forest on upper slopes and ridges on sedimentary, granitic and acid volcanic substrates. Dominated by *Eucalyptus caliginosa* with *Eucalyptus dalrympleana* subsp. *heptantha* and less commonly *Eucalyptus bridgesiana, Eucalyptus viminalis, Eucalyptus elliptica* or *Eucalyptus youmanii*. A shrub and/or small tree layer may be present, with *Lissanthe strigosa* subsp. *subulata, Olearia viscidula, Rubus parvifolius, Melichrus urceolatus, Hibbertia riparia* and *Acacia implexa*. The sparse to dense groundcover supports *Poa sieberiana, Themeda australis, Veronica calycina, Pteridium esculentum, Lomandra multiflora* subsp. *multiflora, Aristida ramosa, Lomandra longifolia, Dianella revoluta* var. *revoluta, Carex breviculmis, Goodenia bellidifolia* subsp. *bellidifolia, Echinopogon caespitosus* var. *caespitosus, Microlaena stipoides* var. *stipoides, Luzula flaccida* form B, *Asperula conferta, Geranium solanderi* var. *solanderi, Haloragis heterophylla, Solenogyne bellioides* and *Wahlenbergia planiflora* subsp. *longipila*.
Description within Subject Land	Broad-leaved Stringybark forests and woodlands typically occur on ridges and upper slopes throughout the Subject Land. It differs to other vegetation on ridgetops by the absence of Silvertop Stringybark (PCT 565) and midslope vegetation by having low abundance of associated eucalypt species. The understory comprises a characteristic *Olearia viscidula* shrub layer. Black Sheoak (*Allocasuarina littoralis*) also occurs in low densities. The ground layer is moderately grassy with Snowgrass, Weeping Grass, *Bothriochloa decipiens*, interspersed throughout a well-developed leaf litter layer. Herbs and forbs are also commonly observed but typically in low cover abundance.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A shrub/grass forest dominated by Broad-leaved Stringybark with a variety of other associate level eucalypt species. A search of the BioNet VIS using vegetation class (i.e., New England Dry Sclerophyll Forests), *Eucalyptus caligulosa* and *Olearia viscidula* yielded four potential PCTs for consideration (i.e., PCTs 559, 565, 568 and 575). Three of these PCTs are dominated by other eucalypt species. PCT 559 is dominated by Youman's Stringybark/Mountain Gum, PCT 565 is dominated by Silver-topped Stringybark/Mountain Gum and PCT 575 is dominated by Tenterfield Woollybutt/Silver-topped Stringybark. These do not describe the community observed within the Subject Land. PCT 568 is dominated by *Eucalyptus caliginosa* with patches of vegetation comprising this tree canopy dominant having an understory similar to that described in the BioNet vegetation types database.

PCT 568 Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

PHOTOGRAPH 9 PCT 568

TABLE 4-16 PCT 571 DESCRIPTION

PCT 571 Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Associated TECs	PCT 571 is associated with: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverine Bioregions – Critically Endangered (BC Act) (part) • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered (EPBC Act) (part)
Cleared (%)	78.00%
BioNet VIS PCT Description	Very tall woodland or tall to very tall open forest occupying lower slopes, valley floors, gullies and drainage lines on deeper soils overlying basalts and metamorphosed sediments. Closely related to Ribbon Gum - Mountain Gum - Snow Gum grassy open forest or woodland (ID554) and Candlebark - Ribbon Gum grassy woodland (ID513) both of which occur at higher elevation on the New England Tablelands. Grades into Blakelys Red Gum - Yellow Box grassy woodlands (ID510) which is also floristically similar. Overstorey dominated by *Eucalyptus viminalis, Angophora floribunda* and *Eucalyptus melliodora*, with associate species such as *Eucalyptus blakelyi, Eucalyptus laevopinea* or *Eucalyptus moluccana* sometimes present. There is often a sparse small tree layer of scattered *Acacia filicifolia* or *A. implexa* over a sparse shrub stratum comprising species such as *Lissanthe strigosa, Cassinia quinquefaria, Pultenaea microphylla, Bursaria spinosa* subsp. *spinosa, Olearia elliptica, Hibbertia obtusifolia, Pimelea curviflora, Rubus parvifolius, Melichrus urceolatus* and *Brachyloma daphnoides*. The groundcover is usually well-developed with a diversity of grasses and forbs present, including *Poa sieberiana* subsp. *sieberiana, Poa labillardierei* var. *labillardierei, Themeda australis, Bothriochloa macra, Austrodanthonia racemosa* var. *racemosa, Sporobolus creber, Sorghum leiocladum, Geranium solanderi* var. *solanderi, Lespedeza juncea* subsp. *sericea, Lotus australis, Mentha satureioides, Elymus scaber, Scleranthus biflorus, Epilobium billardiereanum* subsp. *billardiereanum, Dichondra repens, Asperula conferta, Microlaena stipoides* var. *stipoides* and *Desmodium varians*. This community has been largely cleared for agriculture. Most of the remaining extent occurs on private land and is generally highly modified through clearing, grazing, pasture improvement and weed invasion.
Description within Subject Land	Ribbon Gum woodland / open forest occurs in the central west of the Subject Land in elevated but gently undulating country. Ribbon Gum dominates with Silvertop Stringybark. The sparse shrub layer comprises *Acacia filicifolia, Lissanthe strigosa* and *Rubus parvifolius*. The groundcover is species rich grassy herbaceous without any clear dominance by any species. Bracken fern is often observed.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. The vegetation observed on site is a grassy woodland to open forest dominated by Ribbon Gum (*Eucalyptus viminalis*). A search of the BioNet VIS using vegetation formation yielded 15 potential PCTs for consideration, which was narrowed down to five candidate PCTs after including *Eucalyptus viminalis* as a search species (i.e., PCT 513, 554, 571, 606 and 1099).

PCT 571 Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	
	The absence of Candlebark as a canopy dominant eliminated PCT 513. The co-occurrence of Silver-topped Stringybark eliminated three PCTs (i.e., PCTs 554, 606 and 1099) leaving PCT 571, which does contain this tree canopy dominant. The remaining species observed within the Subject land are generally aligned to this PCT, supporting its selection in the assessment.

PHOTOGRAPH 10 PCT 571

TABLE 4-17 PCT 766 DESCRIPTION

PCT 766 Carex sedgeland of the slopes and tablelands	
Vegetation formation	Freshwater Wetlands
Vegetation class	Montane Bogs and Fens
Associated TECs	PCT 766 is associated with: Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions – Endangered (BC Act) (Part) Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions – Endangered (BC Act) (Part) Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion – Endangered (BC Act) (Part)
Cleared (%)	75.00%
BioNet VIS PCT Description	Mid stratum consists of *Leptospermum gregarium* and *Leptospermum polygalifolium*. Ground stratum comprised of *Carex appressa, C. gaudichaudiana*, *Poa labillardierei* var. *labillardierei* and *Scirpus polystachyus*. On valley floors and drainage lines with poor drainage.
Description within Subject Land	Carex sedgelands in the Subject Land are restricted to broad drainages. They are naturally treeless in the coldest part of the landscape. Patches occur with *Carex gaudichaudiana* and *Carex appressa*, with the latter more apparent doing to its resilience to grazing. Occurrences are now rare and limited because of livestock grazing.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided **Section 4.2** and **Appendix C**. *Carex* spp. dominated vegetation occurring in impeded drainage lines may be represented by one of two PCTs that naturally occur on the New England Tablelands (i.e., PCT 582 and 766). PCT 582 has a detailed description of its composition, with PCT 766 having a limited one, making the decision between the two challenging, especially in a highly disturbed and overcleared landscape. PCT 766 was selected over PCT 582 as it has a higher cleared status, with this choice representing a conservative assignment in the absence of knowledge.

PCT 766 Carex sedgeland of the slopes and tablelands

PHOTOGRAPH 11 PCT 766

TABLE 4-18 PCT 965 DESCRIPTION

PCT 965 Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation class	New England Dry Sclerophyll Forest
Associated TECs	PCT 965 is associated with: New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion – Critically Endangered (BC Act) (Part) Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion – Endangered (BC Act) (Part)
Cleared (%)	75.00%
BioNet VIS PCT Description	Mid-high to very tall dry or moist grassy open forest at high altitudes on the eastern side of the tablelands. Upper stratum species include *Eucalyptus radiata* subsp. *radiata, E. nobilis, E. caliginosa, E, dalrympleana* subsp. *heptantha* and *E. laevopinea*. Middle stratum species include *Acacia filicifolia, Allocasuarina littoralis, Leucopogon lanceolatus, Lomatia silaifolia* and *Monotoca scoparia*. Ground stratum species include *Calochlaena dubia, Doodia caudata, Lomandra longifolia, Poa sieberiana* var. *sieberiana, Pteridium esculentum* and *Themeda australis.*
Description within Subject Land	PCT 965 is largely restricted to the wetter eastern parts of the Subject Land where it typically occurs in heavier wetter soils. Characterised by a dominance of Narrow-leaved Peppermint, this community also includes several other canopy species such as Mountain Ribbon Gum, Mountain Gum, Silver topped Stringybark and Messmate. It differs to vegetation in the east by having no box species in the tree canopy and sparse shrubby understory comprising several species. The ground layer comprises a few grass species notably Snowy Grass and Weeping Grass.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A shrub/grass forest dominated by Narrow-leaved Stringybark with a variety of other associate level eucalypt species. A search of the BioNet VIS using vegetation class (i.e., New England Dry Sclerophyll Forests) and *Eucalyptus radiata* yielded four potential PCTs for consideration (i.e., PCTs 559, 965, 970 and 1553). One of these (PCT 559) is dominated by other eucalypt species (i.e., Youman's Stringybark/Mountain Gum) and was eliminated as these species do not characterize the vegetation within the Subject Land. PCT 965 and PCT 970 are quite similar, with differences in the shrub land. The presence of *Allocasuarina littoralis* indicated PCT 965 rather than PCT 970. PCT 1553 is restricted to the Hunter CMA and is thus eliminated. PCT 965 is dominated by Narrow-leaved peppermint with patches of vegetation comprising this tree canopy dominant having an understory broadly similar to that described in the BioNet vegetation types database, noting that the understorey is highly disturbed by livestock grazing.

PCT 965 Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

PHOTOGRAPH 12 PCT 965

TABLE 4-19 PCT 970 DESCRIPTION

PCT 970 Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation class	New England Dry Sclerophyll Forest
Associated TECs	PCT 970 is associated with: New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion – Critically Endangered (BC Act) (Part)
Cleared (%)	56.00%
BioNet VIS PCT Description	Mid-high to tall shrubby woodland and open forest, on the eastern side of the New England Tableland. Upper stratum species include *Eucalyptus radiata* subsp. *radiata, E. acaciiformis, E. campanulata, E. williamsiana, E. pauciflora* and *E. dalrympleana* subsp. *heptantha*. Middle stratum species include *Banksia spinulosa, Bossiaea scortechinii, Leucopogon lanceolatus, Monotoca scoparia* and *Petrophile canescens*. Ground stratum species include *Lomandra* spp., *Poa sieberiana* var. *sieberiana, Pteridium esculentum* and *Themeda australis*.
Description within Subject Land	PCT 970 is restricted to the wetter eastern parts of the Subject Land where it is generally found higher in the landscape with improved drainage and lighter soils. The vegetation is typically dominated by Narrow-leaved Peppermint with lesser occurrence of Wattle-leaved Peppermint and other eucalypts such as Messmate and Mountain Gum. In difference to other vegetation in the Subject Land, this PCT is characterised by a Bracken Fern (*Pteridium esculentum*) and Snowgrass. *Acacia melanoxylon*, *Acacia deanei* and *Exocarpos cuppressiformis* have been observed in the shrub layer, with the former two potentially reflective of the higher rainfall and grazed nature of this vegetation.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A shrub/grass forest dominated by Narrow-leaved Stringybark with a variety of other associate level eucalypt species. A search of the BioNet VIS using vegetation class (i.e., New England Dry Sclerophyll Forests), *Eucalyptus radiata* and *Eucalyptus acaciformis* yielded one potential PCT for consideration (i.e., PCTs 970). The related and similar PCT 965 is not reported to have *Eucalyptus acaciformis* as a diagnostic species. Both PCTs 965 and 970 are very similar with differences in the shrub land being the most diagnostic. In the Subject Land the shrub layer has been heavily modified and disturbed rendering this part of the PCT absent for identification purposes. PCT 970 was selected because of *Eucalyptus acaciformis*.

PCT 970 Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

PHOTOGRAPH 13 PCT 970 WOODLAND

PHOTOGRAPH 14 PCT 970 GRASSLAND

TABLE 4-20 PCT 1192 DESCRIPTION

PCT 1192 Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	Tableland Clay Grassy Woodlands
Associated TECs	PCT 1192 is associated with: Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion – Endangered (BC Act) (Part)
Cleared (%)	75.00%
BioNet VIS PCT Description	Mid tall to tall open forest or woodland. Landscape Position: At higher altitudes on the eastern edge of the New England Tablelands with major occurrences on the Dorrigo Plateau.
Description within Subject Land	PCT 1192 is a dry grassy woodland located in the central western parts of the Subject Land. It typically occurs low in the landscape and upslope of New England Peppermint woodlands that often occupy the coldest parts. Occurrences in the Subject Land are limited to the local road reserve and Blue Mountain. It comprises several eucalypt species with Snow Gum and/or Mountain Gum being characteristic. Black Sallee (*Eucalyptus stellulata*) and New England Peppermint occur in the lower ecotonal zones with adjoining lower slope vegetation. Almost shrubless, this PCT comprises a mix of grasses and herbs notably Snowgrass and *Austrostipa* spp. with a large contingent of exotic species owing to the influence of land use and livestock grazing.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**.

PCT 1192 Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion

PHOTOGRAPH 15 PCT 1192

TABLE 4-21 PCT 1194 DESCRIPTION

PCT 1194 Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	
Vegetation formation	Wet Sclerophyll Forests (Grassy sub-formation)
Vegetation class	Northern Tableland Wet Sclerophyll Forest
Associated TECs	PCT 1194 is associated with: Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion – Endangered (BC Act) (Part)
Percent cleared value	80.00%
BioNet VIS PCT Description	Mid-high to very tall grassy or shrubby open forest, widespread at high altitudes on the escarpment ranges north from Barrington Tops and on the eastern side of the tablelands. Upper stratum species include *Eucalyptus pauciflora, E. dalrympleana* subsp. *heptantha, E. nobilis, E. radiata* subsp. *sejuncta, E. viminalis, E. fastigata, E. obliqua, E. laevopinea* and *E. stellulata*. Middle stratum species include *Acacia dealbata, Acacia melanoxylon, Dicksonia antarctica, Tasmannia purpurascens* and *Leucopogon hookeri*. Ground stratum species include *Blechnum nudum, Lomandra longifolia, Poa sieberiana* var. *sieberiana* and *Pteridium esculentum.*
Description within Subject Land	This vegetation is limited to the wetter east where it is characterised by Mountain Ribbon Gum and Silvertop Stringybark. The ground stratum is grassy herbaceous with shrub overstory, owing to the heavily grazed condition of this vegetation. Herbs of drier conditions are evident due to the grazing history evident in this community with characteristic wet sclerophyll species accordingly occurring in lower abundance. Relict wet sclerophyll species observed include *Clematis aristata* and *Rubus parvifolius*, Rubus Weed species are common. The vegetation is heavily modified and occurs in a low condition state.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**.

PCT 1194 Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion

PHOTOGRAPH 16 PCT 1194

TABLE 4-22 PCT 1512 DESCRIPTION

PCT 1512 Fuzzy Box open forest of the New England Tableland Bioregion	
Vegetation formation	Grassy Woodlands
Vegetation class	New England Grassy Woodlands
Associated TECs	PCT 1512 is associated with: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered (BC Act) (likely relates)
Cleared (%)	80.00%
BioNet VIS PCT Description	BioNet provides no description for PCT 1512. Description taken from new related PCT (PCT 3358). A tall or very tall open forest or woodland with a very sparse mid-stratum and a grassy, forb-rich ground cover found on fertile soils of the north-eastern New England Tableland. It is characterised by combinations of box and Red Gum eucalypts typically occurring as remnants within extensive undulating agricultural landscapes. *Eucalyptus conica* is very frequently present among the canopy, commonly with one of the Red Gum species *Eucalyptus amplifolia* or *Eucalyptus blakelyi*. Other box eucalypts commonly include *Eucalyptus melliodora* or *Eucalyptus moluccana* and rarely *Eucalyptus bridgesiana*. The mid-stratum is almost always very sparse or absent with occasional isolated small trees including *Allocasuarina luehmannii* or *Acacia implexa*, with lower shrubs commonly including *Lissanthe strigosa*. The ground layer is distinctively grassy and very frequently a continuous cover that includes *Microlaena stipoides*, *Themeda triandra*, *Cymbopogon refractus*, *Dichelachne micrantha*, *Poa sieberiana*, *Aristida ramosa*, *Sorghum leiocladum* and *Bothriochloa macra*. Forbs and climbers are also very frequent and may include Calotis cuneifolia, Geranium solanderi, Haloragis heterophylla, Glycine tabacina and Desmodium varians. Graminoids, including *Dianella longifolia*, and the small fern *Cheilanthes sieberi* subsp. *sieberi* are also common. This PCT is widespread in the Tenterfield district where it extends south from the Queensland border to north of Glen Innes on granites and igneous lithologies. The distribution appears to be interrupted until the Wollomombi area where it occupies similar environmental gradients to the Tenterfield area but on granodiorites, siltstone and metamorphic geologies. This PCT grades into PCT 3344 on the central New England Tableland. It shares many ground cover species but almost always has a high cover of *Poa sieberiana* and is frequently distinguished by the tall cool-climate gums *Eucalyptus viminalis*, *Eucalyptus dalrympleana* or *Eucalyptus pauciflora* rather than *Eucalyptus conica*.
Description within Subject Land	This vegetation is limited to a dry north facing upper slope and not within a riparian zone or on an alluvial soil. The tree canopy is dominated by *Eucalyptus conica*, with minor occurrence of *Eucalyptus caliginosa*. The groundcover is grassy herbaceous with almost no shrub stratum development.
Justification	Information supporting the assignment of PCT and species relied upon for this assignment is provided in **Section 4.2** and **Appendix C**. A grassy woodland dominated by *Eucalyptus conica*. Few PCTs on the New England comprise this species as a dominant, with most associated with depressions and valley flats. This PCT is located on an upper slope rendering the drainage line PCT unsuitable. PCT 1512 was selected as it had matching species.

PCT 1512 Fuzzy Box open forest of the New England Tableland Bioregion

PHOTOGRAPH 17 PCT 1512

4.2.5.4 HAUL ROUTE

The haul route, excluding local roads east from Walcha, was assessed for impacts on native vegetation. Areas where trimming or removal of vegetation are required that have been deemed planted vegetation do not require assessment under the BOS and BAM. Impacts on all routes outside the local road reserve network are limited to PCT – 0 (i.e., not native vegetation).

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- 534,VZ11_DC_woodland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F4-2 Vegetation Zones within the Subject Land

Map 1 of 43

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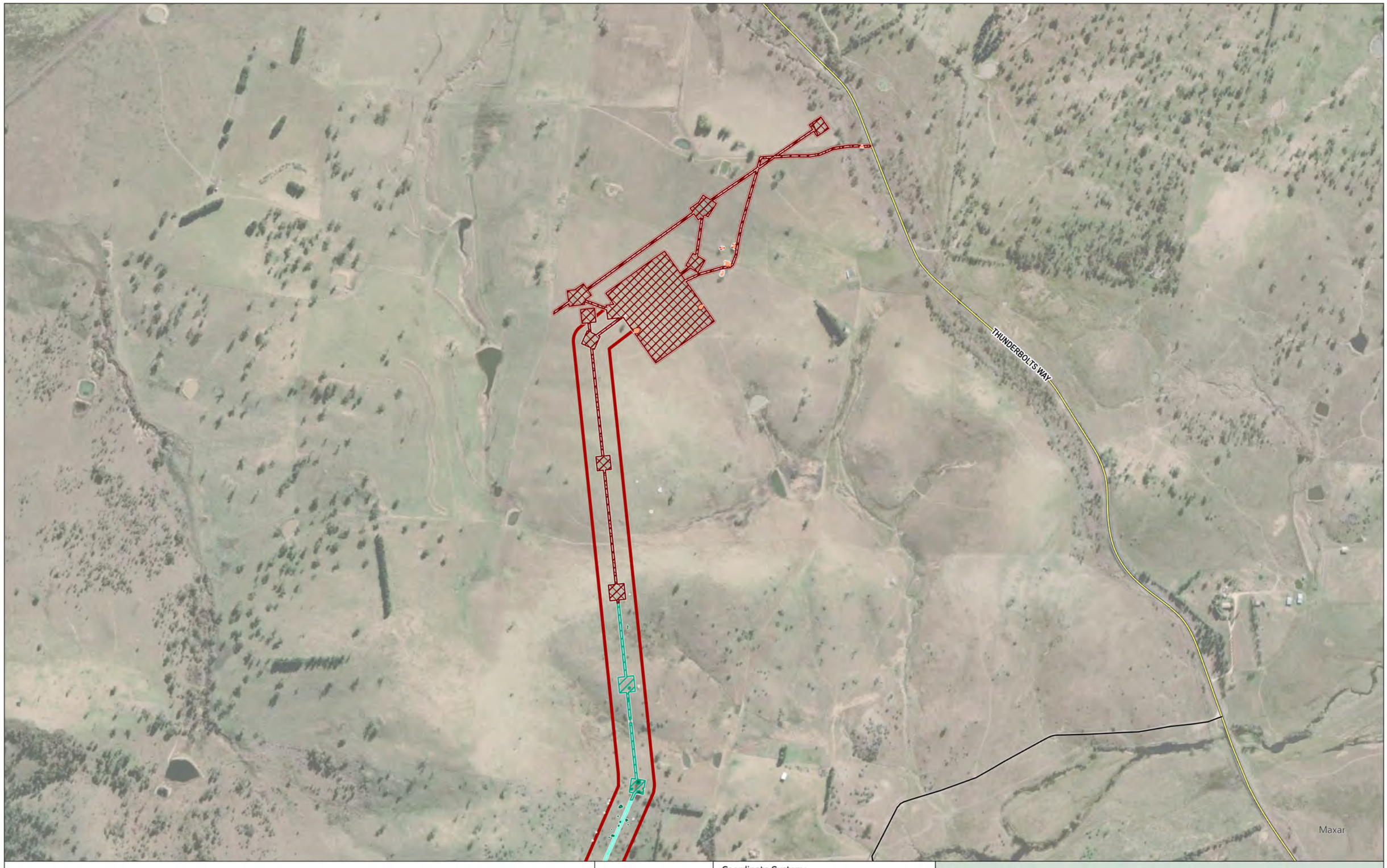

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 1192,VZ47_DC_grassland
- 1192,VZ48_DC_woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 2 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 565,VZ18_DC_openwoodland
- 565,VZ19_DC_grassland
- 565,VZ20_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 3 of 43

Winterbourne Wind Farm
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Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ16_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 4 of 43

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THUNDERBOLTS WAY

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- 510,VZ2_DC_openwoodland
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F4-2 Vegetation Zones within the Subject Land

Map 5 of 43

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Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ7_TL_canopy
- 534,VZ13_mod_grassland
- 567,VZ21_DC_woodland
- 567,VZ24_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 6 of 43

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Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 534,VZ11_DC_woodland
- 534,VZ12_DC_openwoodland
- 534,VZ14_low_grassland
- 534,VZ16_TL_canopy
- 766,VZ32_DC_sedgeland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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BLUE MOUNTAIN ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road
- 534,VZ14_low_grassland
- 534,VZ16_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F4-2 Vegetation Zones within the Subject Land

Map 8 of 43

Winterbourne Wind Farm
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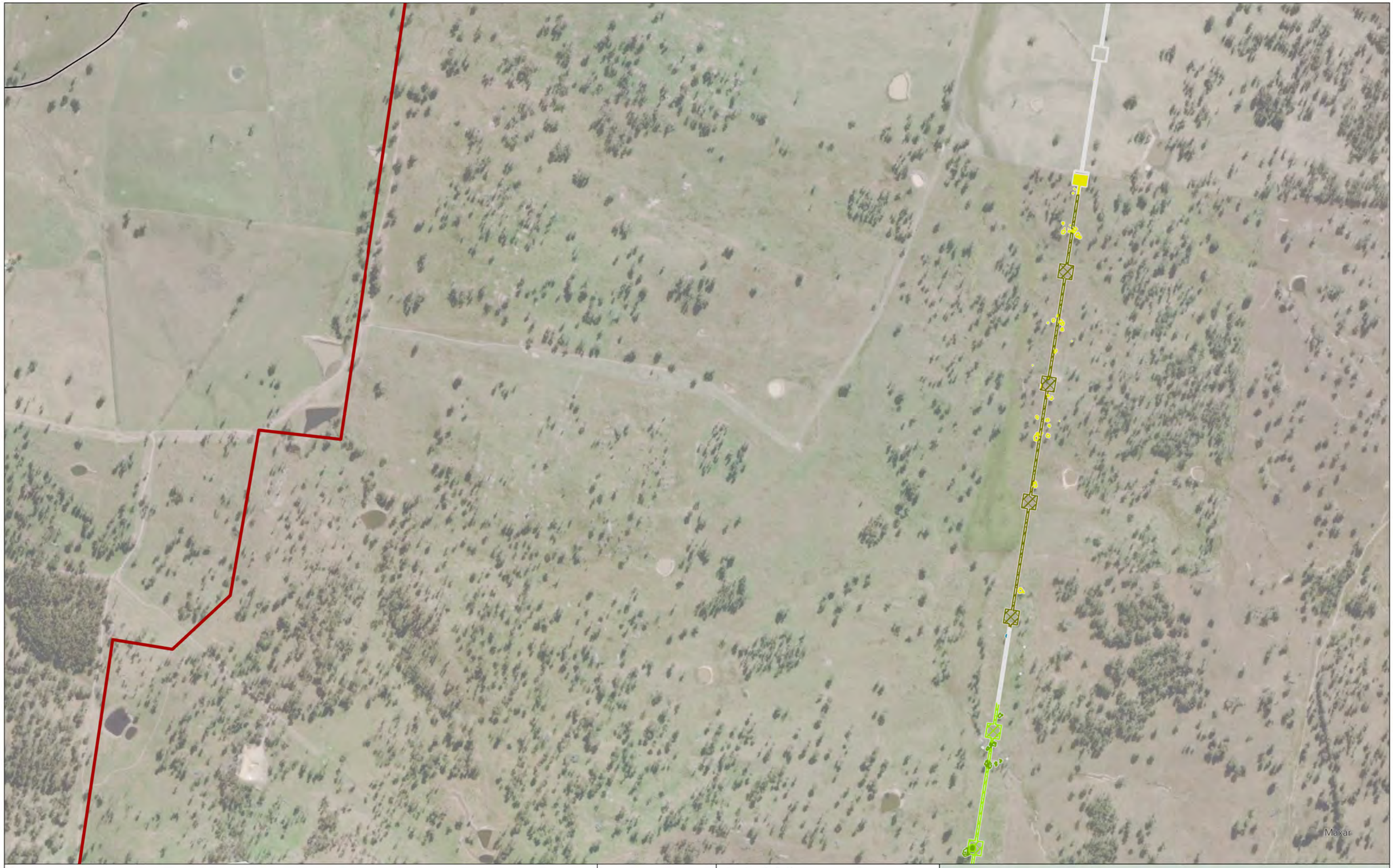

Legend

- Project Area
- Subject Land
- Local Road

- 533,VZ8_DC_openwoodland
- 533,VZ9_DC_grassland
- 533,VZ10_TL_canopy
- 534,VZ12_DC_openwoodland
- 534,VZ13_mod_grassland
- 534,VZ16_TL_canopy
- 567,VZ24_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
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F4-2 Vegetation Zones within the Subject Land

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Maxar

Legend

- Project Area
- Subject Land

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 533,VZ9_DC_grassland
- 533,VZ10_TL_canopy
- 565,VZ17_DC_woodland
- 565,VZ19_DC_grassland
- 567,VZ21_DC_woodland
- 567,VZ22_mod_grassland
- 567,VZ24_TL_canopy
- 568,VZ27_DC_openwoodland
- 568,VZ29_TL_canopy
- 568,VZ51_low_grassland
- 571,VZ52_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 565,VZ17_DC_woodland
- 565,VZ19_DC_grassland
- 567,VZ21_DC_woodland
- 568,VZ25_DC_openforest
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ29_TL_canopy
- 571,VZ30_DC_openforest
- 568,VZ51_low_grassland
- 571,VZ52_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
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Maxar

Legend

- Project Area
- Subject Land

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 565,VZ17_DC_woodland
- 565,VZ18_DC_openwoodland
- 565,VZ19_DC_grassland
- 567,VZ21_DC_woodland
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 571,VZ30_DC_openforest
- 571,VZ52_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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Maxar

Legend

- Project Area
- Subject Land
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
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ERM

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Maxar

Legend

- Project Area
- Subject Land
- 568,VZ25_DC_openforest
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ51_low_grassland

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

Map 14 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

BLUE MOUNTAIN ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 568,VZ25_DC_openforest
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ51_low_grassland
- 1192,VZ47_DC_grassland
- 1192,VZ48_DC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

Map 15 of 43

Winterbourne Wind Farm
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WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 534,VZ11_DC_woodland
- 534,VZ12_DC_openwoodland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 567,VZ21_DC_woodland
- 567,VZ22_mod_grassland
- 567,VZ23_RC_woodland
- 568,VZ51_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

Map 16 of 43

Winterbourne Wind Farm
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ERM

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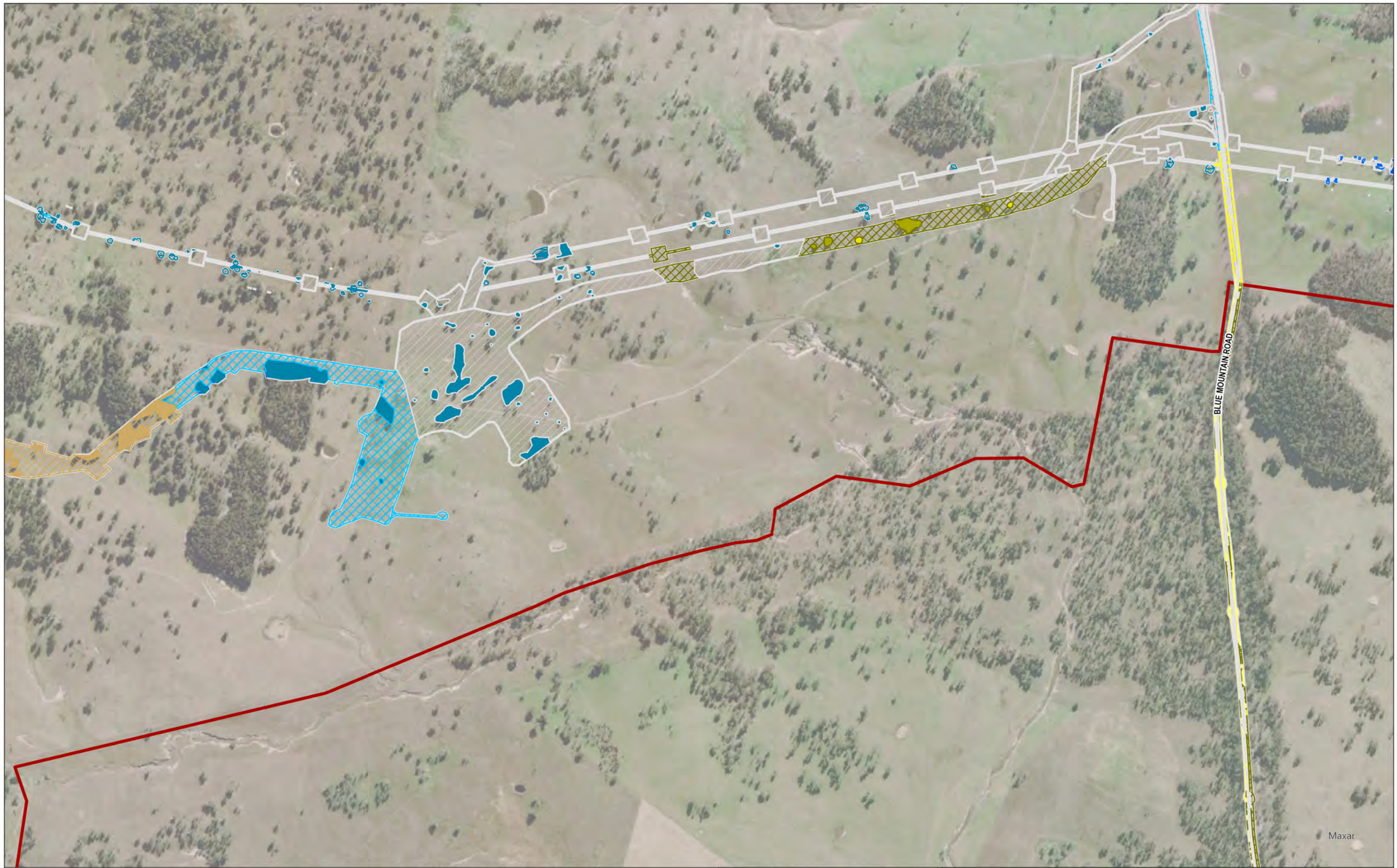

Legend

- Project Area
- Subject Land
- Local Road

- 534,VZ11_DC_woodland
- 534,VZ12_DC_openwoodland
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 534,VZ16_TL_canopy
- 567,VZ21_DC_woodland
- 567,VZ22_mod_grassland
- 567,VZ23_RC_woodland
- 567,VZ24_TL_canopy
- 568,VZ26_DC_woodland
- 568,VZ29_TL_canopy
- 571,VZ30_DC_openforest
- 571,VZ52_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 17 of 43

Winterbourne Wind Farm
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WWPL

ERM

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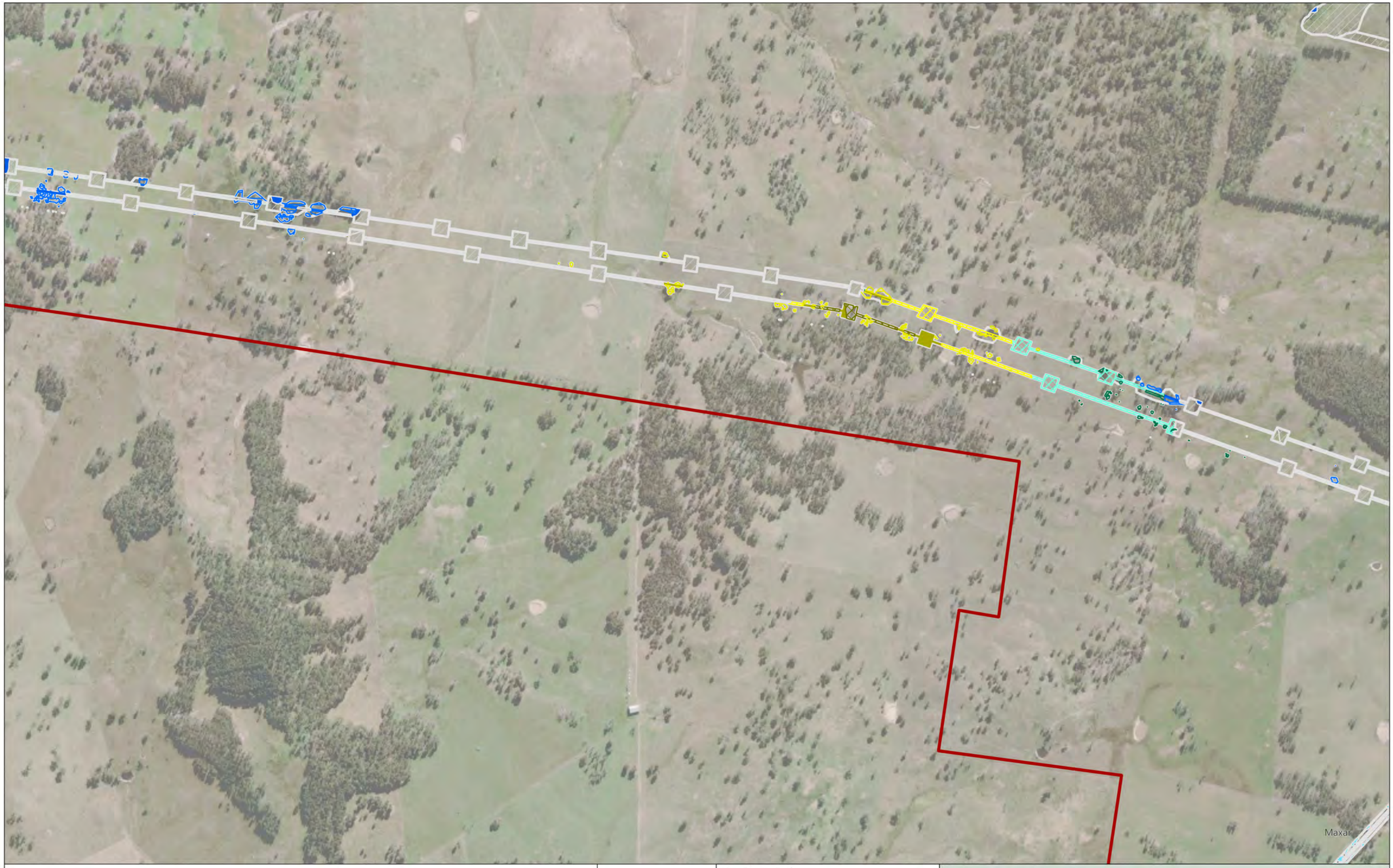

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ3_DC_grassland
- 510,VZ5_low_grassland
- 510,VZ7_TL_canopy
- 534,VZ11_DC_woodland
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ16_TL_canopy
- 567,VZ23_RC_woodland
- 568,VZ26_DC_woodland
- 568,VZ29_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 18 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 534,VZ12_DC_openwoodland
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 567,VZ21_DC_woodland
- 567,VZ22_mod_grassland
- 567,VZ23_RC_woodland
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ51_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 19 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Maxar

Legend

- Project Area
- Subject Land

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 534,VZ14_low_grassland
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ51_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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WINTERBOURNE ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

510,VZ1_DC_woodland
510,VZ2_DC_openwoodland
510,VZ3_DC_grassland
510,VZ5_low_grassland
510,VZ7_TL_canopy
534,VZ11_DC_woodland
534,VZ12_DC_openwoodland
534,VZ13_mod_grassland
534,VZ14_low_grassland
534,VZ15_RC_woodland
534,VZ16_TL_canopy
565,VZ17_DC_woodland
565,VZ18_DC_openwoodland
567,VZ21_DC_woodland
567,VZ22_mod_grassland
567,VZ23_RC_woodland
568,VZ26_DC_woodland
568,VZ27_DC_openwoodland
568,VZ28_DC_grassland
568,VZ29_TL_canopy
568,VZ51_low_grassland
501,VZ39_DC_woodland
1512,VZ40_DC_woodland
501,VZ50_low_grassland
N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
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WWPL

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WINTERBOURNE ROAD

BARK HUT ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 510,VZ7_TL_canopy
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 567,VZ21_DC_woodlard
- 567,VZ22_mod_grassland
- 567,VZ23_RC_woodland
- 568,VZ25_DC_openforest
- 568,VZ26_DC_woodlard
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ29_TL_canopy
- 568,VZ51_low_grassland
- 501,VZ39_DC_woodland
- 1512,VZ40_DC_woodland
- 501,VZ50_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 22 of 43

Winterbourne Wind Farm
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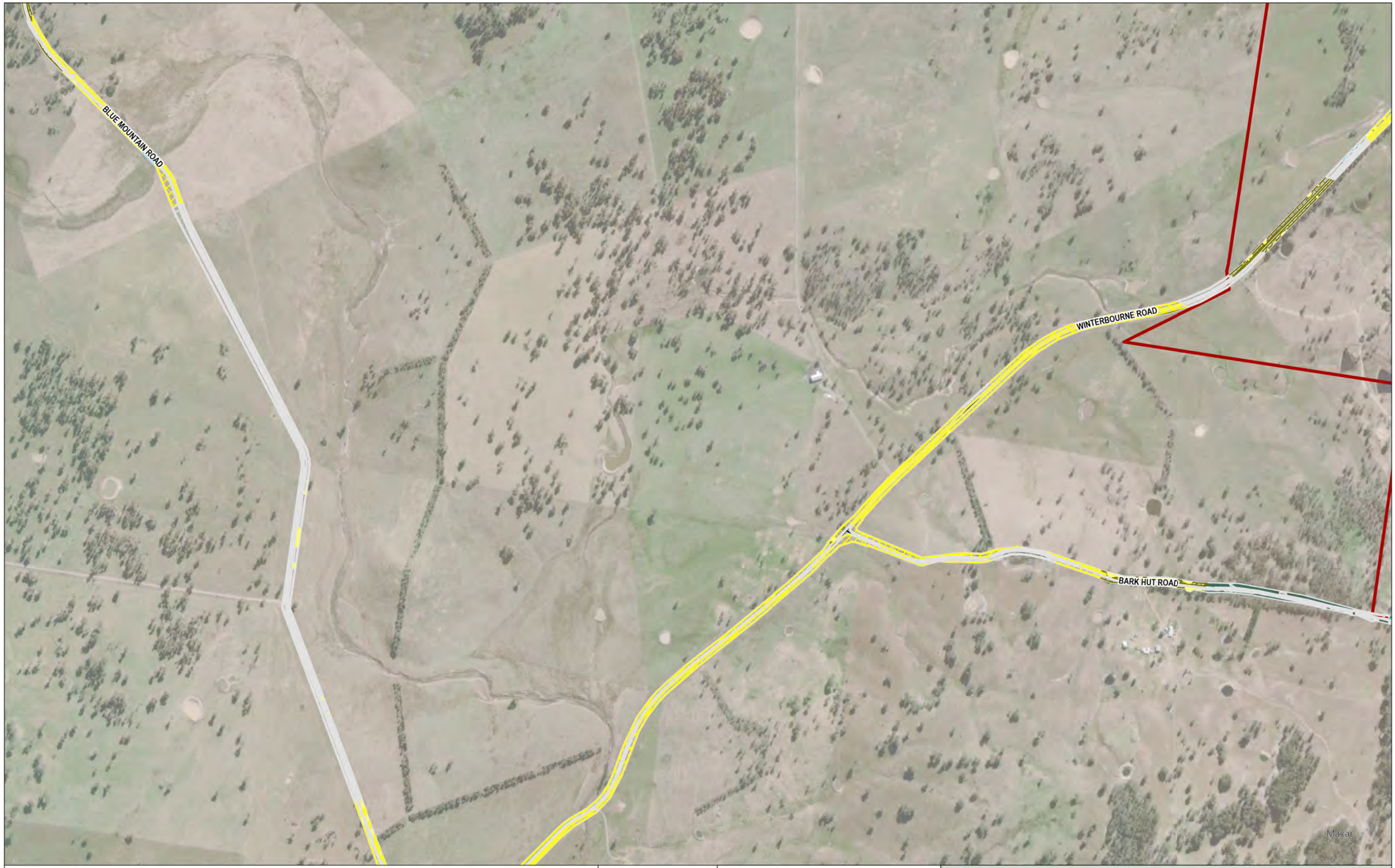

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 534,VZ12_DC_openwoodland
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 567,VZ23_RC_woodland
- 766,VZ33_RC_sedgeland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
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F4-2 Vegetation Zones within the Subject Land

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WWPL

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WINTERBOURNE ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ4_RC_grassland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 534,VZ13_mod_grassland
- 534,VZ15_RC_woodland
- 766,VZ33_RC_sedgeland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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WINTERBOURNE ROAD

EMU CREEK ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ4_RC_grassland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 571,VZ31_RC_woodland
- 1192,VZ48_DC_woodland
- 571,VZ52_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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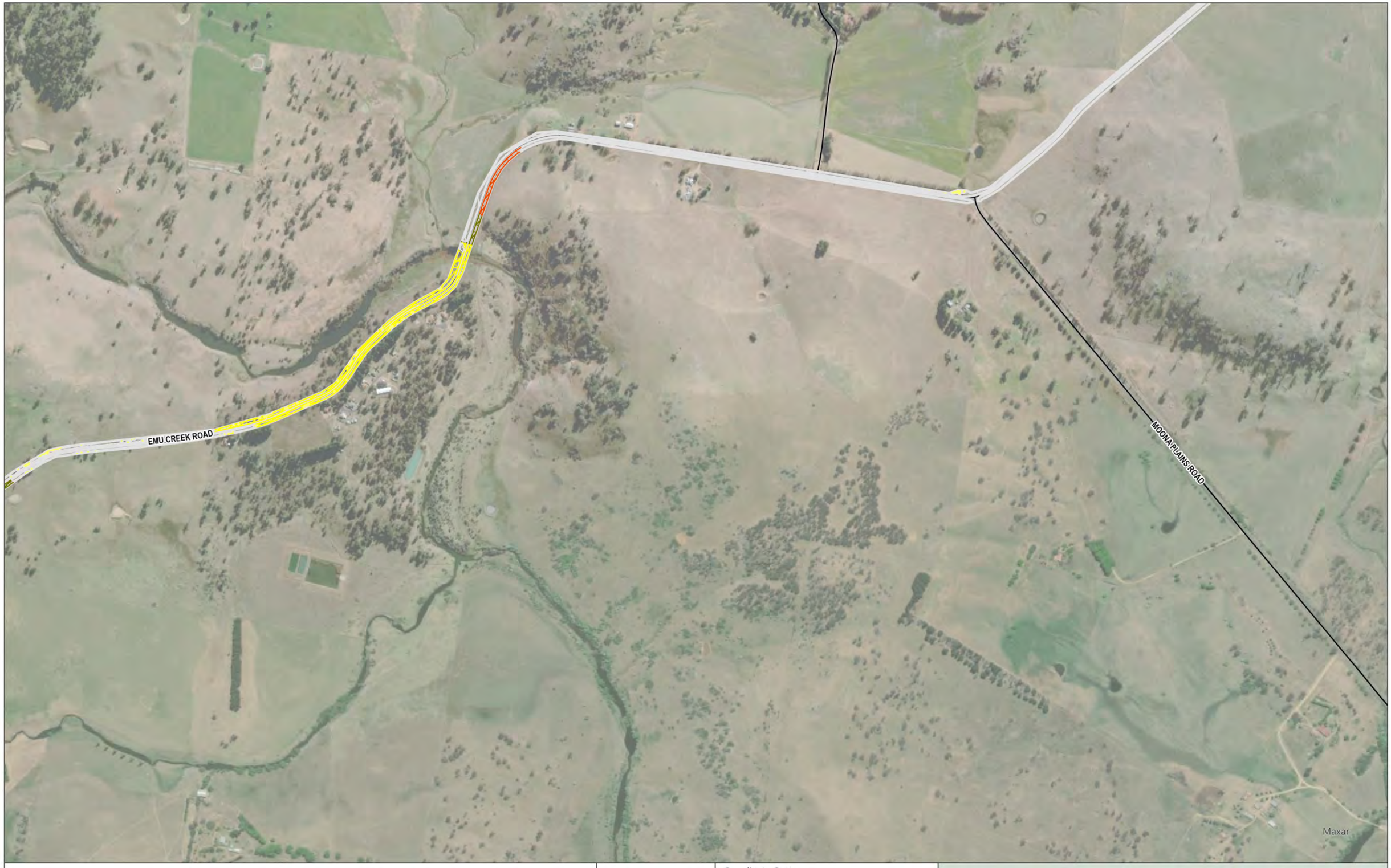

Legend

- Project Area
- Subject Land
- Local Road
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 1192,VZ46_RC_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
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WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- 510,VZ6_RC_woodland
- 534,VZ13_mod_grassland
- 534,VZ15_RC_woodland
- 1192,VZ46_RC_grassland
- 1192,VZ48_DC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 27 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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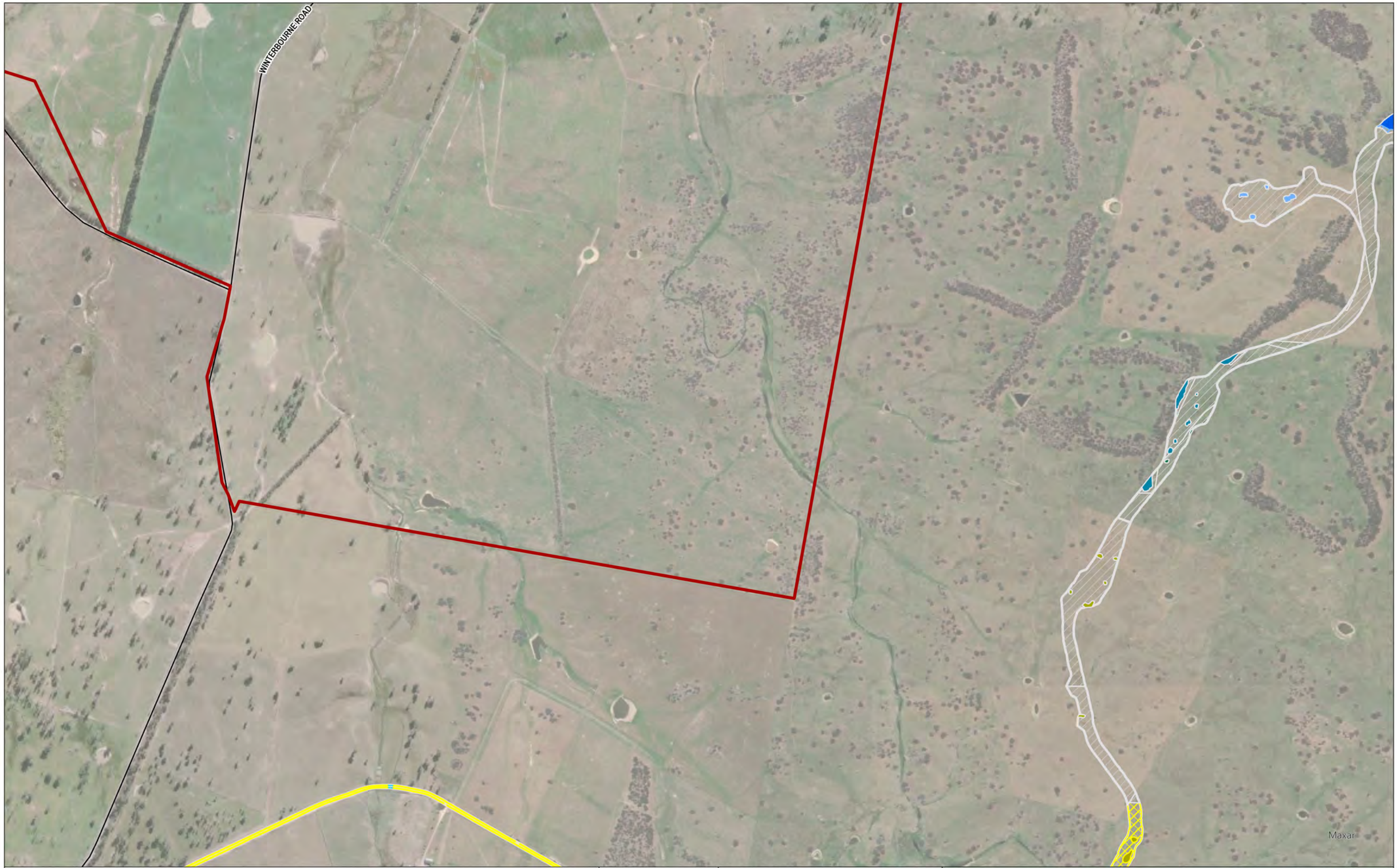

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 534,VZ11_DC_woodland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 567,VZ21_DC_woodland
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 766,VZ33_RC_sedgeland
- 568,VZ51_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 28 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ51_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 29 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ2_DC_openwoodland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 534,VZ14_low_grassland
- 534,VZ15_RC_woodland
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ29_TL_canopy
- 501,VZ39_DC_woodland
- 501,VZ50_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 30 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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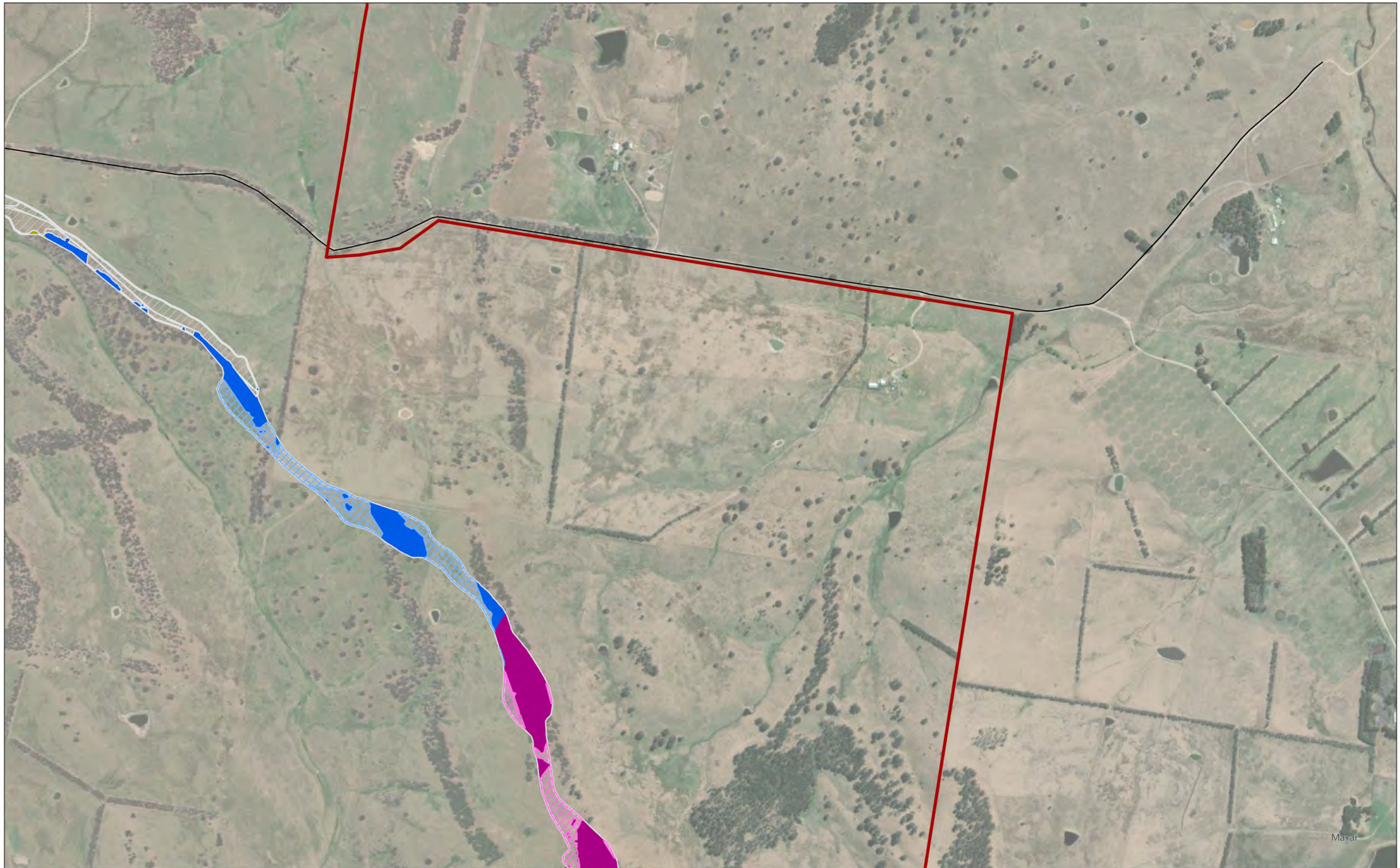

Legend

- Project Area
- Subject Land
- Local Road

- 534,VZ11_DC_woodland
- 568,VZ26_DC_woodland
- 568,VZ51_low_grassland
- 965,VZ35_woodland
- 965,VZ37_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 31 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

BARK HUT ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ5_low_grassland
- 534,VZ11_DC_woodland
- 534,VZ13_mod_grassland
- 534,VZ14_low_grassland
- 534,VZ16_TL_canopy
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ29_TL_canopy
- 766,VZ32_DC_sedgeland
- 568,VZ51_low_grassland
- 970,VZ42_DC_woodland
- 501,VZ50_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

Map 32 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Maxar

Legend

- Project Area
- Subject Land
- Local Road
- 568,VZ51_low_grassland
- 965,VZ35_woodland
- 965,VZ36_DC_shrubland
- 965,VZ37_low_grassland
- 970,VZ42_DC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 33 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ2_DC_openwoodland
- 510,VZ3_DC_grassland
- 510,VZ5_low_grassland
- 534,VZ11_DC_woodland
- 534,VZ12_DC_openwoodland
- 534,VZ15_RC_woodland
- 534,VZ16_TL_canopy
- 567,VZ21_DC_woodland
- 567,VZ22_mod_grassland
- 567,VZ24_TL_canopy
- 568,VZ25_DC_openforest
- 568,VZ26_DC_woodland
- 568,VZ27_DC_openwoodland
- 568,VZ28_DC_grassland
- 568,VZ29_TL_canopy
- 766,VZ32_DC_sedgeland
- 766,VZ33_RC_sedgeland
- 568,VZ51_low_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 34 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Local Road

- 510,VZ1_DC_woodland
- 510,VZ5_low_grassland
- 510,VZ6_RC_woodland
- 567,VZ21_DC_woodland
- 568,VZ25_DC_openforest
- 568,VZ27_DC_openwoodland
- 965,VZ34_openforest
- 965,VZ35_woodland
- 965,VZ37_low_grassland
- 970,VZ42_DC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 35 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 534,VZ11_DC_woodland
- 534,VZ16_TL_canopy
- 568,VZ25_DC_openforest
- 568,VZ26_DC_woodland
- 568,VZ28_DC_grassland
- 568,VZ29_TL_canopy
- 965,VZ34_openforest
- 965,VZ35_woodland
- 965,VZ37_low_grassland
- 965,VZ38_TL_canopy
- 970,VZ41_DC_openforest
- 970,VZ42_DC_woodland
- 970,VZ43_DC_grassland
- 970,VZ45_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 36 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Maxar

Legend

- Project Area
- Subject Land
- 965,VZ34_openforest
- 965,VZ35_woodland
- 965,VZ37_low_grassland
- 965,VZ38_TL_canopy
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

Map 37 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

MOONA PLAINS ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road
- 965,VZ34_openforest
- 965,VZ35_woodland
- 970,VZ41_DC_openforest
- 970,VZ42_DC_woodland
- 970,VZ44_RC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

Map 38 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

Maxar

Legend

- Project Area
- Subject Land

- 766,VZ32_DC_sedgeland
- 965,VZ35_woodland
- 970,VZ41_DC_openforest
- 970,VZ42_DC_woodland
- 970,VZ43_DC_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Local Road

- 567,VZ21_DC_woodland
- 567,VZ22_mod_grassland
- 965,VZ34_openforest
- 965,VZ35_woodland
- 970,VZ42_DC_woodland
- 970,VZ43_DC_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 40 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

MOONA PLAINS ROAD

Maxar

Legend

- Project Area
- Subject Land
- Local Road

- 534,VZ12_DC_openwoodland
- 965,VZ34_openforest
- 965,VZ35_woodland
- 965,VZ37_low_grassland
- 970,VZ41_DC_openforest
- 970,VZ42_DC_woodland
- 970,VZ43_DC_grassland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F4-2 Vegetation Zones within the Subject Land

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land

- 965,VZ35_woodland
- 965,VZ37_low_grassland
- 970,VZ42_DC_woodland
- 970,VZ43_DC_grassland
- 1194,VZ49_DC_woodland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F4-2 Vegetation Zones within the Subject Land

Map 42 of 43

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

Legend

- Project Area
- Subject Land
- Local Road
- 965,VZ35_woodland
- 965,VZ37_low_grassland
- 970,VZ41_DC_openforest
- 970,VZ42_DC_woodland
- 970,VZ43_DC_grassland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F4-2 Vegetation Zones within the Subject Land

Map 43 of 43

Winterbourne Wind Farm
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WWPL

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4.2.6 THREATENED ECOLOGICAL COMMUNITIES

Four EPBC Act TECs were identified as part of the desktop assessment in the PMST as having the potential to occur within the Subject Land. Two of these TECs were also identified through PCT association, and have equivalent communities listed under the BC Act and an additional five TECs were identified through PCT association that were not identified by the PMST. Consideration of these TECs is provided in **Table 4-23**.

TABLE 4-23 THREATENED ECOLOGICAL COMMUNITIES INVESTIGATION

TEC	BC Act	EPBC Act	Associated PCT	Recorded within the Subject Land
New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands and BC Act equivalent	Critically Endangered	Critically Endangered	533, 534, 965, 970	Yes – limited to PCTs 533 and 534 where New England Peppermint is a characteristic canopy species
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and BC Act equivalent	Critically Endangered	Critically Endangered	510, 567, 571	Yes – limited to PCT 510 where one or more of the characteristic canopy tree species are dominant
Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	Endangered	-	766	Yes – limited to occurrences of PCT 766
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions	Endangered	-	766	No – PCT 766 presents as a Carex Sedgeland and the community does not present as a Montane Peatland and Swamp.
Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion	Endangered	Endangered	766	No – PCT 766 presents as a Carex Sedgeland and the community does not present as a Wetland.
Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	Endangered	-	965, 1194	Yes – limited to occurrences of PCTs 1192 and 1194 where basalt occurs
Natural Temperate Grassland of the South Eastern Highlands	-	Critically Endangered	766	No - PCT 766 presents as a Carex Sedgeland and the community does not present as a Grassland.
Lowland Rainforest of Subtropical Australia	Endangered	Critically Endangered	-	No – no rainforest communities occur in the Subject Land
Ben Halls Gap Sphagnum Moss Cool Temperate Rainforest	Endangered	Critically Endangered	-	No – no rainforest communities occur in the Subject Land

The mapping of woody TECs (i.e., excluding Carex sedgelands EEC), has generally considered the schematic transect of the landscapes present in the Subject Land (Benson & Ashby, 2000) as reproduced below in **Figure 4-3**.

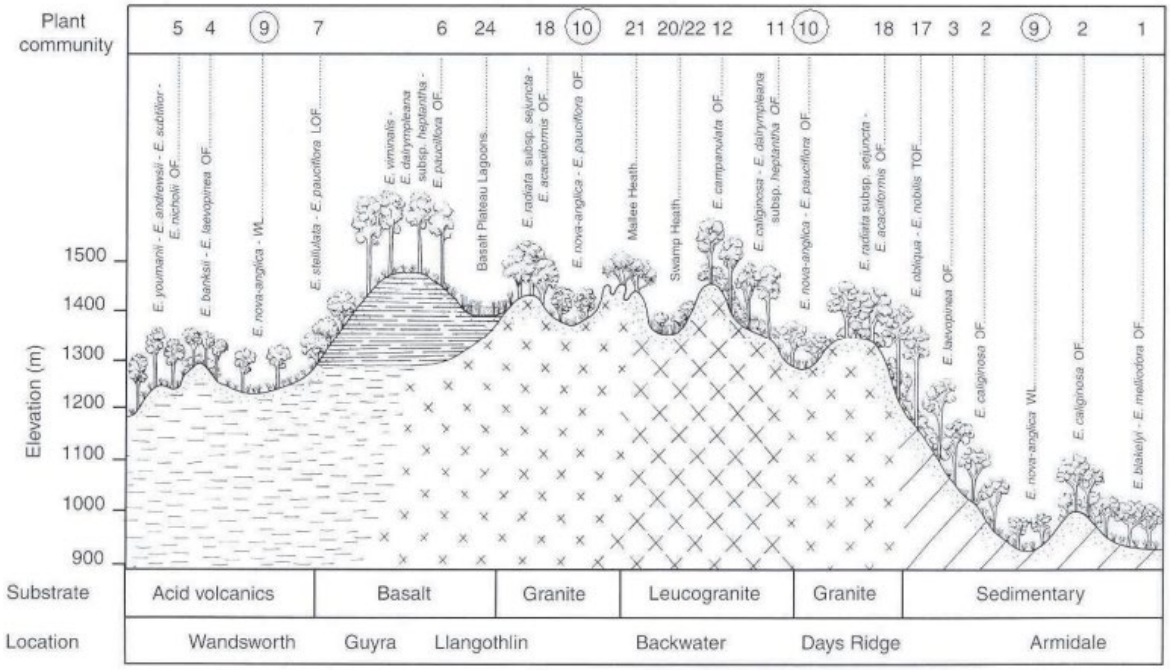

Fig. 1. Schematic transect of the landscapes present in the area covered by the Guyra 1: 100 000 map sheet showing the relationship between topographic position, elevation, substrate and plant communities. OF = Open-Forest, WL = Woodland, LOF = Low Open-Forest, TOF = Tall Open-Forest (after Walker and Hopkins (1990)). Reproduced with permission, from Benson and Ashby (2000). Plant communities 9 and 10, circled, are components of the national ecological community.

FIGURE 4-3 SCHEMATIC TRANSECT OF THE LANDSCAPES (BENSON & ASHBY, 2000)

The following sections provide additional details with respect to the TECs found within the Subject Land.

4.2.6.1 NEW ENGLAND PEPPERMINT (*EUCALYPTUS NOVA-ANGLICA*) GRASSY WOODLANDS

The New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion in NSW/New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands TEC is listed as Critically Endangered under both the BC Act and the EPBC Act respectively. Both these listed communities will here onward be referred to as 'New England Peppermint Grassy Woodland TEC'.

Characteristically, New England Peppermint Grassy Woodlands typically occur in high altitude areas of low relief (i.e. frost hollows and areas of cold air drainage). Soils are generally of low to medium fertility being derived mostly from sedimentary geologies. According to the Scientific Committee's final determination (TSSC 2011), New England Peppermint Grassy Woodlands are dominated by trees of *Eucalyptus nova-anglica* and occasionally with *E. dalrympleana* subsp. *heptantha*, as a co-dominant.

There are few shrubs with the ground cover usually dense with *Asperula conferta*, *Poa sieberiana*, *Themeda australis*, *Juncus filicaulis*, *Dichondra repens*, *Carex inversa*, *Rumex brownii*, *Acaena ovina* and *Desmodium varians*[30] common (TSSC, 2011).

Benson and Ashby identify the following as indicator species: *Eucalyptus nova-anglica*, *Carex inversa*, *Haloragis heterophylla*, *Juncus filicaulis*, *Cymbonotus lawsonianus* and *Leucopogon fraseri*.

To be considered part of the BC Act listed TEC, patches must meet the key characteristics described in **Table 4-24**, as per (TSSC, 2011).

TABLE 4-24 BC ACT KEY DIAGNOSTIC CHARACTERISTICS FOR THE ASSESSMENT OF NEW ENGLAND PEPPERMINT GRASSY WOODLAND TEC

Key Diagnostic Characteristic	Response
Is the site in the New England Tableland Bioregion?	Yes
Is the vegetation an open grassy forest or woodland with sparse or no shrubs?	PCTs 533 and 534 mapped within the Subject Land have this characteristic.
Does the tree layer contain mainly New England Peppermint?	PCTs 533 and 534 mapped within the Subject Land have this characteristic. Where present in other PCTs, New England Peppermint is never dominant.
Outcome	**Woody patches of PCT 533 and 534 meet the key diagnostic criteria for inclusion within the TEC (i.e., presence of New England Peppermint as a dominant canopy species). Moderate and low condition patches may not meet the key diagnostic criteria for inclusion based on degradation. See analysis below.**

To be considered part of the EPBC Act listed TEC, patches must meet the key diagnostic characteristics and condition thresholds described in **Table 4-25**, as per (TSSC, 2011).

TABLE 4-25 EPBC ACT KEY DIAGNOSTIC CHARACTERISTICS AND CONDITIONS THRESHOLDS FOR NEW ENGLAND PEPPERMINT GRASSY WOODLAND TEC

Key Diagnostic Characteristic	Response
Distribution limited to the tablelands and slopes of northeastern NSW, extending into southeastern Queensland	The Subject Land is within the New England Tablelands of northeastern NSW
An overstorey dominated, or co-dominated by *Eucalyptus nova-anglica* (New England Peppermint)	Woody patches of PCTs 533 and 534 mapped within the Subject Land have this characteristic. Non-woody patches assigned to these PCTs require consideration of groundcover diagnostic species.
The shrub layer is typically sparse or absent	PCTs 533 and 534 mapped within the Subject Land have this characteristic
The ground layer vegetation is usually dominated by native grasses and herbs. Cover is typically dense, though this may vary in response to seasonal conditions and management history.	PCTs 533 and 534 mapped within the Subject Land generally have this characteristic. Management history has had a marked impact on floristic composition and structure. It is questionable whether low condition grasslands comply with this criteria.

[30] Now *Grona varians*

Key Diagnostic Characteristic	Response
Condition Thresholds	
Patch Size: The patch, excluding the buffer zone, is at least 0.5 ha in size	There are patches of PCT 533 and 534 mapped within the Subject Land that qualify under this threshold
Ground Cover: The perennial ground cover vegetation is dominated by native species AND the ground cover of the patch has EITHER: At least 20 different native vascular plant species present in the patch. At least 5 different grazing-sensitive (highly palatable) native species present in the patch.	Not all patches of PCT 533 and 534 that are greater than 0.5 ha qualify under this threshold. Moderate condition grasslands may comply with this threshold Low condition grasslands are not likely to comply with this threshold
Trees: The trees must have a density of EITHER: At least 10 native trees per 0.5 ha, that are at least 10 cm in DBH. At least 10 native tree stems per 0.5 ha that are at least 50 cm in height, as evidence of potential natural regeneration of native tree species.	All woody patches of PCT 533 and 534 that are greater than 0.5 ha qualify under this threshold
Outcome	Woody patches of PCT 533 or 534 of greater than 0.5 ha in area form part of the Commonwealth listed community. Moderate and low condition patches may not. See analysis below.

An analysis of condition states by species diversity included the consideration of:

- Average native species richness by BAM plot by woody vegetation zones, moderate condition grasslands and low condition grasslands (see **Table 4-26**);
- Total Part 2 species incidence by woody vegetation zones, moderate condition grasslands and low condition grasslands (NSW Scientific Committee 2013) (see **Table 4-27**); and
- Total of 'palatable species' presence by woody vegetation zones, moderate condition grasslands and low condition grasslands (TSSC 2011) (see **Table 4-28**).

TABLE 4-26 BAM PLOT MEAN SPECIES RICHNESS FOR WOODY AND MODERATE/LOW CONDITION GRASSLANDS VEGETATION ZONES FOR PCTS 533 AND 534

Vegetation condition	Average number of native vascular plant species per BAM plot (TSSC 2011)
Woody vegetation (i.e., woodlands and open woodland vegetation zones)	21.3 (n = 13 BAM plots)
Moderate condition grasslands	14.0 (n= 5 BAM plots)
Low condition grasslands	10.6 (n = 10 BAM plots)

TABLE 4-27 NEW ENGLAND PEPPERMINT DIAGNOSTIC MEAN SPECIES COUNT BY BAM PLOT FOR WOODY AND MODERATE/LOW CONDITION GRASSLANDS VEGETATION ZONES FOR PCTS 533 AND 534

Vegetation condition	Average number of Part 2 diagnostic species per BAM plot (NSW Scientific Committee 2013)
Woody vegetation (i.e., woodlands and open woodland vegetation zones)	12.4 (n = 13 BAM plots)
Moderate condition grasslands	8.6 (n= 5 BAM plots)
Low condition grasslands	6.9 (n = 10 BAM plots)

TABLE 4-28 NEW ENGLAND PEPPERMINT PALATABLE MEAN SPECIES COUNT BY BAM PLOT FOR WOODY AND MODERATE/LOW CONDITION GRASSLANDS VEGETATION ZONES FOR PCTS 533 AND 534

Vegetation condition	Average number of palatable species per BAM plot (TSSC 2011)
Woody vegetation (i.e., woodlands and open woodland vegetation zones)	2.6 (n = 13 BAM plots)
Moderate condition grasslands	2.2 (n= 5 BAM plots)
Low condition grasslands	1.6 (n = 10 BAM plots)

This analysis shows clear differences between the woody and non-woody condition states.

As expected, the woody condition state vegetation (i.e., woodlands and open woodlands) had the highest species richness per BAM plot (i.e., 21.6) and greatest number of Part 2 diagnostic species; however, the latter was only marginally greater than the average count per BAM plot recorded in moderate condition grasslands. The difference in average count per BAM plot for Part 2 species is likely associated with eucalypt presence in the woody condition state vegetation, as these are absent from the count in non-woody patches. Low condition grasslands had the least species richness per BAM plot for all measures.

A total of 14 palatable species were recorded in woody vegetation with seven of those species restricted to this condition state, these being: *Cynoglossum australe*, *Glycine clandestine*, *Poranthera microphylla*, *Pultenaea microphylla*, *Scleranthus biflorus*, *Sorghum leiocladum* and *Viola betonicifolia.* Palatable species observations shared between both woody and grassland condition states include: *Ammobium alatum*, *Bulbine bulbosa*, *Grona varians*, *Geranium solanderi*, *Haloragis heterophylla*, *Themeda triandra* and *Veronica calycina.* Five highly palatable species were observed in moderate condition grasslands (total of five BAM plots) and six were observed in low condition grasslands (total of 10 BAM plots).

The analysis of species diversity verifies the condition rating assigned to vegetation zones and allows for the following conclusions:

- Patches of woody vegetation have the highest New England Peppermint Grassy Woodland species diversity (i.e., highest average Part 2 count and palatable species count);
- Low condition grasslands have the least species diversity in all measures, notably Part 2 New England Peppermint Grassy Woodland diagnostic species and palatable species; and

- Neither moderate or low condition grasslands have at least 20 different native vascular plant species in a BAM plot, with the BAM plot average for low condition grasslands being 10.4 or nearly half this threshold.

The data indicates that the low condition grasslands comprise very low plant species diversity of insufficient character to warrant inclusion in the BC Act listed community. At the very least, the conservation value of the low condition grasslands should be treated separately to woody and moderate condition grassland condition states when evaluating loss at a regional level.

The data supports the exclusion of moderate and low condition grasslands from the Commonwealth listing as it is considered highly unlikely that any patch of these condition classes would comprise:

- At least 10 native trees per hectare (i.e., mapped areas do not comprise trees or regenerating eucalypts as BAM plots show no regenerating eucalyptus in either the moderate or low condition grasslands); and
- At least 20 different native vascular plant species; or
- At least five different grazing-sensitive (highly palatable native species).

The extent of BC Act listed New England Peppermint TEC within the Subject Land is shown in **Figure 4-4**.

4.2.6.2 WHITE BOX – YELLOW BOX – BLAKELY'S RED GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLAND

The White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC is listed as Critically Endangered under the EPBC Act and part of the national community is listed in NSW as the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions which is listed as Critically Endangered under the BC Act. The term 'Box-Gum Grassy Woodland TEC' is used here onward to describe both the EPBC Act and BC Act listed communities.

The community generally presents as an open woodland with a canopy foliage cover of less than 30% consisting of *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and/or *Eucalyptus blakelyi* (Blakely's Red Gum) and in some cases the grey boxes *Eucalyptus microcarpa* and *E. moluccana* can occur as co-dominants. A shrub layer is generally absent but can include *Acacia, Bursaria, Cassinia, Hibbertia, Lissanthe* and *Templetonia* species (TSSC, 2023).

The ground cover is dominated by tussock grasses, especially *Themeda triandra* (Kangaroo Grass) and *Poa sieberiana* (Snow Grass), along with species of *Austrostipa, Aristida, Chloris, Cymbopogon, Dichanthium, Microlaena* and *Rytidosperma*. Between the tussocks there may be bare ground or a range of forbs from genera such as *Bulbine, Chrysocephalum, Dianella, Geranium, Goodenia, Lomandra, Pimelea* and *Stackhousia* (TSSC, 2023).

The final determination (NSW TSSC 2020) describes the distribution of Box Gum Woodland as spanning an elevation range "from approximately 170 m ASL on the western slopes of the Great Dividing Range to approximately 1200 m on the Northern Tablelands of NSW (Beadle 1981), although occurrences on the ranges are typically at lower elevations (Prober et al. 2017)".

In terms of average annual rainfall, final determination (NSW TSSC 2020) describes the distribution as having "Annual rainfall across its distribution increases from west to east and is generally within the range 500 – 800 mm (Prober 1996; Keith 2004), although the community may occur in areas receiving as little as 400 mm/annum on the western slopes (Beadle 1981, Prober et al. 2017).".

The occurrences of Box Gum Woodland within the Subject Land are at their eastern most limit of distribution. The Subject Land has an elevation range of 1,031 to 1332 m, with average annual rainfall being ~830 mm in the west to 1,033 mm in the east (WorldClim 2.1 Precipitation Annual; online Australian Living Atlas accessed 27 May 2025). Where occurring in the Subject Land, Box Gum Woodland is generally on soils of medium fertility and gentle gradients upslope of the frost hollows where New England Peppermint Grassy Woodlands occur and downslope of steeper less fertile lands where Broad-leaved Stringybark forests and woodlands predominate. These lower parts of the landscape are the most arable parts of the Subject Land and have been cleared across the New England Tablelands for agricultural purposes.

The EPBC Act and BC Act listed communities have been assessed against the mapped extent of PCT 510 within the Subject Land. To be considered part of the EPBC Act listed TEC, patches must meet the key diagnostic characteristics, as per (TSSC, 2011).

To be considered part of the BC Act listed TEC, patches must meet the key characteristics described in **Table 4-29**

TABLE 4-29 BC ACT KEY DIAGNOSTIC CHARACTERISTICS FOR THE ASSESSMENT OF BOX-GUM GRASSY WOODLAND TEC

Question	Response
Is the site on the tablelands or western slopes of NSW?	Yes – the Subject Land is on the New England Tablelands
Does the site contain, or would the site have recently been likely to contain, White Box, Yellow Box or Blakely's Red Gum?	Woody patches of PCT 510 are characterised in this way (i.e., Yellow Box and Blakely's Red Gum). BioNet describes the adjoining upslope vegetation on steeper slopes (i.e., PCT 567) as having Yellow Box and/or Blakely's Red Gum as an associate species but not dominant. Ecotonal areas with this adjoining vegetation type have been included in the mapped occurrence of PCT 510 to conservatively account for the extent of this TEC. Occurrences of PCT 567 within the Subject Land have low to no presence of Yellow Box.
Is the ground layer mainly grassy?	Yes – PCT 510 is predominantly grassy.
If the site has been degraded, is there potential for assisted natural regeneration of the tree layer or the understorey (e.g. by removing grazing, weeds, etc.)?	Low condition grasslands have low native plant species composition where past and present land use has favoured exotic/cosmopolitan species and increase abundance of unpalatable grass species. The application of phosphorus and other soil ameliorants to improve pastures for livestock has likely altered the soil biome thus diminishing the potential for assisted natural regeneration. Higher quality patches of this community are most likely found in the road reserves where agricultural practices are less influential.

Question	Response
Determination of Presence	**Occurs where woody patches are mapped. Occurrences of grassland vegetation in a low condition state reflect the heavily modified agricultural environment where the potential for assisted natural regeneration is considered low. Further analysis is provided for grasslands below.**

To be considered part of the EPBC Act listed TEC, patches must meet the key diagnostic characteristics and condition thresholds described in **Table 4-30**, as per TSSC (2023).

TABLE 4-30 EPBC ACT KEY DIAGNOSTIC CHARACTERISTICS FOR THE ASSESSMENT OF BOX-GUM GRASSY WOODLAND TEC

Question	Response
Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?	PCT 510 is characterised in this way (i.e., Yellow Box and Blakely's Red Gum). BioNet describes the adjoining upslope vegetation on steeper slopes (i.e., PCT 567) as having Yellow Box and/or Blakely's Red Gum as an associate species but not dominant. Ecotonal areas with the adjoining vegetation type have been included in the mapped occurrence of PCT 510 to conservatively account for the extent of this TEC.
Does the patch have a predominately native understorey?	Yes – PCT 510 is predominantly grassy.
Is the patch 0.1 ha or greater in size?	Yes
There are 12 or more native understorey species present (excluding grasses) from the provided list, with at least one important species (Species list attained from: https://www.dcceew.gov.au/sites/default/files/documents/box-gum-species.pdf)	Generally. There are occurrences of the PCT 510 that have low native plant species composition where this threshold would not be met.
Outcome	**Present. The extent of this TEC is reflected in the mapping of PCT 510. Condition based distinctions are noted (e.g. grasslands verse woody vegetation). See analysis below for consideration of grassy vegetation.**

An analysis of condition states by species diversity included the consideration of:

- Average native species richness by BAM plot for woody vegetation zones, moderate condition grasslands and low condition grasslands excluding native grasses (see **Table 4-31**); and
- Total Part 2 species incidence by woody vegetation zones, moderate condition grasslands and low condition grasslands (NSW TSSC 2020) (see **Table 4-32**).

TABLE 4-31 BAM PLOT MEAN SPECIES RICHNESS FOR WOODY AND MODERATE/LOW CONDITION GRASSLANDS VEGETATION ZONES FOR PCT 510

Vegetation condition	Average number of native vascular plant species per BAM plot excluding native grasses (TSSC 2023)
Woody vegetation (i.e., woodlands and open woodland vegetation zones)	19.6 (n = 10 BAM plots)
Moderate condition grasslands	11.8 (n = 7 BAM plots)
Low condition grasslands	11.5 (n = 4 BAM plots)

TABLE 4-32 BOX GUM WOODLAND DIAGNOSTIC MEAN SPECIES COUNT BY BAM PLOT FOR WOODY AND MODERATE/LOW CONDITION GRASSLANDS VEGETATION ZONES FOR PCT 510

Vegetation condition	Average number of Part 2 diagnostic species per BAM plot (NSW Scientific Committee 2020)
Woody vegetation (i.e., woodlands and open woodland vegetation zones)	9.3 (n = 10 BAM plots)
Moderate condition grasslands	10.2 (n = 7 BAM plots)
Low condition grasslands	5.5 (n = 4 BAM plots)

This analysis shows clear differences between the woody and non-woody condition states.

As expected, the woody condition state vegetation (i.e., woodlands and open woodlands) had the highest species richness per BAM plot (i.e., 19.6) and second highest number of Part 2 diagnostic species; however, the latter was only marginally less than the average count per BAM plot recorded in moderate condition grasslands. The difference in the Part 2 diagnostic species average is likely explained by the homogeneous character of the groundcover stratum throughout the Subject Land, with localized adverse impacts on native groundcover species potentially occurring beneath the tree canopy as livestock typically shelter in these areas. Low condition grasslands had the least species richness per BAM plot for all measures, with the number of Part 2 diagnostic species being half that of moderate condition grasslands.

The analysis of species diversity verifies the condition rating assigned to vegetation zones and allows for the following conclusions:

- Patches of woody vegetation have the highest Box Gum Woodland species diversity together with a diagnostic tree canopy cover;
- Low condition grasslands have the least species diversity in all measures, notably Part 2 Box Gum Woodland diagnostic species; and
- Moderate condition grasslands have relatively high plant species richness despite the overstory canopy being absent and is in significantly better condition than low condition grasslands due to higher presence of diagnostic species.

The data supports the exclusion of low condition grasslands from the Commonwealth listing as it is considered highly unlikely that any patch of this condition class would comprise:

- At least 20 native trees per hectare (i.e., mapped areas do not comprise trees or regenerating eucalypts as BAM plots show no regenerating eucalyptus in either the moderate or low condition grasslands); or
- At least 12 native non-grass species; and

- At least one important species.

The low condition grasslands comprise very low plant species diversity of insufficient character to warrant inclusion in the BC Act and/or EPBC Act listed community. At the very least, the conservation value of the low condition grasslands should be treated separately to woody and moderate condition grassland condition states when evaluating loss at a regional level.

The extent of BC Act listed extent of Box-Gum Grassy Woodland TEC within the Subject Land is shown in **Figure 4-4**.

4.2.6.3 CAREX SEDGELAND OF THE NEW ENGLAND TABLELAND, NANDEWAR, BRIGALOW BELT SOUTH AND NSW NORTH COAST BIOREGIONS

The Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions TEC is listed as Endangered under the BC Act. The term 'Carex Sedgeland TEC' is used here onward to describe the community.

The community generally presents as fens dominated by sedges, grasses and semi-aquatic herbs. Dominant species include *Carex appressa*, *Stellaria angustifolia*, *Scirpus polystachyus*, *Carex gaudichaudiana*, *Carex* sp. Bendemeer, *Carex tereticaulis* and *Isachne globosa*. Other common species include *Geranium solanderi* var. *solanderi*, *Haloragis heterophylla*, *Lythrum salicaria, Epilobium billardierianum* subsp. *hydrophilum* and *Persicaria hydropiper*. The community occurs at higher altitudes of the tablelands but in some cases extends onto the slopes, along drainage depressions in areas of altitude between 440 and 1,360 m (NSW Scientific Committee, 2011).

The extent of Carex Sedgeland TEC within the Subject Land is presented in **Figure 4-4**.

4.2.6.4 RIBBON GUM-MOUNTAIN GUM-SNOW GUM GRASSY FOREST/WOODLAND OF THE NEW ENGLAND TABLELAND BIOREGION

The Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion TEC is listed as Endangered under the BC Act. The term 'New England Grassy Gum Woodland TEC' is used here onward to describe this community.

The New England Grassy Gum Woodland TEC is characterised by a tree layer that is usually 20 m – 30 m tall, although it may be less tall in exposed or damp sites or where there has been past clearing or thinning. The classification of this ecological community is determined by the presence of any one of its three dominant White-gum species, *Eucalyptus viminalis*, *Eucalyptus dalrympleana subsp. Heptantha*, *Eucalyptus pauciflora*, in combination with or without a rich assemblage of shrubs and grasses in the above-ground understory and midstory, or below-ground seed bank. Dominant species in the mid-layer and understory include *Acacia dealbata*, *Pultenaea microphylla and Pimelea linifolia*. The groundcover grass species consist of *Poa sieberiana var. sieberiana* and *P. labillardieri var. labillardieri,* with herbs such as *Acaena spp.* and *Ammobium alatum.*

New England Grassy Gum Woodland TEC occurs across the Northern Tablelands bioregion on a variety of soil substrates, but primarily on undulating basalt loam soils at elevations between 500 to 1500 m (NSW Scientific Committee, 2003).

Occurrences of Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion are limited to patches of 1194 coincident with basalt. The extent of New England Grassy Gum Woodland TEC within the Subject Land is presented in **Figure 4-4**.

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions
- New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion
- Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern

Coordinate System:
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Date: 23/05/2025
Created By: VN
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F4-4 Threatened Ecological Communities within the Subject Land

Map 1 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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ERM

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BLUE MOUNTAIN ROAD

THUNDERBOLTS WAY

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions
- New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion
- Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/05/2025
Created By: VN
Drawing Size: A3

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1:56,000

F4-4 Threatened Ecological Communities within the Subject Land

Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx

BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
THUNDERBOLTS WAY
DERBY STREET
EMU CREEK ROAD
OXLEY HIGHWAY
MOONA PLAINS ROAD
Earthstar Geographics

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions
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- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/05/2025
Created By: VN
Drawing Size: A3
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F4-4 Threatened Ecological Communities within the Subject Land

Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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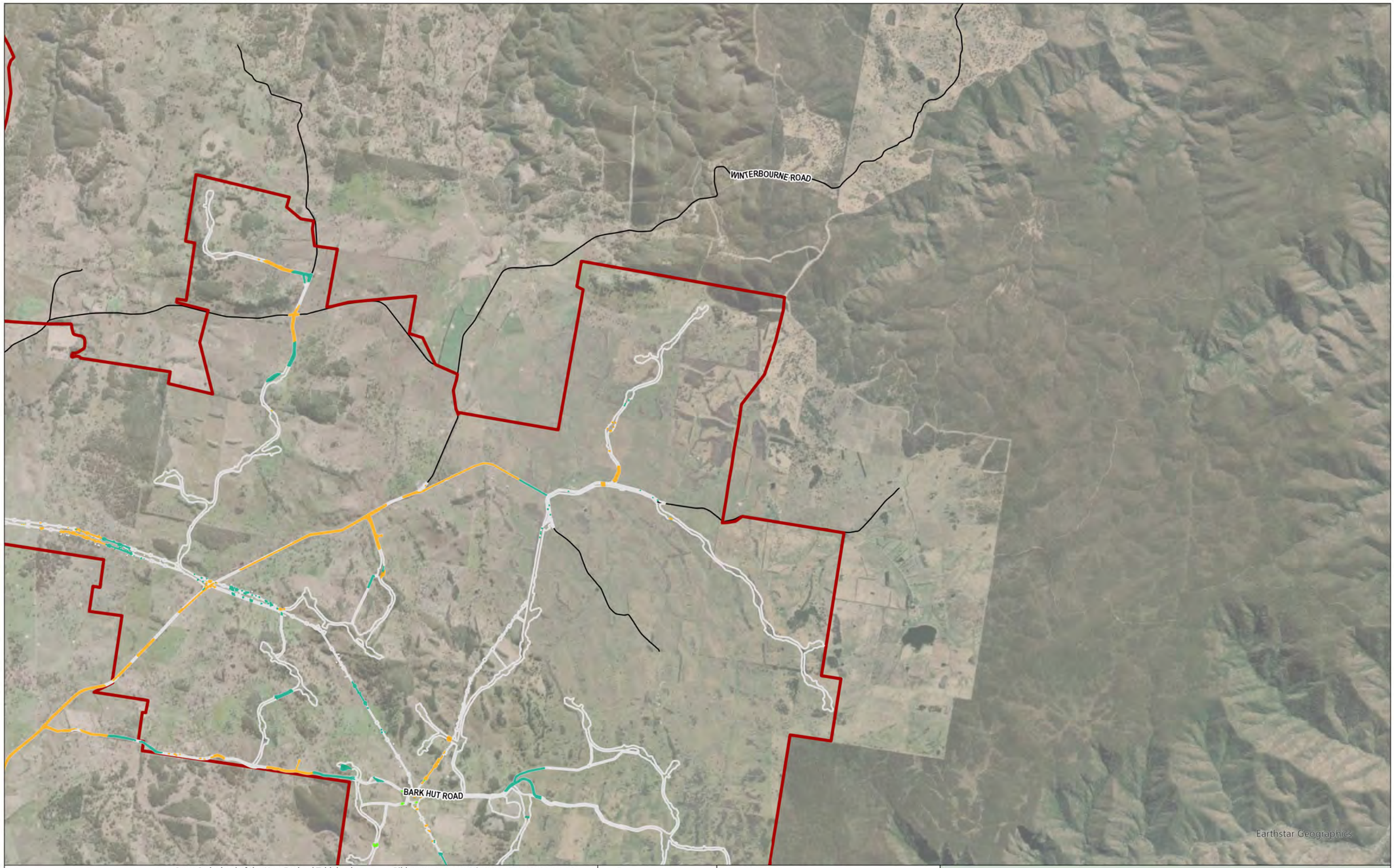

Legend

- Project Area
- Subject Land
- Local Road
- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions
- New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion
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Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/05/2025
Created By: VN
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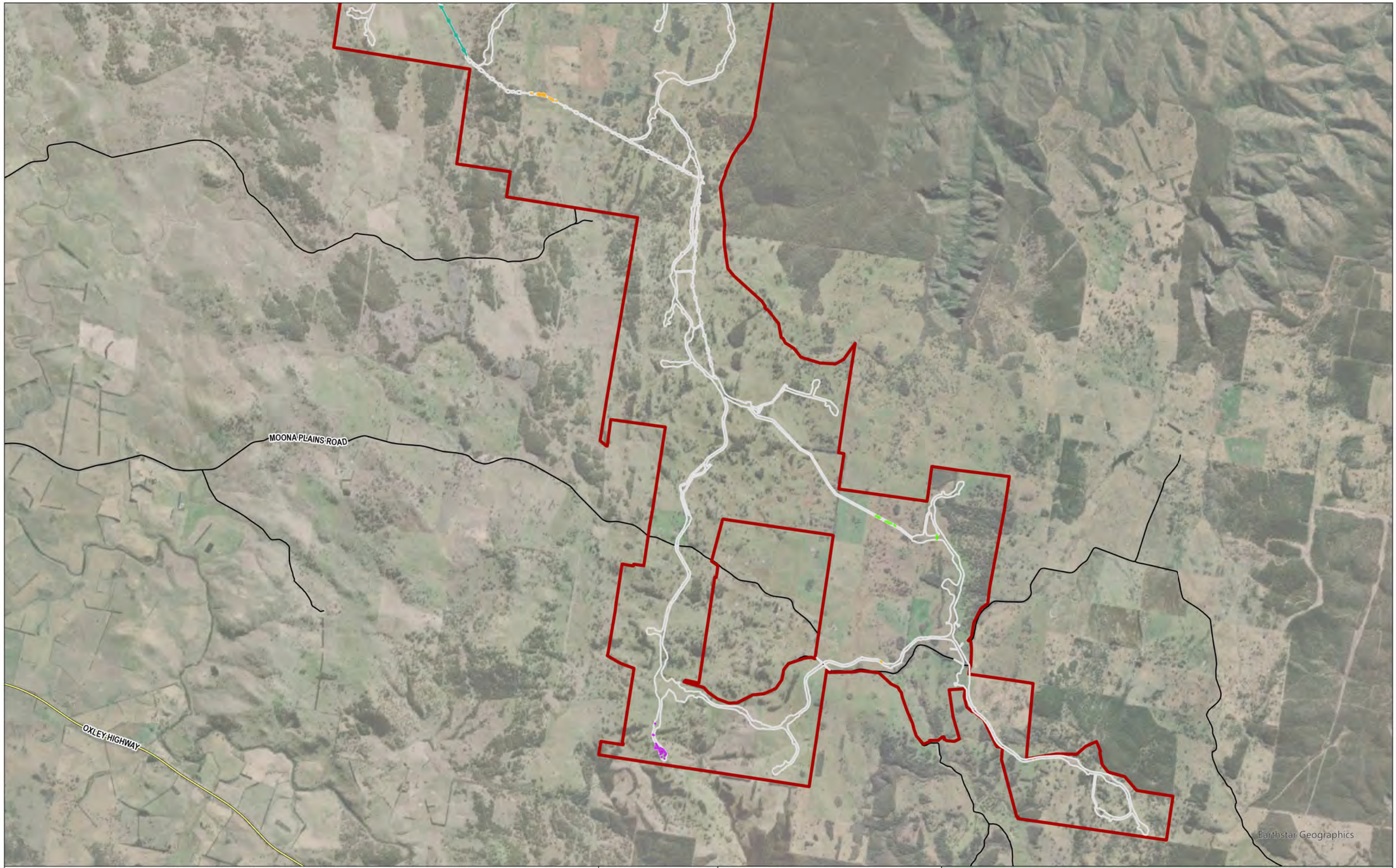
F4-4 Threatened Ecological Communities within the Subject Land

Map 4 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R6.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions
- New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion
- Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern

Coordinate System: GDA 1994 MGA Zone 56
Date: 23/05/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:56,000

F4-4 Threatened Ecological Communities within the Subject Land

Map 5 of 5

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4.3 MAP VEGETATION ZONES AND ASSESS VEGETATION CONDITION

This section includes the results of vegetation integrity assessment, which involved the:

- Mapping of VZs (see Section 4.3.1 of the BAM);
- Determining the patch size class (see Section 4.3.2 of the BAM); and
- Assessing the vegetation integrity of VZs in accordance with Section 4.3.3 of the BAM using vegetation integrity survey plots (i.e., BAM plots) (see Section 4.3.3) and required number of BAM plots (see Section 4.3.4 of the BAM).

4.3.1 VEGETATION ZONES

Forty-four VZs were delineated from the PCT groups to describe broad condition states (e.g., structural forms such as open forest, woodland, open woodland, grassland), impact type (i.e., total or partial clearing) and tenure (i.e., private lands and local road corridor). A total of 145 BAM plots were used in the assessment, representing a sampling rate of one BAM plot per ~3.20 ha. The total number of plots exceeded the BAM minimum requirement by ~44% (i.e., minimum requirement was 101 BAM plots), which represents an inferior sampling rate of one BAM plot per ~4.60 ha.

An ANOSIM was performed to test the validity of the *a priori* assignment of BAM plots to VZs, as was done for the PCT assignments. The test showed BAM plot similarities were significantly greater within their assigned VZ group than between VZs (i.e., Global R of 0.511 p <0.1). This supports the BAM plot data assignment to VZs under their respective PCTs, thus its use in this assessment to calculate VIS.

Details of vegetation zones and BAM plot requirements are provided in . The mapped extent of vegetation zones within the Subject Land is shown in **Figure 4-2**.

4.3.2 PATCH SIZE

Patch size of each vegetation zone was determined based on BAM Subsection 4.3.1. Patch sizes were assigned to vegetation zones within the Subject Land using ArcGIS to select boundaries depicted in the vegetation mapping for the Subject Land and aerial imagery. In accordance with the BAM, patch size area was assigned to each vegetation zone as a class, being < 5 ha, 5–24 ha, 25–100 ha or ≥ 100 ha.

The patches extend onto adjoining land beyond the footprint of the Subject Land. Patch size of each vegetation zone was determined to be greater than 100 ha, the maximum patch size to be entered into the BAM-C.

TABLE 4-33 VEGETATION ZONES AND PATCH SIZE

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha)	Patch size class	Minimum BAM Plot Requirement (#)	BAM Plots used in assessment (#)	BAM Plot names
1	510	VZ1_DC_woodland	3.94	>100 ha	2	5	JH029 BAMPlot1 JH063 WWF129 WWF128
2	510	VZ2_DC_openwoodland	0.38	>100 ha	1	1	WWF136
3	510	VZ3_DC_grassland	8.72	>100 ha	3	4	WWF139 WWF134 WWF133 WWF135
4	510	VZ4_RC_grassland	2.4	>100 ha	2	3	JH050 WT153 JH121
5	510	VZ5_low_grassland	14.23	>100 ha	3	4	JH077 JH026 JH027 WWF074
6	510	VZ6_RC_woodland	0.96	>100 ha	1	3	JH042 JH102 WWF110
7	533	VZ7_DC_openwoodland	0.14	>100 ha	1	2	JH108 JH107
8	533	VZ8_DC_grassland	0.52	>100 ha	1	2	WWF111 WWF112

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha)	Patch size class	Minimum BAM Plot Requirement (#)	BAM Plots used in assessment (#)	BAM Plot names
9	534	VZ9_DC_woodland	2.49	>100 ha	2	6	JH061 JH059 JH013 WWF118 WWF117 WWF081
10	534	VZ10_DC_openwoodland	0.58	>100 ha	3	1	WWF090
11	534	VZ11_mod_grassland	12.88	>100 ha	3	3	WWF115 WWF123 WT143
12	534	VZ12_low_grassland	31.88	>100 ha	4	10	JH101 MA07 MA08 JH040 JH033 JH034 JH060 JH039 JH036 JH084
13	534	VZ13_RC_woodland	3.26	>100 ha	2	4	JH037 JH041 WT149 JH094
14	565	VZ14_DC_woodland	5.13	>100 ha	3	5	WWF103 WWF104 JH018 JH08 WWF130
15	565	VZ15_DC_openwoodland	0.17	>100 ha	1	1	WWF076
16	565	VZ16_DC_grassland	11.94	>100 ha	3	5	JH117 JH069 WWF131

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha)	Patch size class	Minimum BAM Plot Requirement (#)	BAM Plots used in assessment (#)	BAM Plot names
							JH076 JH118
17	567	VZ17_DC_woodland	16.58	>100 ha	3	5	WWF020 WWF109 JH016 WWF055 WWF122
18	567	VZ18_mod_grassland	29.63	>100 ha	4	5	JH055 JH075 JH111 WWF062 WWF068
19	567	VZ19_RC_woodland	0.34	>100 ha	1	1	JH104
20	568	VZ20_DC_openforest	4.48	>100 ha	2	2	WWF087 WWF088
21	568	VZ21_DC_woodland	28.47	>100 ha	4	8	WWF073 WWF045 JH022 JH031 WWF052 JH021 JH025 JH024
22	568	VZ22_DC_openwoodland	1.3	>100 ha	1	1	WWF051
23	568	VZ23_DC_grassland	50.29	>100 ha	5	5	JH067 WWF059 JH030 JH032 WWF049

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha)	Patch size class	Minimum BAM Plot Requirement (#)	BAM Plots used in assessment (#)	BAM Plot names
24	571	VZ24_DC_openforest	14.12	>100 ha	3	3	JH010 JH09 JH012
25	571	VZ25_RC_woodland	1.36	>100 ha	1	2	WT152 WT151
26	766	VZ26_DC_sedgeland	1.18	>100 ha	1	1	WWF120
27	766	VZ27_RC_sedgeland	0.4	>100 ha	1	1	WWF056
28	965	VZ28_openforest	3.09	>100 ha	2	2	JH113 JH112
29	965	VZ29_woodland	12.21	>100 ha	3	4	WWF032 JH098 BP22 WWF041
30	965	VZ30_DC_shrubland	0.95	>100 ha	1	1	WWF043
31	965	VZ31_low_grassland	26.13	>100 ha	4	4	WT147 WWF002 BP21 WWF044
32	501	VZ32_DC_woodland	2.65	>100 ha	2	3	JH065 MA01 JH119
33	1512	VZ33_DC_woodland	0.66	>100 ha	1	1	WT138
34	970	VZ34_DC_openforest	4.6	>100 ha	2	4	JH122 WWF025 WWF005 WWF007

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha)	Patch size class	Minimum BAM Plot Requirement (#)	BAM Plots used in assessment (#)	BAM Plot names
35	970	VZ35_DC_woodland	8.44	>100 ha	3	5	BP27 WWF047 WWF026 WWF003 WWF037
36	970	VZ36_DC_grassland	42.67	>100 ha	4	4	WWF035 BP24 JH114 WWF027
37	970	VZ37_RC_woodland	0.23	>100 ha	1	1	JH124
38	1192	VZ38_RC_grassland	1.22	>100 ha	1	1	JH095
39	1192	VZ39_DC_grassland	18.02	>100 ha	3	3	MA09 WT139 BAMPlot25
40	1192	VZ40_DC_woodland	2.82	>100 ha	2	2	WWF084 WWF085
41	1194	VZ41_DC_woodland	0.93	>100 ha	1	1	WWF017
42	501	VZ42_low_grassland	6.35	>100 ha	3	3	WT144 JH120 WT145
43	568	VZ43_low_grassland	58.68	>100 ha	5	8	WWF058 JH079 WT140 JH092 WT146 WWF086 WWF065 BAMPlot19

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha)	Patch size class	Minimum BAM Plot Requirement (#)	BAM Plots used in assessment (#)	BAM Plot names
44	571	VZ44_low_grassland	26.71	>100 ha	4	5	BAMPlot5 JH070 JH116 JH073 WWF095

4.4 VEGETATION INTEGRITY SCORES

Data from the preceding sections was used to determine the current vegetation integrity score (VIS) (see Section 4.4 of the BAM), which involved the use of the equations in Appendix H of the BAM and the following condition attributes obtained from the BAM plots:

- Composition (i.e., number of native plant species by growth form);
- Structure (i.e., per cent cover of native plant species by growth form); and
- Function (i.e., habitat measures such as fallen log length, hollows, leaf litter and tree growth form stand structure).

The VIS was calculated by inputting BAM plot data (i.e., composition, structure and function values – see **Appendix D**) into vegetation zones established in the online BAM Calculator (BAM-C). The BAM-C generated calculations are summarized in **Table 4-34**. Vegetation zones in bold emphasis represent those with a VIS that fall below the specified offsetable threshold.

TABLE 4-34 VEGETATION INTEGRITY SCORES

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score
1	54.1	68	53	58
2	27.3	56.6	26.9	34.6
3	33.8	51.1	23.9	34.5
4	41	57.2	10.2	28.8
5	**29.3**	**61.1**	**0.2**	**12.1**
6	74.7	84.4	84.8	81.2
7	52	59	34.2	47.2
8	40.7	51.1	6.5	23.8
9	66.5	67.1	54.3	62.3
10	38.8	41.3	45.5	41.8
11	38.5	67.6	11.3	30.9
12	**24**	**47.8**	**1.8**	**12.7**
13	63.7	74.6	80.2	72.5
14	61	68.9	62.5	64.1
15	6.7	46.5	23.1	19.3
16	30.8	50.4	4.7	19.4
17	59.1	72.7	68.1	66.4
18	44.4	58	6.6	25.8
19	80.7	71.1	43.5	63
20	70.2	61.3	60.6	63.9
21	42.2	64	76.5	59.1
22	**8.4**	**47.6**	**3.6**	**11.3**

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score
23	42.3	53.5	3.7	20.3
24	65.2	63.1	53.5	60.4
25	63.9	58.2	95.4	70.8
26	65.2	88.6	...	76
27	49.5	16.4	...	28.5
28	35.8	65.3	67.5	54
29	22.4	52.7	10.5	23.2
30	**19.2**	**41.8**	**0**	**9.3**
31	**31.6**	**49.6**	**0.1**	**11.6**
32	66	66.8	76.1	69.5
33	81.5	60.2	41.1	58.6
34	59.4	75.7	92.5	74.6
35	38.1	79.8	82.3	63
36	**52.3**	**49.3**	**0.8**	**13.7**
37	22.3	50.6	57.5	40.2
38	36	71.1	13.7	32.7
39	38.1	64.7	1.7	16.1
40	40.8	49.9	17.2	32.7
41	58.8	64.2	91.9	70.3
42	**24.1**	**60.1**	**2.5**	**15.3**
43	**35.5**	**44.7**	**0.2**	**11.7**
44	**41.9**	**53.3**	**1.5**	**15**

Vegetation zones that have a VIS not exceeding the offsetting threshold (i.e., <15 for TECs and <17 for non-TECs) amount to an area of 208.90ha, which represents 45% of assessable vegetated lands within the Subject Land.

4.5 BIRD COMMUNITY COMPOSITION

4.5.1 HABITAT

The relatively heterogenous landform character of the Subject Land and variegated patterning in woody vegetation cover are the main factors defining bird habitat and the associated composition of the observed community. Dry sclerophyll woodlands and forests on ridgetops are separated from grassy woodlands in areas of lower relief by grasslands derived from past land clearing. Year-round water availability occurs in the form of farms dams, with ephemeral flows experienced in semi-permanent creeks.

The sparse occurrence of woody vegetation in areas of low relief (i.e., trees and/or tall shrub canopy strata) means that many bird species reliant on hollows and/or tree canopies as part of their lifecycle are likely to have a patchy distribution and limited to areas of higher VIS.

Non-passerine bird species (birds not within the order Passeriformes) are most likely to benefit from these habitat values. Species likely to be observed in areas of non-woody vegetation include raptors, quails and allies, pigeons and doves, cockatoos and parrots. If observed, non-passerine species reliant on microhabitat provided by areas of waterbodies or a tree canopy would likely be transient such as grebes, pelicans and allies, herons and allies, ducks and allies, waders and gulls, cuckoos and kingfishers. These would be observed as fly overs while moving between areas of interest.

Smaller and/or generalist passerine species most likely to be observed in the Subject Land include crows, ravens, magpies, wrens and pipits. The presence of anthropogenic features such as fence lines, posts and dams would provide localised favourable conditions for some smaller passerine species such as larks, robins, wagtails, thornbills and finches. Non-passerine granivores such as parrots would also benefit from the presence of closed depressions like farm dams.

4.5.1.1 RESIDENT RAPTOR HABITAT

As per Section 6.1.5 of the BAM, the likely habitat for resident raptor species has been determined. This aligns with broad habitat types identified across the landscape.

Several stick nests suitable for use by raptors were observed across the Subject Land, ranging between 40 cm to 1 m in width. No observations of raptors using these suitable nests were made throughout the field surveys. A White-bellied Sea-Eagle nest is known to occur in proximity to the Subject Land; however, no sightings of the species have been made within the Subject Land. Nests suitable for raptor use throughout the Subject Land are displayed in **Figure 4-5**.

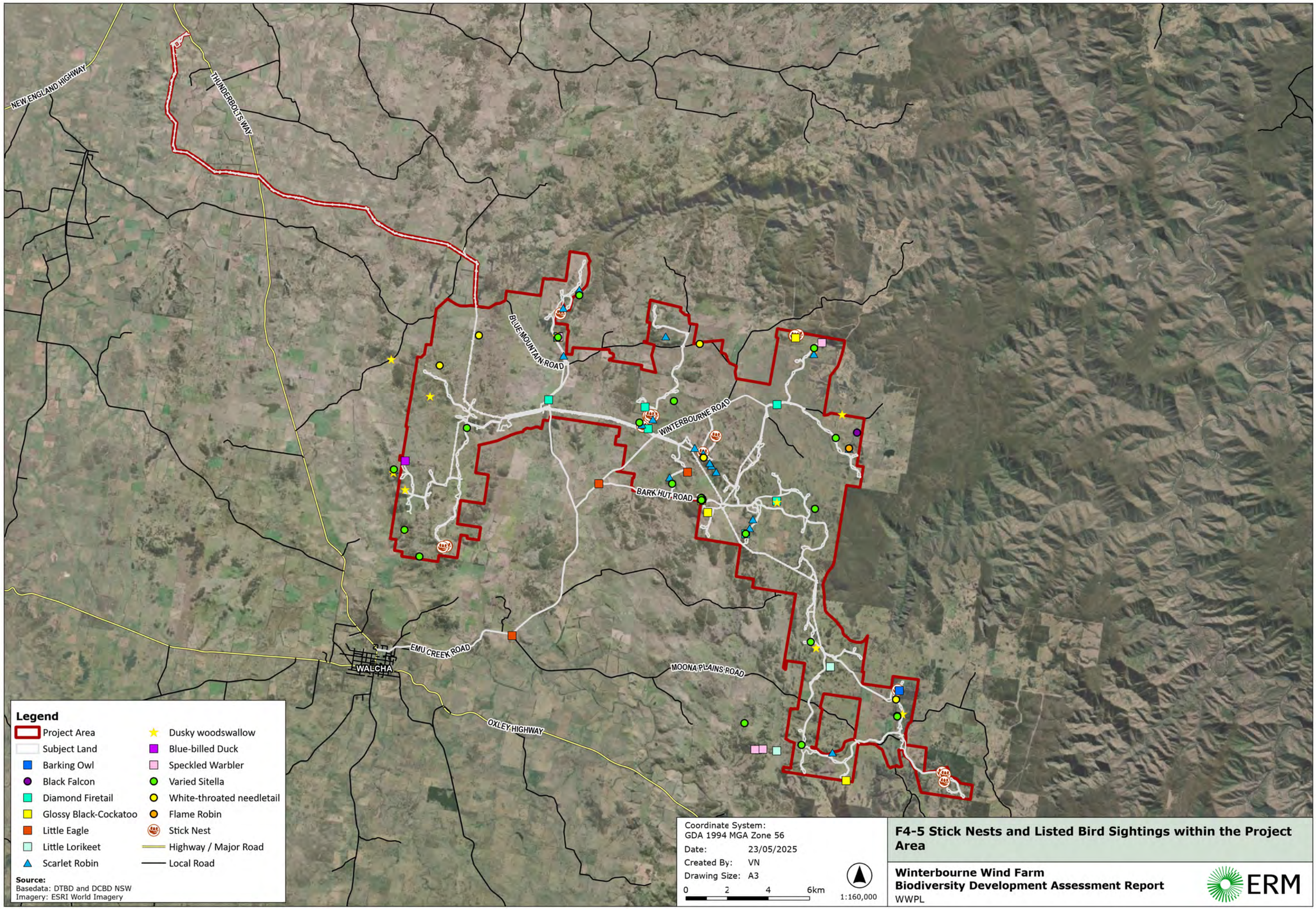
4.5.1.2 LISTED BIRD SPECIES

Threatened and/or migratory avian species observed within and in proximity to the Subject Land are detailed in **Table 4-35** and observation points are shown in **Figure 4-5**.

TABLE 4-35 THREATENED BIRD SPECIES OBSERVED

Common Name	Scientific Name	BC Act	EPBC Act	Number of Sightings
Barking Owl	*Ninox connivens*	V	-	One individual opportunistically observed outside of the breeding season.
Black Falcon	*Falco subniger*	V	-	One individual opportunistically observed perched.
Blue-billed Duck	*Oxyura australis*	V	-	Two to four males observed on a dam during surveys at BUS01 by ERM in Winter 2023.
Diamond Firetail	*Stagonopleura guttata*	V	V	Nine individuals were recorded by Nature Advisory at BUS3 during the Summer 2022 survey.

Common Name	Scientific Name	BC Act	EPBC Act	Number of Sightings
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	One to five individuals observed at multiple BUS locations over multiple seasons
Flame Robin	*Petroica phoenica*	V	-	One individual observed at BUS5 by ERM in Spring 2023
Little Eagle	*Hieraaetus morphnoides*	V	-	Two incidental observations made by Nature Advisory, one within the Project Area and one in proximity to the Project Area.
Scarlet Robin	*Petroica boodang*	V	-	One to four individuals observed at multiple BUS locations and opportunistically over multiple surveys by ERM.
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	V	V	Opportunistically observed and two individuals detected by Nature Advisory at BUS7 during Autumn 2021 surveys. Evidence of foraging observed in proximity to suitable breeding habitat.
Speckled Warbler	*Chthonicola sagittata*	V	-	Four individuals observed at BUS3 by Nature Advisory in Autumn 2021.
Varied Sitella	*Daphoenositta chrysoptera*	V	-	Between 3 and 12 individuals were observed at multiple locations across multiple seasons.
White-throated Needletail	*Hirundapus caudacutus*	V	V, Mi	Nine individuals opportunistically observed flying between 40 and 60 m high in a south-easterly direction.



F4-5 Stick Nests and Listed Bird Sightings within the Project Area

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4.6 BAT COMMUNITY COMPOSITION

Extensive deployment of bat detectors was undertaken to sample microbat presence over all seasons. Data from devices deployed between September and October 2020 were analysed by Balance! Environmental. Data from devices deployed between May 2023 and June 2023 and from continuous monitoring at met masts between May 2023 and April 2025 were analysed by Green Tape Solutions. Data from devices deployed between September and November 2023 were analysed by Lachlan McRae Fauna Services.

The four bat call analysis report are attached as **Appendix F**. Across the survey periods, a total of 21 species or species groups have been identified, with the confidence in the species identification ranked as either 'definite', 'probable' or 'possible'. As a precautionary approach, all levels of identification confidence have been treated as confirmation of species presence.

Potential calls of two listed threatened species not able to be distinguished by calls (*Nyctophilus corbeni* and *Micronomus norfolkensis*) have been detected with identification confidence of 'potential'. Based on updated species distribution models sourced from the Australasian Bat Society – BatMap, the Project Area is beyond the predicted distribution of both species (Australasian Bat Society, 2023).

M. norfolkensis is most likely to occur east of the Great Dividing Range and, while individuals have been detected further inland, the species is largely associated with coastal habitats. Contrastingly, *N. corbeni* is an inland species predicted to occur west of the town of Bendemeer approximately 43 km west from the Project Area. Calls assigned to *Nyctophilus spp.* cannot be confidently identified to species level, with physical trapping to identify the species within this genus. Given the Project Area is outside the known range of *N. corbeni* identification by way of physical trapping has not been undertaken within the Project Area; however, the species have been retained in this assessment as a conservative approach to collision risk. Vagrant individuals outside of this mapped distribution may still interact with the proposed development and consequently be at risk of collision; however, this is expected to be rare.

TABLE 4-36 BAT CALL ANALYSIS RESULTS

Scientific Name	Common Name	BC Act	EPBC Act	Confirmed Presence
Austronomus australis	White-striped Freetail Bat	-	-	Definite
Chalinolobus gouldii	Gould's Wattled Bat	-	-	Definite
Chalinolobus morio	Chocolate Wattled Bat	-	-	Definite
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Probable
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Possible
Miniopterus australis	Little Bent-winged Bat	V	-	Possible
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Definite
Myotis macropus	Southern Myotis	V	-	Possible
Nyctophilus corbeni, Nyctophilus geoffroyi, or *Nyctophilus gouldi*	Corben's Long-eared Bat, Lesser Long-eared Bat, or Goulds Long-eared Bat	-	-	Possible
Ozimops planiceps	South-eastern Freetail Bat	-	-	Possible

Scientific Name	Common Name	BC Act	EPBC Act	Confirmed Presence
Ozimops ridei	Ride's Free-Tailed Bat	-	-	Possible
Rhinilophus megaphyllus	Smaller Horseshoe Bat	-	-	Definite
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Definite
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Probable
Scotorepens balstoni	Inland Broad-nosed Bat	-	-	Possible
Scotorepens orion	Eastern Broad-nosed Bat	-	-	Probable
Scotorepens spp.	-	-	-	Probable
Vespadelus darlingtoni	Large Forest Bat	-	-	Definite
Vespadelus regulus	Southern Forest Bat	-	-	Probable
Vespadelus troughtoni	Eastern Cave Bat	V	-	Probable
Vespadelus vulturnus	Little Forest Bat	-	-	Possible

Of the 21 species or species groups identified through the bat call analysis, eight species are listed as threatened species under the BC Act. None of the species are listed under the EPBC Act.

Of the eight BC Act listed species:

- One is assessed as a species credit species identified as a candidate species in the BAM-C (*Myotis macropus*) and a species polygon is required for the determination of impacts and offsets;
- Four are ecosystem credit species identified in the BAM-C, including:
  - *Falsistrellus tasmaniensis;*
  - *Scoteanax rueppellii*;
  - *Miniopterus orianae oceanensis;* and
  - *Saccolaimus flaviventris.*
- Three are additional species not identified in the BAM-C, including:
  - *Micronomus norfolkensis* (ecosystem credit species);
  - *Vespadelus troughtoni* (species credit species); and
  - *Miniopterus australis* (dual credit species).

These results provide a preliminary assessment of bat community composition across the broader Project Area. Further assessment will be undertaken pre-construction, as well as throughout operation of the Project, with ongoing impacts to bat community composition to be assessed further in the BBAMP in relation to the baseline data presented in this BDAR.

4.6.1 ANALYSIS OF MONITORING DATA

Ongoing passive recording of bat calls from devices attached to three met masts was completed between May 2023 and April 2025 with omnidirectional microphones set at heights of 2 m (n=1), 30 m (n=3) and 70 m (n=1) to allow for further investigation of bat utilisation at heights considered at risk of collision, and changes to site level utilisation in relation to weather, time and season.

Analysis was undertaken by Green Tape Solutions with the full report provided in **Appendix F** of this Updated BDAR.

A summary of the total number of bat calls recorded for each species at each of the three height treatments is provided in **Table 4-37**. Activity and diversity were highest at 2 m with all but one species group detected. Activity at both 30 m and 70 m was driven largely by four species/species groups (*Austronomus australis, Ozimops planiceps/Ozimops ridei, Ozimops ridei/Micronomus norfolkensis,* and *Saccolaimus flaviventris*) with activity being higher at 70 m than at 30 m.

TABLE 4-37 NUMBER OF TOTAL CALLS PER SPECIES ACROSS THREE HEIGHT TREATMENTS

Species	Feeding Guild*	2 m	30 m	70 m	Species Total
Austronomus australis	High-flying	2665	651	4544	7860
Chalinolobus gouldii	Canopy-foraging	1557	306	84	1947
Chalinolobus morio	Canopy-foraging	959	0	0	959
Falsistrellus tasmaniensis or Scotorepense orion	Canopy-foraging	1517	7	27	1551
Falsistrellus tasmaniensis or Scotorepense orion or Scoteanax rueppellii	Canopy-foraging	0	8	0	8
Miniopterus australis	Canopy-foraging	10	0	0	10
Miniopterus orianae oceanensis	Canopy-foraging	15	0	0	15
Miniopterus orianae oceanensis or Vespadelus darlingtoni	Canopy-foraging	202	3	6	211
Myotis macropus	Canopy-foraging	34	0	0	34
Myotis macropus or Nyctophilus spp	Canopy-foraging	12	0	0	12
Nyctophilus spp	Canopy-foraging	92	0	4	96
Ozimops planiceps	High-flying	9	0	0	9
Ozimops planiceps or Ozimops ridei	High-flying	4143	424	1141	5708
Ozimops ridei	High-flying	604	0	0	604
Ozimops ridei or Micronomus norfolkensis	High-flying	2193	461	1417	4071
Rhinolophus megaphyllus	Canopy-foraging	6	0	0	6
Saccolaimus flaviventris	High-flying	925	728	2907	4560
Scoteanax rueppellii or Scotorepens orion	Canopy-foraging	1	0	0	1
Scotorepens balstoni	Canopy-foraging	25	0	0	25

Species	Feeding Guild*	2 m	30 m	70 m	Species Total
Scotorepens orion	Canopy-foraging	53	0	1	54
Vespadelus darlingtoni	Canopy-foraging	955	18	22	995
Vespadelus darlingtoni or Vespadelus vulturnus or Vespadelus regulus	Canopy-foraging	278	2	2	282
Vespadelus pumilus	Canopy-foraging	670	0	0	670
Vespadelus regulus	Canopy-foraging	1	0	0	1
Vespadelus troughtoni	Canopy-foraging	19	0	0	19
Vespadelus troughtoni or Vespadelus pumilus	Canopy-foraging	739	7	33	779
Total Calls Across Species		17684	2615	10188	30488

*Foraging guilds have been determined based on known behaviors sourced from the following citations: (Churchill S. , 2008; Menkhorst & Knight, 2011; Strahan, 2023)

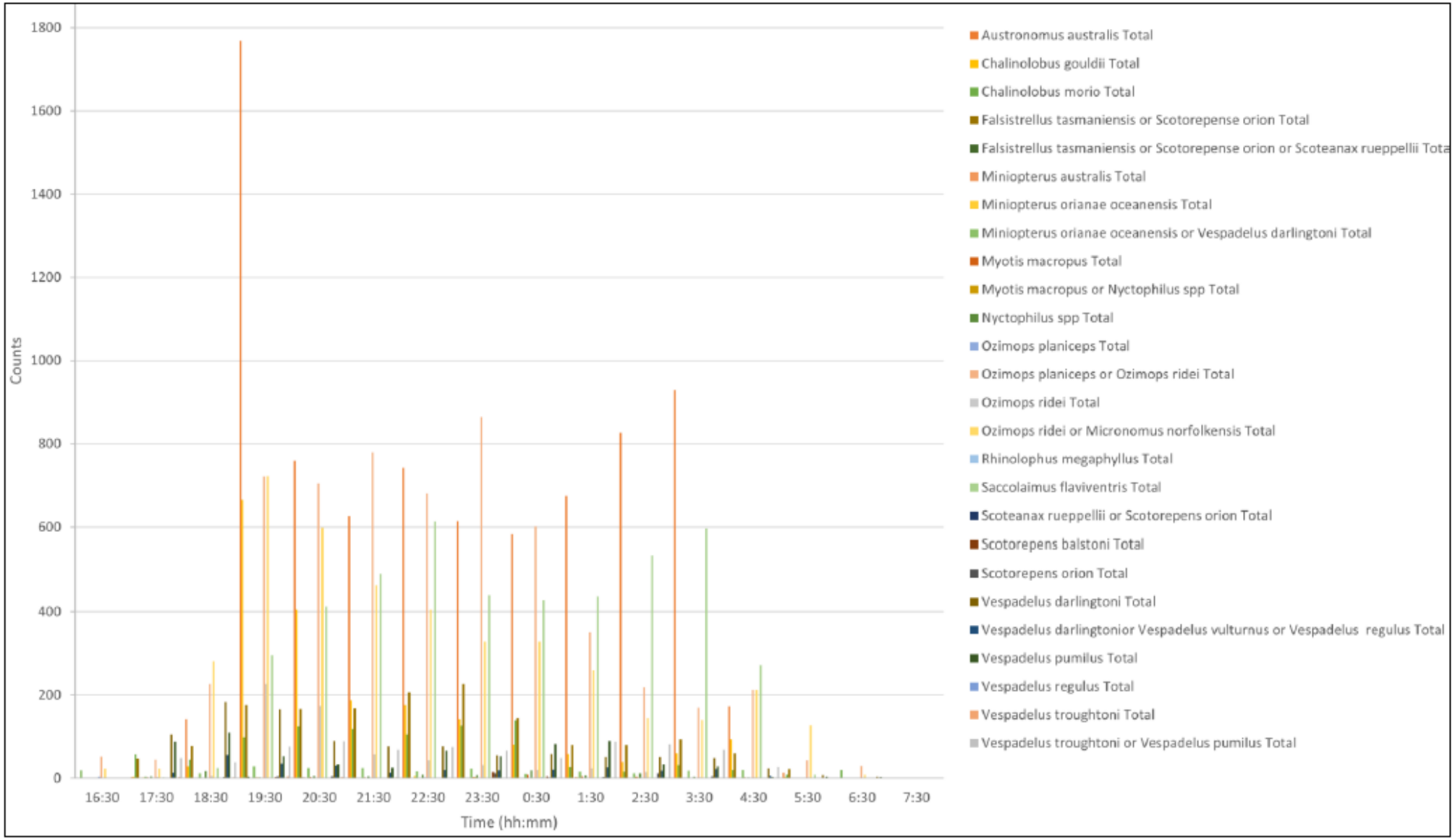
4.6.1.1 BAT ACTIVITY ACROSS TIME RANGES

The total cumulative number of calls recorded across the sample period at different time ranges has been analyzed for each unique species or species group and is presented in **Chart 4-3**. For those species with high utilisation rates – White-striped freetail bat (*Austronomus australis*), Gould's Wattled Bat (*Chalinolobus gouldii*), Little Bent-wing Bat (*Miniopterus australis*), and Large Bent-wing bat (*Miniopterus orianae oceanensis*) – as inferred from high numbers of calls, activity levels were present throughout the night. Peak nightly activity periods were observed approximately two to three hours after sunset and before sunrise. While activity levels were still present between these periods, call numbers steadily declined following initially high activity before reaching the lowest levels of activity at approximately 12am.

Activity for the Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) was low in the hours immediately preceding sunset with utilisation levels peaking at approximately 11:30pm. Slight reductions in call numbers were observed in the early hours of the morning (between 12am and 1:30am) with another peak in activity occurring at approximately 3:30am.

For those species where total call numbers are low, the potential influence of time on utilisation rates is unclear. Apparent utilisation peaks occur in the immediate hours post sunset and is consistent with reported bat activity within the literature (Scanlon & Petit, 2008; Milne, Fisher, Rainey, & Pavey, 2005; Turbill, 2008). However, apparent trends in utilisation may simply be a result of low numbers of detections influenced by the availability of suitable habitat or low regional populations.

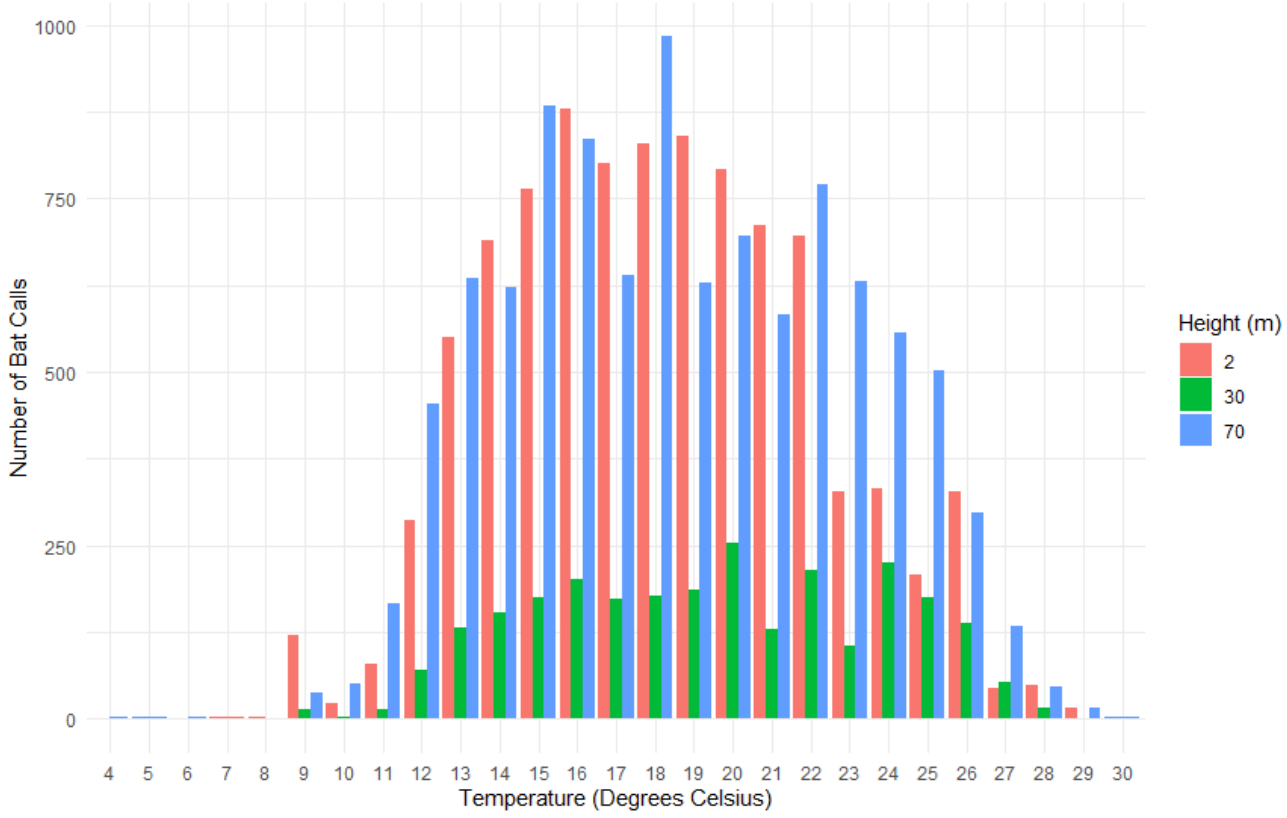
CHART 4-3 TIME RANGE AND TOTAL NUMBER OF CALLS FOR ALL MICROBAT SPECIES



4.6.1.2 CHANGES IN MONTHLY ACTIVITY FOR THREATENED BATS

Activity of threatened bats within the Project Area was found to undergo large fluctuations between months. While seasonal variations in activity are species and climate dependent (Turbill, 2008; Gonsalves & Law, 2018), reductions in activity during winter months are common in temperate climates where individuals will undergo bouts of torpor with periodic arousal, sometimes coinciding with warmer weather (Turbill, 2008). **Chart 4-4** shows the relationship between the number of total calls and changes in temperature. Peak activity occurred between 12 ˚C and 26 ˚C showing that changes in nighttime temperature to either seasonal extreme resulted in a reduction in activity across all height treatments.

CHART 4-4 TOTAL BAT CALLS IN RELATION TO TEMPERATURE

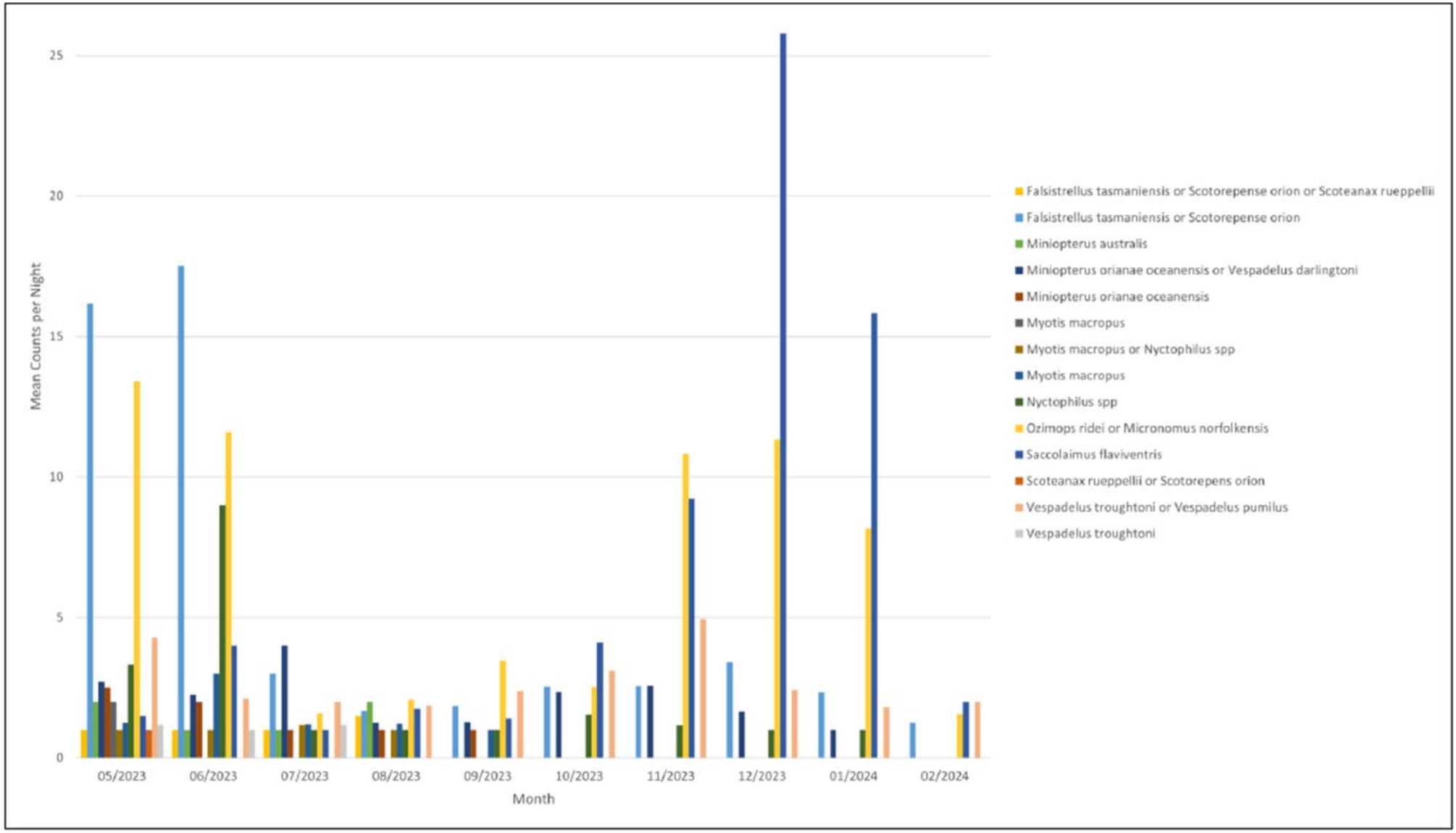


Seasonal movements between maternal and overwintering roosts are also known although poorly understood (McKenzie & Muir, 2000). Nightly activity levels between months observed within the Project Area reflects these seasonal variations. Activity was highest in Summer and Autumn driven largely by very high observed nightly activity of the *F. tasmaniensis/S. orion/S. ruepellii, F. tasmaniensis/S.orion,* and *M. orianae oceanensis/ V. darlingtonia* species groups. While confirmation of species cannot be made for *Nyctophilus* from acoustic detections alone, activity was largely consistent throughout the seasons with mean counts per night of approximately one though counts rose sharply in the month of June to nine mean calls per night. It is unclear to what extent this is the result of an increase in the activity of the threatened *N. corbeni*; however, does coincide with the known mating periods for the species and so sharp increases in utilisation may be a result of higher activity associated with breeding season (Menkhorst & Knight, 2011).

The occurrence of some threatened species and species groups is seasonal within the Project Area as indicated in **Chart 4-5**. Bat diversity of threatened species was highest between May and August with all 14 species and species groups present in May, albeit with low mean nightly counts for some species. Diversity was largely reduced between October and February and likely corresponds with seasonal nomadic movements of species.

While confirmation of species presence of *Vespadelus troughtoni* is not possible from acoustic analysis alone, probable calls were only detected between the months of May and July with a mean calls per night of approximately one. Similarly, *Miniopterus australis* was only detected between the months of May and August. Seasonal microbat movements are poorly understood for Australian species and fluctuations in species activity may be a result of temporal changes in temperature and/or insect abundance and is likely to be site and species dependent. Collision risk to threatened bat species is likely to be highest during periods of peak utilisation, however as described in **Section 7.3.4** such risk is expected to be low given the canopy foraging behaviour of the majority of the identified threatened species. Of the threatened species recorded in the Project Area, only *Saccolaimus flaviventris* is a high-flying species.

CHART 4-5 MEAN NIGHTLY ACTIVITY PER MONTH FOR EACH THREATENED SPECIES



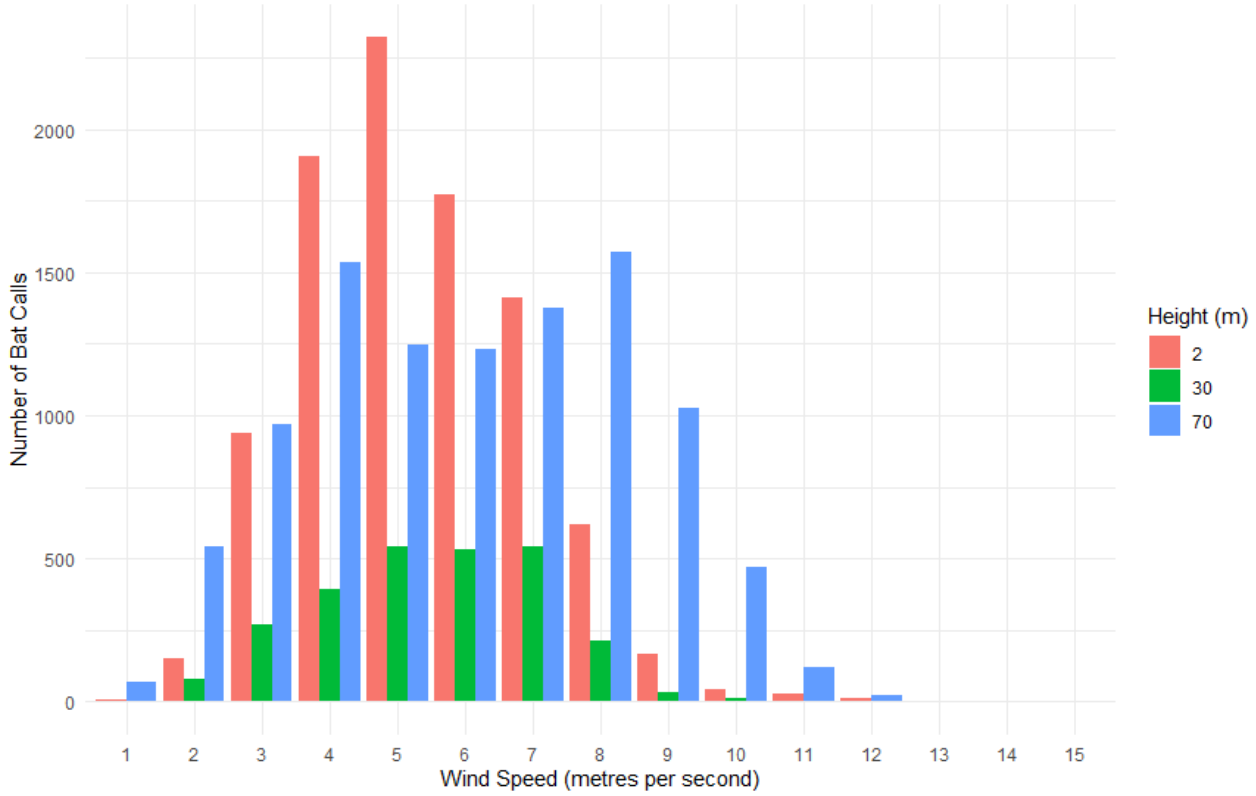
4.6.1.3 EFFECTS OF WEATHER CONDITIONS ON MICROBAT UTILISATION

Microbat activity at a site level is known to be influenced by wind speeds with bat activity reported to be generally higher at lower wind speeds (Arnett & Baerwald, 2013; Cryan, et al., Behaviour of bats at wind turbines, 2014; Hein & Schirmacher, 2016). The relationship between bat activity within the Project Area and wind speed has been investigated using microbat acoustic data and wind speed data collected from met masts between September 2023 and April 2024. Anabat data was collected across the same three height treatments (2 m, 30 m and 70 m), while wind speed data from two height treatments was selected to best align with the deployment heights of the anabat recorders (wind speed at 37 m was compared against 2 m and 30 m bat treatments, while wind speed at 77 m was compared against the 70 m bat treatment). Due to device errors, recordings at 70 m were only available from two of the three met masts sampled.

Chart 4-6 shows the number of total bat calls recorded by height in relation to increasing wind speed classes. Bat activity across all three height treatments were highest between 0 and 8 m/s with peaks in activity occurring at approximately 5 m/s. Declines in activity are present in both the 2 m and 30 m heights once wind speeds reach 7 m/s with that total number of calls in both treatments reduced to very low occurrences once wind speeds reach over 9 m/s. While the total calls observed at 70 m show clear declines in relation to increasing wind speeds, these declines are not present until 9 m/s from which there is a sharp decline in total calls before reaching very low to almost zero at wind speeds greater than 11 m/s. Bat activity is expected to decline as wind speeds reach greater than 6 m/s (Ellerbrok, Farwig, Peter, & Voigt, 2024; Hein & Schirmacher, 2016); however, the high activity at 70 m observed at wind speeds between 6 and 9 m/s are higher than those previously recorded.

A. australis, O. planiceps, O. ridei, and *S. flaviventris* are known to exhibit powerful flight patterns often at height (Churchill S. , 1998) and are the dominant likely drivers of high activity at 70 m. While specific drivers of high-altitude flights are not likely to be identified from acoustic calls alone, the morphology and flight behaviours of the species may increase their tolerance to higher wind speeds during foraging and/or dispersal flights and subsequently may result in higher collision risks from the Project (see **Section 7.3.4**).

CHART 4-6 TOTAL BAT CALLS ACROSS THREE HEIGHT TREATMENTS AGAINST WIND SPEED



While dispersal movement may occur at heights within the rotor swept area (RSA) for all species regardless of foraging guild, the risk of collision and/or barotrauma is likely to be highest during foraging activities. Two broad foraging guilds have been established to allow for comparative analysis of activity between species. For this assessment, 'Canopy Foraging' species refers to those species known or likely to forage at heights either just above or below the canopy including very low foraging species such as *Myotis macropus,* whereas 'High-flying' species refers to those species known to engage in high-altitude foraging and/or flight behaviours.

Activity levels of 'high-flying' (**Chart 4-7**) species largely mirrors trends in **Chart 4-6**. 'Canopy-foraging' species (**Chart 4-8**) were predominantly active at 2 m with few calls detected at the 30 m and 70 m height treatments. Total calls were also found to be more heavily influenced by increasing wind speeds with peak activity observed in wind speeds up to 6 m/s before steadily declining. These findings are more in line with the declines in bat activity in relation to wind speed observed in previous studies and provides further evidence for the influence of morphological and behavioural traits when considering potential collision and/or barotrauma risks.

CHART 4-7 TOTAL CALLS OF 'HIGH-FLYING' BATS IN RELATION TO WIND SPEED

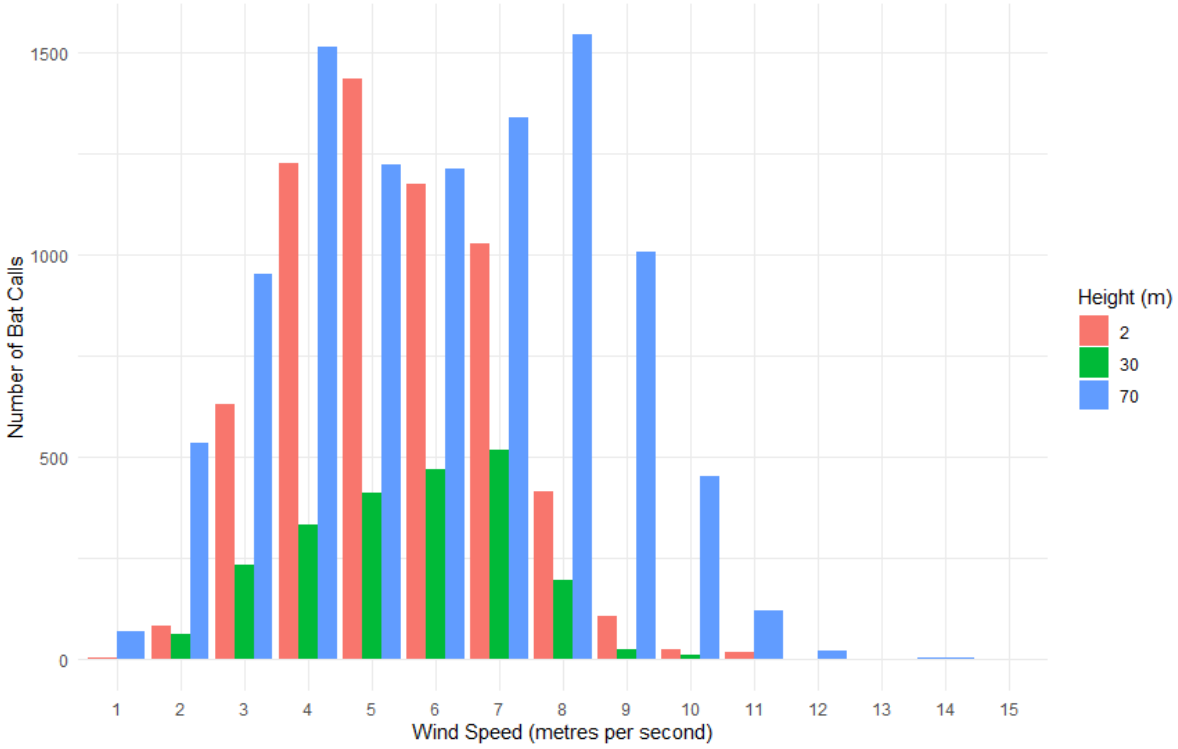
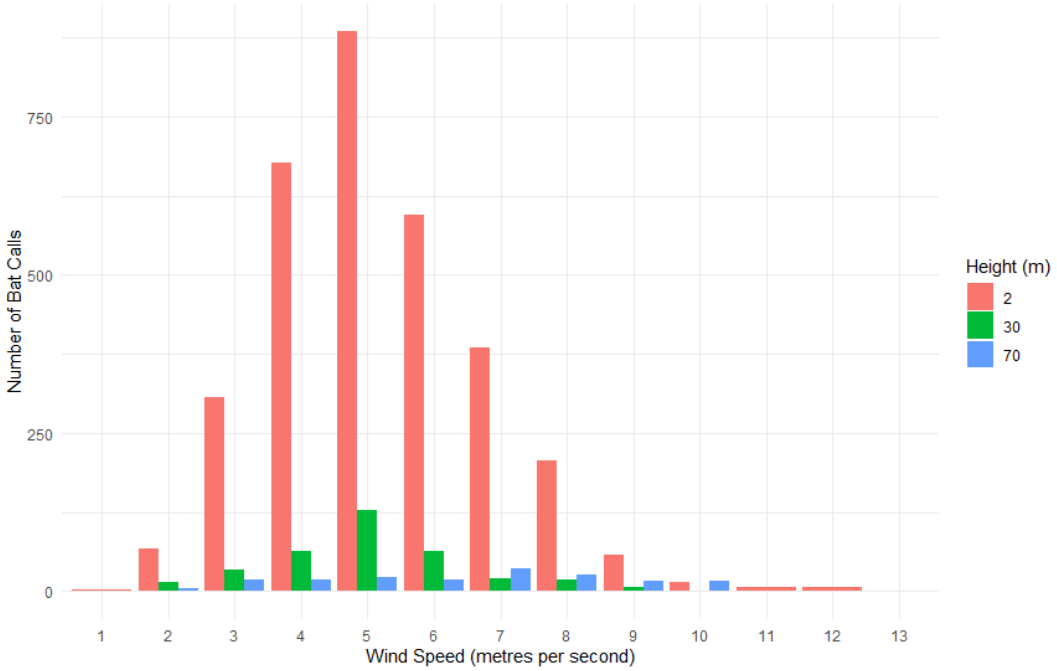


CHART 4-8 TOTAL CALLS OF 'CANOPY-FORAGING' BATS IN RELATION TO WIND SPEED



5. HABITAT SUITABILITY FOR THREATENED SPECIES

5.1 HABITAT SUITABILITY

Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. The TBDC identifies the threatened species assessed for ecosystem credits. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.

'Species credit species', also referred to as 'candidate species', are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence. These species are identified in the TBDC. A targeted survey or an expert report is required to confirm the presence or absence of these species on the Subject Land. Alternatively, for a development, activity, clearing or biodiversity certification proposal only, the Applicant may elect to assume the species is present.

In some circumstances the TBDC may identify a threatened species that requires assessment for ecosystem credits and species credits (referred to as dual credit species). For dual credit species, part of the habitat is assessed as a species credit (e.g., breeding habitat or land mapped on an important habitat map for a species). The remaining habitat components for the species are assessed as an ecosystem credit (e.g., foraging habitat).

For a small number of threatened species, a habitat constraint may refer to a mapped location (Important Mapped Area) that identifies areas that are considered important for those species. Maps currently available relevant to the Subject Land include important mapped areas for breeding of the Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*). These maps have been reviewed and it has been determined that the Subject Land does not form part of the important habitat mapping for these species.

The following sections identify the ecosystem credit species, species credit species and dual credit species relevant to this BDAR.

5.1.1 ECOSYSTEM CREDIT SPECIES

The ecosystem credit species predicted to occur on or use the Subject Land as advised by the BAM-C are listed in **Table 5-1**. No ecosystem credit species have been excluded from further assessment.

TABLE 5-1 PREDICTED ECOSYSTEM CREDIT SPECIES

Common name	Scientific name	Listing status		Species retained for further assessment	Associated PCT	Sensitivity to gain class
		BC Act	EPBC Act			
Barking Owl (Foraging)	*Ninox connivens*	V	-	Yes	510, 533, 534, 565, 567, 568, 571, 965, 970, 1194	High
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	Yes	766	Moderate
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus picumnus*	V	V	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Diamond Firetail	*Stagonopleura guttata*	V	V	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	Moderate
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	Yes	510, 533, 534, 565, 567, 568, 571, 766, 965, 970, 1194	Moderate
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Flame Robin	*Petroica phoenicea*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	Moderate
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Grey-headed Flying-fox (Foraging)	*Pteropus poliocephalus*	V	V	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Hastings River Mouse	*Pseudomys oralis*	E	E	Yes	965, 970	High
Large Bent-winged Bat (Foraging)	*Miniopterus orianae oceanensis*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Little Eagle (Foraging)	*Hieraaetus morphnoides*	V	-	Yes	510, 533, 534, 565, 567, 568, 766, 965, 970, 1194	Moderate

Common name	Scientific name	Listing status		Species retained for further assessment	Associated PCT	Sensitivity to gain class
		BC Act	EPBC Act			
Little Lorikeet	*Glossopsitta pusilla*	V	-	Yes	510, 533, 534, 567, 571, 965, 970, 1194	High
Masked Owl (Foraging)	*Tyto novaehollandiae*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
New Holland Mouse	*Pseudomys novaehollandiae*	V	V	Yes	533, 567	High
Olive Whistler	*Pachycephala olivacea*	V	-	Yes	1194	Moderate
Painted Honeyeater	*Grantiella picta*	V	V	Yes	510, 533, 534, 565, 567, 568, 571, 965, 970, 1194	Moderate
Powerful Owl (Foraging)	*Ninox strenua*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Regent Honeyeater (Foraging)	*Anthochaera phrygia*	CE	CE	Yes	510, 567, 571, 970	High
Scarlet Robin	*Petroica boodang*	V	-	Yes	510, 533, 534, 565, 567, 568, 766, 965, 970, 1194	Moderate
Sooty Owl (Foraging)	*Tyto tenebricosa*	V	-	Yes	565	High
South-eastern Glossy Black-Cockatoo (Foraging)	*Calyptorhynchus lathami lathami*	V	V	Yes (in part) Absence of foraging resources in selected PCTs	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
South-eastern Hooded Robin	*Melanodryas cucullata cucullata*	E	E	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	Moderate
Speckled Warbler	*Chthonicola sagittata*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Spotted Harrier	*Circus assimilis*	V	-	Yes	533, 567, 766	Moderate

Common name	Scientific name	Listing status		Species retained for further assessment	Associated PCT	Sensitivity to gain class
		BC Act	EPBC Act			
Spotted-tail Quoll	*Dasyurus maculatus*	V	E	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Square-tailed Kite (Foraging)	*Lophoictinia isura*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	Moderate
Swift Parrot (Foraging)	*Lathamus discolor*	E	CE	Yes	510, 533, 534, 565, 567, 568, 571, 965, 970, 1194	Moderate
Varied Sittella	*Daphoenositta chrysoptera*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	Moderate
White-bellied Sea-Eagle (Foraging)	*Haliaeetus leucogaster*	V	-	Yes	510, 533, 534, 565, 567, 568, 571, 965, 970	High
White-throated Needletail	*Hirundapus caudacutus*	-	V, Mi	Yes	510, 533, 534, 565, 567, 568, 571, 766, 965, 970, 1194	High
Yellow-bellied Glider	*Petaurus australis*	V	V	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194	High
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	Yes	510, 533, 534, 565, 567, 568, 766, 965, 970, 1194	High

5.1.2 SPECIES CREDIT SPECIES

The species credit species (candidate species) identified by the BAM-C are listed in **Table 5-2** and **Table 5-3**.

TABLE 5-2 FLORA CANDIDATE SPECIES

Common Name	Scientific Name	Listing status		Species retained for further assessment	Associated PCTs
		BC Act	EPBC Act		
Narrow-leaved Bertya	*Bertya ingramii*	E	E	No	567
Granite Boronia[31]	*Boronia granitica*	V	E	No	567, 970
Pygmy Cypress Pine	*Callitris oblonga*	V	V	Yes	533, 534, 567, 965, 970
Bird Orchid	*Chiloglottis anaticeps*	E	E	Yes	965, 970, 1192, 1194
Barrington Tops Ant Orchid	*Chiloglottis platyptera*	V	-	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	Yes	533, 1194
Bluegrass	*Dichanthium setosum*	V	V	Yes	501, 510, 534, 567
	Diuris eborensis	E	E	*	-
Small Snake Orchid	*Diuris pedunculata*	E	E	Yes	501, 510, 533, 534, 567, 965, 970, 1192, 1194
Northern Blue Box	*Eucalyptus magnificata*	E	-	Yes	510, 533, 534, 567, 965, 970, 1192, 1194
Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	V	V	Yes	510, 533, 534, 565, 567, 568, 965, 970
Small-fruited Mountain Gum	*Eucalyptus oresbia*	V	-	Yes	501
-	*Euphrasia arguta*	CE	CE	Yes	510, 533, 534, 567, 568, 965, 1192, 1194
Polblue Eyebright	*Euphrasia ciliolata*	V	-	Yes	534, 568, 766, 965, 970, 1194
Beadle's Grevillea	*Grevillea beadleana*	E	E	Yes	567
Tall Velvet Sea-berry	*Haloragis exalata* subsp. *velutina*	V	V	Yes	567, 568, 965, 970

[31] Species additional to BAM-C (EPBC Act species)

Common Name	Scientific Name	Listing status		Species retained for further assessment	Associated PCTs
		BC Act	EPBC Act		
Hawkweed[31]	*Picris evae*	V	V	*	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Singleton Mint Bush	*Prostanthera cineolifera*	V	V	Yes	510, 965, 970
Elegant Greenhood	*Pterotylis elegans*	V	-	Yes	510, 965, 970, 1194
Scrub Turpentine	*Rhodamnia rubescens*	CE	CE	No[32]	-
Montane Green Five-corners[31]	*Styphelia perileuca*	E	E	*	965, 970, 1192, 1194
Broad-leaved Pepperbush	*Tasmannia purpurascens*	V	-	Yes	534, 1194
Austral Toadflax	*Thesium australe*	V	V	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194

TABLE 5-3 FAUNA CANDIDATE SPECIES

Common name	Scientific name	Listed status		Retained for further assessment	Dual credit species	Associated PCTs
		BC Act	EPBC Act			
Tusked Frog population in the Nandewar and New England Tableland Bioregions	*Adelotus brevis* – endangered population	EP	-	No	N/A	510, 533, 534, 567, 766
Rufous Bettong	*Aepyprymnus rufescens*	V	-	No	No	510, 533, 534, 565, 567, 568, 965, 970, 1194
Regent Honeyeater (Breeding)	*Anthochaera phrygia*	CE	CE	No	Yes	510, 567, 571, 970
Bush Stone-curlew	*Burhinus grallarius*	E	-	No	No	510, 533, 534, 567, 965, 970, 1192, 1194

[32] Excluded as species is a vagrant AND appeared in BAM-C two days before finalisation (see cl6.31 of the BC Regs)

Common name	Scientific name	Listed status		Retained for further assessment	Dual credit species	Associated PCTs
		BC Act	EPBC Act			
South-eastern Glossy Black-Cockatoo (Breeding)	*Calyptorhynchus lathami lathami*	V	V	Yes	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	No	No	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	E	No	No	510, 533, 534, 565, 567, 568, 965, 970, 1194
White-bellied Sea-Eagle (Breeding)	*Haliaetus leucogaster*	V	-	No	Yes	501, 510, 533, 534, 565, 567, 568, 571, 965, 970
Little Eagle (Breeding)	*Hieraaetus morphnoides*	V	-	No	Yes	510, 533, 534, 565, 567, 568, 766, 965, 970, 1192, 1194
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	No	No	510, 533, 534, 567, 965, 970, 1192, 1194
Swift Parrot (Breeding)	*Lathamus discolor*	E	CE	No	Yes	510, 533, 534, 565, 567, 568, 571, 965, 970, 1194
Booroolong Frog	*Litoria booroolongensis*	E	E	No	No	533, 534, 565, 567, 568, 965, 970, 1194
Davies' Tree Frog	*Litoria daviesae*	V	V	No	No	510, 533, 565, 567, 568, 766, 965, 970, 1194
Glandular Frog	*Litoria subglandulosa*	V	V	No	No	533, 534, 565, 567, 568, 766, 965, 970, 1192, 1194
Square-tailed Kite (Breeding)	*Lophoictinia isura*	V	-	No	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Southern Myotis	*Myotis macropus*	V	-	Yes	No	510, 533, 534, 565, 567, 568, 571, 766, 965, 970, 1194
Large Bent-winged Bat (Breeding)	*Miniopterus orianae oceanensis*	V	-	No	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1194

Common name	Scientific name	Listed status		Retained for further assessment	Dual credit species	Associated PCTs
		BC Act	EPBC Act			
Barking Owl (Breeding)	*Ninox connivens*	V	-	Yes	Yes	501, 510, 533, 534, 565, 567, 568, 571, 965, 970, 1192, 1194
Powerful Owl (Breeding)	*Ninox strenua*	V	-	No	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Southern Greater Glider	*Petauroides volans*	E	E	Yes	No	510, 567, 568, 965, 970, 1192, 1194
Squirrel Glider	*Petaurus norfolcensis*	V	-	Yes	No	510, 533, 534, 565, 567, 568, 965, 1194
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	No	No	510, 567, 568, 965, 970, 1194
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	No	No	510, 533, 534, 565, 567, 568, 965, 970
Koala (Breeding)	*Phascolarctos cinereus*	E	E	Yes	Yes	501, 510, 533, 534, 565, 567, 568, 571, 965, 970, 1192, 1194
Grey-headed Flying-fox (Breeding)	*Pteropus poliocephalus*	V	V	No	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Masked Owl (Breeding)	*Tyto novaehollandiae*	V	-	No	Yes	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Sooty Owl (Breeding)	*Tyto tenebricosa*	V	-	No	Yes	565
Eastern Cave Bat	*Vespadelus troughtoni*	V	-	Yes	No	510, 533, 534, 565, 567, 568, 965, 970, 1192, 1194
Additional Species for Consideration						
Northern Long-nosed Potoroo	*Potorous tridactylus tridactylus*	V	V	Yes	No	965

5.1.3 EXCLUDED THREATENED SPECIES

Modification to the BAM-C generated list is appropriate where one or more of the following factors is relevant to the species:

- Disturbance;
- Vagrancy;
- Geographical limitations;
- Absence of habitat constraints; and
- Clause 6.31 of the *Biodiversity Conservation Regulation 2017* (Designated period).

Seven species have been excluded from the assessment as outlined below:

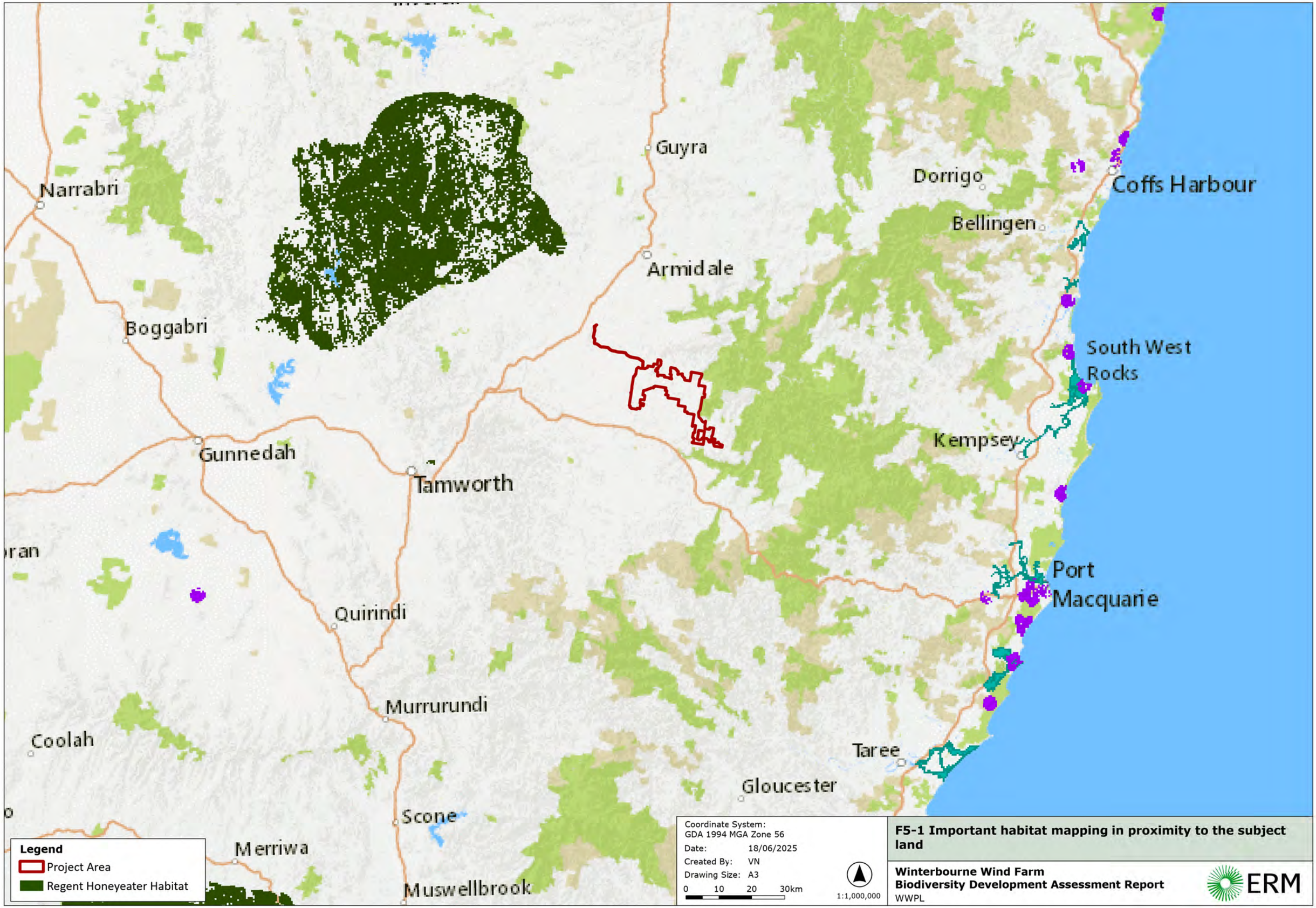
- Two species excluded based on the absence of Important Mapped Areas for the species across the Subject Land (**Figure 5-1**) as listed below:
  - Regent Honeyeater (*Anthochaera phrygia*); and
  - Swift Parrot (*Lathamus discolor*).
- Eight species excluded based on TBDC listed habitat constraints:
  - Narrow-leaved Bertya (*Bertya ingramii*);
  - Brush-tailed Rock-wallaby (*Petrogale penicillata*);
  - Brush-tailed Phascogale (*Phascogale tapoatafa*);
  - Large Bent-winged Bat (*Miniopterus orianae oceanensis*);
  - Little Bent-winged Bat (*Miniopertus australis*); and
  - Large-eared Pied-bat (*Chalinolobus dwyeri*).
- One species was excluded as it appeared in the BAM-C on the day of credit report finalization:
  - Scrub Turpentine (*Rhodamnia rubescens*).

Justification for the exclusion of threatened species in this assessment is provided in **Table 5-4**.

TABLE 5-4 JUSTIFICATION FOR EXCLUSION

Common Name	Scientific Name	Justification for Exclusion
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	Habitat constraints – No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding present within the Subject Land
Little Bent-winged Bat	*Miniopterus australis*	Habitat constraints – No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding present within the Subject Land
Large-eared Pied-bat	*Chalinolobus dwyeri*	Habitat constraints – No rocky areas containing caves, overhangs, escarpments, outcrops, crevices, old mines or tunnels present within the Subject Land
Narrow-leaved Bertya	*Bertya ingramii*	Habitat constraints – No cliffs, escarpments or rocky areas present within the Subject Land
Brush-tailed Phascogale	*Phascogale tapoatafa*	Geographic constraint – west of Tia River. Decision supported by BioNet records.

Common Name	Scientific Name	Justification for Exclusion
Brush-tailed Rock-wallaby	*Petrogale penicillata*	Habitat constraints – No cliffs, escarpments or rocky areas present within the Subject Land
Regent Honeyeater	*Anthochaera phrygia*	Subject Land does not contain any areas of Important Habitat Mapping as per the NSW DPIE BAM – Important Areas viewer
Scrub Turpentine	*Rhodamnia rubescens*	This species appeared on the BAM-C "habitat suitability: Candidate" tab for the first time on the day of BAM-C finalization (18 June 2025). It was not present on the 16 June 2025. In accordance with cl6.31 of the BC Regs, this amounts to a change to the BAM. The designated period for SSD Projects is 12 months. The BAM-C has been finalized within the designated period. On this basis, the species is not retained for assessment. Additionally, the species is a vagrant species for the Walcha Plateau IBRA subregion. The species profile states it occurs below 600m elevation. The Subject Land and Walcha Plateau are higher than this elevational maximum for the species. The record for the species is inaccurate and old, and is likely to be incorrectly mapped for the Walcha Plateau.
Swift Parrot	*Lathamus discolor*	Subject Land does not contain any areas of Important Habitat Mapping as per the NSW DPIE BAM – Important Areas viewer



F5-1 Important habitat mapping in proximity to the subject land

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

5.2 HABITAT SURVEYS - CANDIDATE SPECIES CREDIT SPECIES

A targeted survey or an expert report is required to confirm the presence of these species on the Subject Land. Alternatively, for a development activity, the Applicant may elect to assume the species is present.

5.2.1 CANDIDATE SPECIES OCCURRENCE

The presence of a species can be determined based on the following:

- Assumed presence within the Subject Land; or
- An Important Mapped Area; or
- Targeted threatened species surveys; or
- An expert report.

5.2.1.1 ASSUMED PRESENCE

Targeted threatened flora surveys were completed across the Subject Land. Presence for threatened flora has been assumed in areas where survey was not completed to the level of requirement as detailed in the BAM. One species credit species, Leafless Tongue Orchid (*Cryptostylis hunteriana*) was assumed to be present in associated PCTs occurring in a condition state suitable for habitat occupation (i.e., woody vegetation).

Detections of Barking Owl (*Ninox connivens*) and Glossy-black Cockatoo (*Calyptorhynchus lathami lathami*) in the Subject Land are not attributed to breeding activity. The status of breeding activity for these species in the Subject Land is not fully understood. For this reason, both species were conservatively assumed to occur for breeding habitat (although it is likely that breeding by these two species in the local area is not within the Subject Land).

A species polygon will be established for these species.

5.2.1.2 IMPORTANT AREAS

The Subject Land contains no important mapped areas (**Figure 5-1**). Species excluded on this basis include:

- Regent Honeyeater (*Anthochaera phrygia*);
- Swift Parrot (*Lathamus discolor*);
- Migratory Shorebirds; and
- Plains Wanderer (*Pedionomus torquatus*).

Targeted survey and species polygons are not required for these species.

5.2.1.3 TARGETED THREATENED SPECIES SURVEYS

Candidate threatened species identified as not present within the Subject Land after the completion of targeted surveys are listed in **Table 5-5**. Species polygons are not required for these species.

TABLE 5-5 THREATENED SPECIES EFFORT

Species	Effort / Justification
Beadle's Grevillea *Grevillea beadleana*	Targeted flora surveys for *Grevillea beadleana* were completed in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The nearest recent records (2002) of this species are located approximately 13.5 km north of the Subject Land. The species grows in open eucalypt forest and woodland with a shrubby understory on granite. These areas are dispersed throughout the Project Area. Based on survey effort completed across the Subject Land, lack of known recent records within the Project Area, and extensive land use history of grazing within the Development Footprint, the species is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Bird Orchid *Chiloglottis anaticeps*	Targeted flora surveys for *Chiloglottis anaticeps* were completed in associated PCTs (see Table 5-2). The nearest recent records (2021) of the species are located approximately 30 km east, and 53 km north-east of the Subject Land in the Werrikimbe National Park and Cathedral Rock National Park. The species is known only from three subpopulations within these two national parks and all subpopulations occur at high elevation (800-1400m above sea level). The species is known to occur on steep slopes in clay loam over basalt in montane wet sclerophyll forest. Suitable conditions are not considered to be present and so the Subject Land is unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from known records and a lack of suitable habitat present within the Development Footprint, the species is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Booroolong Frog *Litoria booroolongensis*	Targeted fauna surveys for *Litoria booroolongensis* were completed in areas of potential breeding habitat using a combination of Nocturnal aural-visual surveys and tadpole searches. Surveys were conducted in 2021, 2023 and 2025, and achieved suitable variation in weather conditions. Although the survey effort completed is considered suitable for this species, no records of the species were observed. The closest recent records of the species (2017) are located approximately 40 km south west of the Project Area in Swamp Oak Creek and Jamiesons Creek. The species is known to be limited to habitats containing permanent creeks or rivers where rock structures or rock crevices are present in relatively shallow, slow to medium flowing sections of stream. Suitable habitat features are largely absent from the Project Area and so it is considered unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from known records and the limited presence of suitable habitat within the Development Footprint, the species is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Broad-leaved Pepperbush *Tasmannia purpurascens*	Targeted flora surveys for *Tasmannia purpurascens* were completed in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The nearest known record of the species (2017) is located approximately 34km south-east of the Subject Land within Werrikimbe National Park. The species is known to occur in tall, moist eucalypt forest, sub-alpine woodland and cool temperate rainforest. No suitable wet forest or rainforest habitat is present and so the Subject Land is unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from recent records and lack of suitable habitat, the species is not considered to occur within the Subject Land and so is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Brush-tailed Rock-wallaby *Petrogale penicillata*	The Brush-tailed Rock-wallaby is known to be restricted to areas where rocky escarpments, gorges, steep slopes, boulder piles, rocky outcrops or cliff lines are present.

Species	Effort / Justification
	Although recent records (2021) are present within Oxley Wild Rivers National Park approximately 2 km east of the Project Area, no such habitat is present within the Subject Land. Due to the absence of suitable habitat, this species has been excluded from assessment and is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Bush Stone-curlew *Burhinus grallarius*	Targeted fauna surveys for *Burhinus grallariu*, including call-playback and spotlighting transects, were undertaken throughout areas identified as possessing suitable habitat. Opportunistic detection was also possible throughout all time spent on site and survey effort is considered to be sufficient for the species. No detections of the species were made following survey effort. The most recent records (2019) are approximately 34 km north of the Project Area in the town of Armidale. The species is known to occur throughout open forests and grassy woodlands. Potentially suitable habitat is present throughout the Subject Land however the species is considered unlikely to be present. The species is deemed absent on the basis of survey effort.
Davies' Tree Frog *Litoria daviesae*	Targeted fauna surveys for *Litoria daviesae* were completed in areas of potential breeding habitat using a combination of Nocturnal aural-visual surveys and tadpole searches. Surveys were conducted in 2021, 2023 and 2025, and achieved suitable variation in weather conditions. Although the survey effort completed is considered suitable for this species, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Eastern Pygmy-possum *Cercartetus nanus*	Targeted fauna surveys for the Eastern Pygmy Possum (*Cercartetus nanus*) involving camera traps baited with universal bait and hair tubes, were undertaken within areas of suitable habitat. No detection of the species was made and due to the limited available habitat within the Subject Land survey effort is considered to be sufficient for detection. The most recent records (2020) of the species are approximately 35 km east of the Project Area within the Carrai National Park. In the species range north of Newcastle the species is found at higher elevations only in sclerophyll forests and rainforests. Although possessing a broad range, recent studies show that within this range the species is patchily distributed with low abundance overall. Although potential habitat is present in parts of the Subject Land, due to the distance from known recent records and a lack of a detection following targeted surveys, the species is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Elegant Greenhood *Pterostylis elegans*	Targeted flora surveys for Elegant Greenhood were completed in associated PCTs (see Table 5-2. Despite the survey effort, no records of the species were observed. The most recent records (2007) of the species are approximately 30 km east of the Project Area within the Oxley River Wilds National Park. The species is known to occur on red-brown loams at elevations between 950 m and 1200 m within tall open eucalypt forests. The species has a restricted range and is known from eight small subpopulations and although potential open eucalypt woodland is present within the Subject Land it is considered unlikely to support the species. Based on survey effort completed across the Subject Land and substantial distance from recent records, the species is not considered to occur within the Subject Land and so is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.

Species	Effort / Justification
Euphrasia arguta	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. In addition to this targeted flora transects were completed, approximately 82 hours of effort across the Project Area involving 90 transects conducted in suitable habitat in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Glandular Frog *Litoria subglandulosa*	Targeted fauna surveys for *Litoria subglandulosa* were completed in areas of potential breeding habitat using a combination of Nocturnal aural-visual surveys and tadpole searches. Surveys were conducted in 2021, 2023 and 2025, and achieved suitable variation in weather conditions. Although the survey effort completed is considered suitable for this species, no records of the species were observed. There are old records from 2009 of the species to the north of the Project Area within Cunnawarra National Park. The species is deemed absent on the basis of survey effort.
Granite Boronia *Boronia granitica*	Targeted flora surveys for *Boronia granitica* were completed in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The nearest recent records (1994) of this species are located over 40 km north of the Subject Land. The species grows on granitic soils amongst rock outcrops, often in rock crevices, and in forests and woodlands on granite scree and shallow soils. These areas are dispersed throughout the Project Area. Based on survey effort completed across the Subject Land, lack of known recent records within the Project Area, and extensive land use history of grazing within the Development Footprint, the species is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Hawkweed *Picris evae*	Targeted flora surveys for *Picris evae* were completed in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The nearest record (1990) of this species is located approximately 15 km north of the Subject Land. All recent collections appear to come from modified habitats such as weedy roadside vegetation and paddocks. Its main habitat is open Eucalypt forest including a canopy of *Eucalyptus melliodora, E. crebra, E. populnea, E. albens, Angophora subvelutina, Allocasuarina torulosa*, and/or *Casuarina cunninghamiana* with a *Dichanthium* grassy understory. Based on survey effort completed across the Subject Land, lack of known recent records within the Project Area, and extensive land use history of grazing within the Development Footprint, the species is not considered to be impacted by the Project. The species is deemed absent on the basis of survey effort.
Little Eagle (Breeding) *Hieraaetus morphnoides*	BUS were undertaken over 4 years and 3 seasons. The fixed-point bird count method was used; 15 min surveys were carried out. Eight impact points were surveyed 8 times each (2 reference points were also surveyed 8 times each). BUS surveys totaled 48 hours of survey effort for Oct 2020 (8 days), Mar-Apr 2021 (6 days) and Jan 2022 (5 days) and were conducted to detect diurnal bird activity within the subject land over a 2-year period. An additional BUS survey was conducted in Mar 2022 (3 days). Stick nest surveys were carried out in woodland areas during other field surveys. Vantage point surveys and BUS surveys completed in 2023 and 2024. The species breeding habitat is deemed absent on the basis of survey effort.

Species	Effort / Justification
Masked Owl *Tyto novaehollandiae*	Nocturnal bird surveys were conducted following dusk over a period of four nights in August 2020 as well as over eight nights in August 2021. A total of 44 sites were surveyed on 23 and 25-28 August 2021 and 1 to 2 September 2021 for nocturnal forest owls with call playback and spotlighting conducted. Surveys were conducted from approximately 6pm to between 8:30pm and 10:30pm. Total survey effort was 23 hours of nocturnal surveys including spotlighting and call playback during 2021. The species is deemed absent on the basis of survey effort.
Montane Green Five-corners *Styphelia perileuca*	Targeted flora surveys for *Styphelia perileuca* were completed in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Northern Blue Box *Eucalyptus magnificata*	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. In addition to this targeted flora transects were completed, approximately 82 hours of effort across the Project Area involving 90 transects conducted in suitable habitat in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Northern Long-nosed Potoroo *Potorus tridactylus tridactylus*	Targeted fauna surveys involving camera traps baited with universal bait and hair tubes, were undertaken within areas of suitable habitat. The species was detected from one camera trap, situated approximately 90m beyond the Subject Land. Records from 2021 and 2012 occur on the western extent of the Oxley Wild Rivers National Park which neighbours the Subject Land, very few records occur beyond the National Parks of the northern tablelands. No detection within the Subject Land was made of the species and survey effort is considered sufficient. The species is deemed absent on the basis of survey effort.
Pale-headed Snake *Hoplocephalus bitorquatus*	Twelve sites were surveyed for this species with the transect at each site replicated twice on different nights. Survey effort for each transect was one person-hour (standard spotlighting techniques were used with a focus placed on the tree trunks and other habitat likely to be used by the Pale-headed snake). There are no records of the Pale-headed snake on the Walcha Plateau. The species is unlikely to occur within the Subject Land, is deemed absent and could be classified as a vagrant species.
Polblue Eyebright *Euphrasia ciliolata*	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. The species is deemed absent on the basis of survey effort.
Powerful Owl *Ninox strenua*	Nocturnal bird surveys were conducted following dusk over a period of four nights in August 2020 as well as over eight nights in August 2021. A total of 44 sites were surveyed on 23 and 25-28 August 2021 and 1 to 2 September 2021 for nocturnal forest owls with call playback and spotlighting conducted. Surveys were conducted from approximately 6pm to between 8:30pm and 10:30pm. Total survey effort was 23 hours of nocturnal surveys including spotlighting and call playback during 2021. The species is deemed absent on the basis of survey effort.

Species	Effort / Justification
Pygmy Cypress Pine *Callitris oblonga*	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. In addition to this targeted flora transects were completed, approximately 82 hours of effort across the Project Area involving 90 transects conducted in suitable habitat in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Rufous Bettong *Aepyprymnus rufescens*	There are no records of the Rufous Bettong on the Walcha Plateau. This species is unlikely to occur within the Subject Land deemed absent on the basis of survey effort and could be classified as a vagrant species.
Singleton Mint Bush *Prostanthera cineolifera*	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. The species is deemed absent on the basis of survey effort.
Small-fruited Mountain Gum *Eucalyptus oresbia*	Targeted flora surveys for *Eucalyptus oresbia* were completed in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Small Snake Orchid *Diuris pedunculata*	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. The species is deemed absent on the basis of survey effort.
Sooty Owl *Tyto tenebricosa*	Nocturnal bird surveys were conducted following dusk over a period of four nights in August 2020 as well as over eight nights in August 2021. A total of 44 sites were surveyed on 23 and 25-28 August 2021 and 1 to 2 September 2021 for nocturnal forest owls with call playback and spotlighting conducted. Surveys were conducted from approximately 6pm to between 8:30pm and 10:30pm. Total survey effort was 23 hours of nocturnal surveys including spotlighting and call playback during 2021. The species is deemed absent on the basis of survey effort.
Square-tailed Kite *Lophoictinia isura*	Bird utilisation and raptor surveys (BUS) were undertaken over 4 years and 3 seasons. The fixed-point bird count method was used; 15 min surveys were carried out. Eight impact points were surveyed 8 times each (2 reference points were also surveyed 8 times each). BUS surveys totaled 48 hours of survey effort for Oct 2020 (8 days), Mar-Apr 2021 (6 days) and Jan 2022 (5 days) and were conducted to detect diurnal bird activity within the subject land over a 2-year period. An additional BUS survey was conducted in Mar 2022 (3 days). Stick nest surveys were carried out in woodland areas during other field surveys. Vantage point surveys and BUS surveys completed in 2023 and 2024. The species is deemed absent on the basis of survey effort.

Species	Effort / Justification
Tall Velvet Sea-berry *Haloragis exalata subsp. velutina*	Surveys were undertaken where the 100-square-metre gridlines intersect within suitable habitat for a target species. Surveys for multiple target species occurred. At each survey location point (grid intersect), a 40-metre diameter area (1,256 m^2 circular area) was systematically surveyed for the target species. A total of 518 survey points were undertaken within the development site resulting in a total of 65 hectares of potential threatened flora habitat inspected across the development footprint which represented approximately 670 survey hours. In addition to this targeted flora transects were completed, approximately 82 hours of effort across the Project Area involving 90 transects conducted in suitable habitat in associated PCTs (see Table 5-2). Despite the survey effort, no records of the species were observed. The species is deemed absent on the basis of survey effort.
Tusked Frog population in the Nandewar and New England Tableland Bioregions Adelotus brevis – endangered population	Targeted fauna surveys for *Adelotis brevis* were completed in areas of potential breeding habitat using a combination of Nocturnal aural-visual surveys and tadpole searches. Surveys were conducted in 2021, 2023 and 2025, and achieved suitable variation in weather conditions. Although the survey effort completed is considered suitable for this species, no records of the species were observed. An old record (1972) of the species in the western part of the Project Area with additional records present along the southern margin of the Walcha Plateau IBRA subregion. The species is deemed absent on the basis of survey effort.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Bird utilisation and raptor surveys (BUS) were undertaken over 4 years and 3 seasons. The fixed-point bird count method was used; 15 min surveys were carried out. Eight impact points were surveyed 8 times each (2 reference points were also surveyed 8 times each). BUS surveys totaled 48 hours of survey effort for Oct 2020 (8 days), Mar-Apr 2021 (6 days) and Jan 2022 (5 days) and were conducted to detect diurnal bird activity within the subject land over a 2-year period. An additional BUS survey was conducted in Mar 2022 (3 days). Stick nest surveys were carried out in woodland areas during other field surveys. Vantage point surveys and BUS surveys completed in 2023 and 2024. The species is deemed absent on the basis of survey effort.

Species polygons are required to be prepared in accordance with the BAM for each species credit species present, or assumed to be present, within the Subject Land. Species polygons have been prepared for ten species confirmed to occur within the Subject Land as listed in **Table 5-6**. These are based on the species polygon specifications outlined in the TBDC and relevant guidelines for the species. Further details are provided in **Table 5-7**.

TABLE 5-6 SPECIES REQUIRING SPECIES POLYGONS

Species	Polygon parameters	Figure
Barking Owl (*Ninox connivens*)	800 m radius from recorded owl where suitable hollow-bearing tree intersecting with woody PCTs. Excludes grasslands.	Figure 5-2
Bluegrass (*Dichanthium setosum*)	Polygon comprising occurrence and adjoining polygons.	Figure 5-3
Koala (*Phascolarctos cinereus*)	Associated PCTs with preferred feed trees. Excludes grasslands.	Figure 5-4
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	Count of individuals that will or may be adversely impacted. Conservative estimate for known locations of this species. 30 m buffer to individuals for polygon.	Figure 5-5

Species	Polygon parameters	Figure
South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*)	200 m radius from suitable hollow-bearing tree intersecting with woody PCTs. Excludes grasslands. Conservative estimate of impacts as polygon includes PCTs that do not contain *Allocasuarina* spp.	Figure 5-6
Southern Greater Glider (*Petauroides volans*)	Associated PCTs, excluding grasslands. Excludes woody vegetation mapped as isolated trees (i.e., crown separations too great for movement/use).	Figure 5-7
Southern Myotis (*Myotis macropus*)	Woody vegetation within 200 m of a waterbody irrespective of hollow presence or not (assumed). Conservative estimate of impacts.	Figure 5-8
Squirrel Glider (*Petaurus norfolcensis*)	Associated PCTs, excluding grasslands. Conservative estimate of impacts as species has only been found in a few locations. Excludes woody vegetation mapped as isolated trees (i.e., crown separations too great for movement/use).	Figure 5-9
Leafless Tongue Orchid (*Cryptostylis hunteriana*)	Assumed presence. Extent of associated PCTs 533 and 1192.	Figure 5-10
Austral Toadflax (*Thesium australe*)	Limited to extent of occurrence.	Figure 5-11
Eastern Cave Bat (*Vespadelus troughtoni*)	Associated PCTs, excluding grasslands, where occurring within 100m of habitat feature (breeding) or 2km of habitat feature (foraging)	Figure 5-12

5.2.1.4 EXPERT REPORTS

BCD sought additional information with respect to threatened frogs within the Subject Land, including the Yellow-spotted Tree Frog (*Litoria castanea*), which has subsequently become irrelevant to the assessment following BAM-C changes applied by BCD. Dr Frank Lemckert was commissioned as an expert to analyse the biodiversity values of the Subject Land against the species ecology, habitat and recorded incidence. The expert report concluded that the species has likely never occurred within the Subject Land and that no habitat important to the species is present and therefore no further assessment is required. The expert report, attached as **Appendix G**, justifies the use of an expert report to assess the species and Dr Lemckert's credentials as an expert on the species.

TABLE 5-7 CANDIDATE SPECIES IDENTIFIED BY TARGETED SURVEY

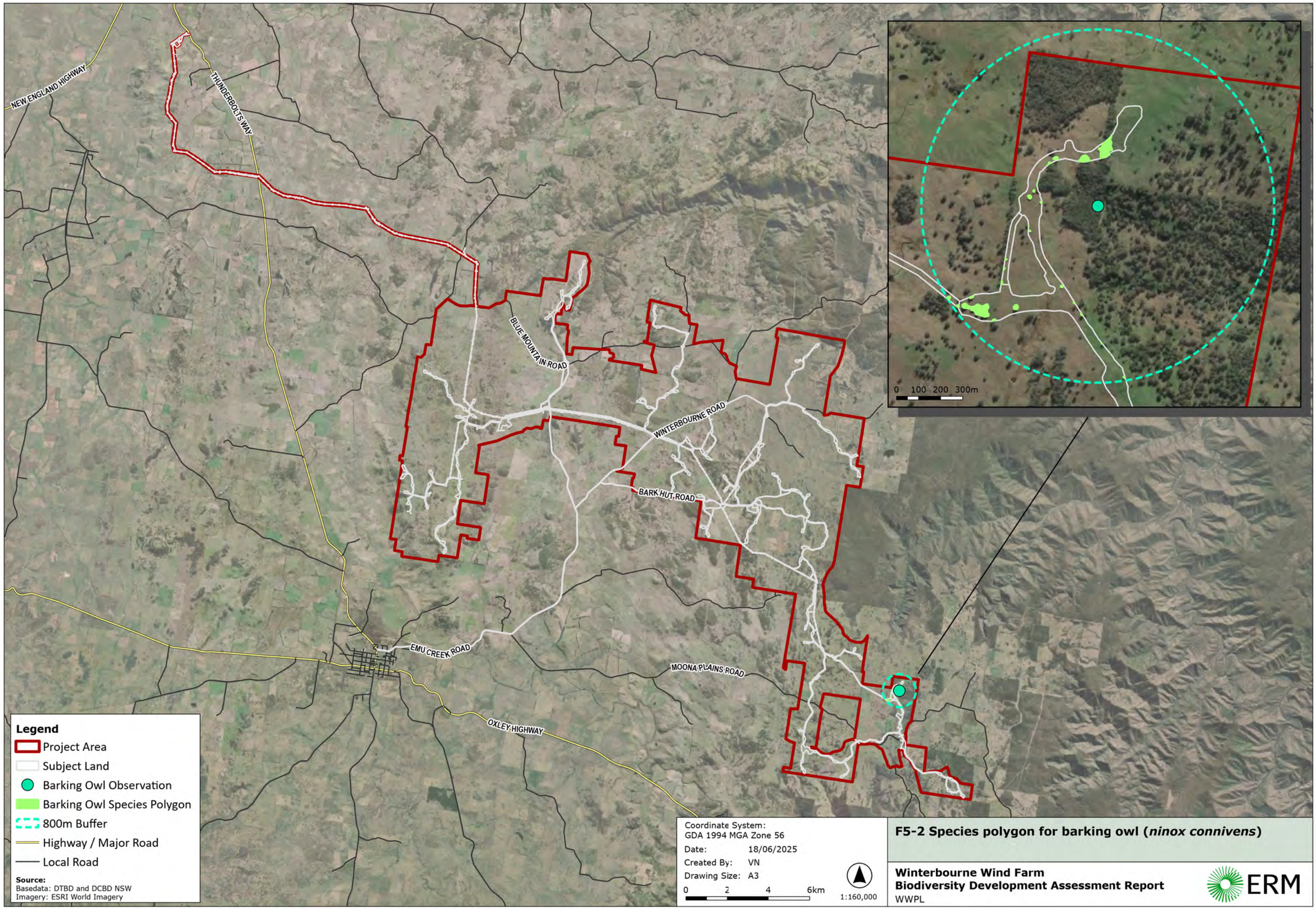
Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Candidate Species							
Barking Owl	*Ninox connivens*	V	-	2.00	No	One individual opportunistically observed outside of the breeding season.	All woody VZs; 1. within 800 m (being the approximate home range) from the location of a detected owl 2. containing a living or dead tree with a hollow >20 cm diameter that occurs >4 m above the ground.
Bluegrass	*Dichanthium setosum*	V	V	2.00	No	Eight individuals recorded in PCT 965 in 2020 by NGH. Seven records of potential *Dichanthium setosum* taken in 2024 by NGH are not confirmed observations on the NSW BioNet or AVH following submission to the Royal Botanic Gardens for formal identification.	VZs adjoining observed occurrences. Known occurrences have been avoided.
Koala	*Phascolarctos cinereus*	E	E	2.00	No	Detected through scats that were positively identified by Koala experts.	All woody VZs associated with the species. Conservative estimate.
Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	V	V	2.00	No	136 individuals observed within the Project Area	Assessed as individuals. All individuals known to occur within the Subject Land.
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	V	V	2.00	No	Opportunistically observed and two individuals detected by Nature Advisory at BUS7 during Autumn 2021 surveys. Evidence of foraging observed in proximity to suitable breeding habitat.	Woody VZs within a 200 m buffer of potential nest trees. Conservative estimate as extent of 'breeding habitat' for this rule is greater than likely actually breeding within the local area.

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Southern Greater Glider	*Petauroides volans*	E	E	2.00	No	13 individuals detected at one location and scats detected at one location.	No species polygon guidelines. All woody VZs for associated PCTs. Conservative estimate noting no consideration of hollow-bearing trees.
Southern Myotis	*Myotis macropus*	V	-	2.00	No	Possible calls detected from multiple devices from May/June 2023	Woody VZs within 200 m of a waterbody. Conservative estimate.
Squirrel Glider	*Petaurus norfolcensis*	V	-	2.00	No	Detected through call playback response and camera traps.	No species polygon guidelines. All woody VZs for associated PCTs. Conservative estimate noting no consideration of hollow-bearing trees.
Austral Toadflax	*Thesium australe*	V	V	2.0	No	Recorded at one roadside location.	
Eastern Cave Bat	*Vespadelus troughtonii*	V	-	3.0	No	No breeding habitat within 100 m of Subject Land	All woody VZs where associated with PCT and within 2 km of potential roost habitat.
Ecosystem Credit Species							
Diamond Firetail	*Stagonopleura guttata*	V	V	N/A	N/A	Nine individuals were recorded by Nature Advisory at BUS3 during the Summer 2022 survey.	N/A
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	N/A	N/A	One to five individuals observed at multiple BUS locations over multiple seasons	N/A
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	N/A	N/A	Possible and probable calls detected from multiple devices from May/June 2023 and possible detection in October/November 2020	N/A

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Flame Robin	*Petroica phoenicea*	V	-	N/A	N/A	One individual observed at BUS5 by ERM in Spring 2023	N/A
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	N/A	N/A	Possible and probable calls detected from multiple devices from May/June 2023 and positively identified from October/November 2020	N/A
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	-	N/A	N/A	Definite and probable calls detected from multiple devices from May/June 2023, Spring 2023 and October/November 2020	N/A
Little Eagle	*Hieraaetus morphnoides*	V	-	N/A	N/A	Two incidental observations made by Nature Advisory, one within the Project Area and one in proximity to the Project Area.	N/A
Scarlet Robin	*Petroica boodang*	V	-	N/A	N/A	One to four individuals observed at multiple BUS locations and opportunistically over multiple surveys by ERM.	N/A
Speckled Warbler	*Chthonicola sagittata*	V	-	N/A	N/A	4 individuals observed at BUS3 by Nature Advisory in Autumn 2021.	N/A
Spotted-tail Quoll	*Dasyurus maculatus*	V	E	N/A	N/A	1 individual was detected through camera traps in October 2023	N/A
Varied Sitella	*Daphoenositta chrysoptera*	V	-	N/A	N/A	Between 3 and 12 individuals were observed at multiple locations across multiple seasons.	N/A
White-throated Needletail	*Hirundapus caudacutus*	V	V, Mi	N/A	No	Nine individuals opportunistically observed flying between 40 and 60 m high in a south-easterly direction.	N/A

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	V	-	N/A	N/A	Definite call recorded on one device from May/June 2023 and definite call from Spring 2023.	N/A
Other listed species							
Black Falcon	*Falco subniger*	V	-	N/A	N/A	One individual observed perched	N/A
Blue-billed Duck	*Oxyura australis*	V	-	N/A	N/A	Two to four males observed on a dam during surveys at BUS01 by ERM in Winter 2023.	N/A
Eastern Cave Bat	*Vespadelus troughtoni*	V	-	3.00	Yes	Possible and probable calls detected from multiple devices from May/June 2023 and Spring 2023.	Species credit species – added for species credits as detected
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V	-	N/A	No	Possible calls detected from multiple devices from May/June 2023	Ecosystem credit species
Little Bent-winged Bat	*Miniopterus australis*	V	-	3.00	Yes	Possible calls detected in October/November 2020	Dual credit species – not added for species credits as per habitat constraints

*Possible: call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.



F5-2 Species polygon for barking owl (*ninox connivens*)

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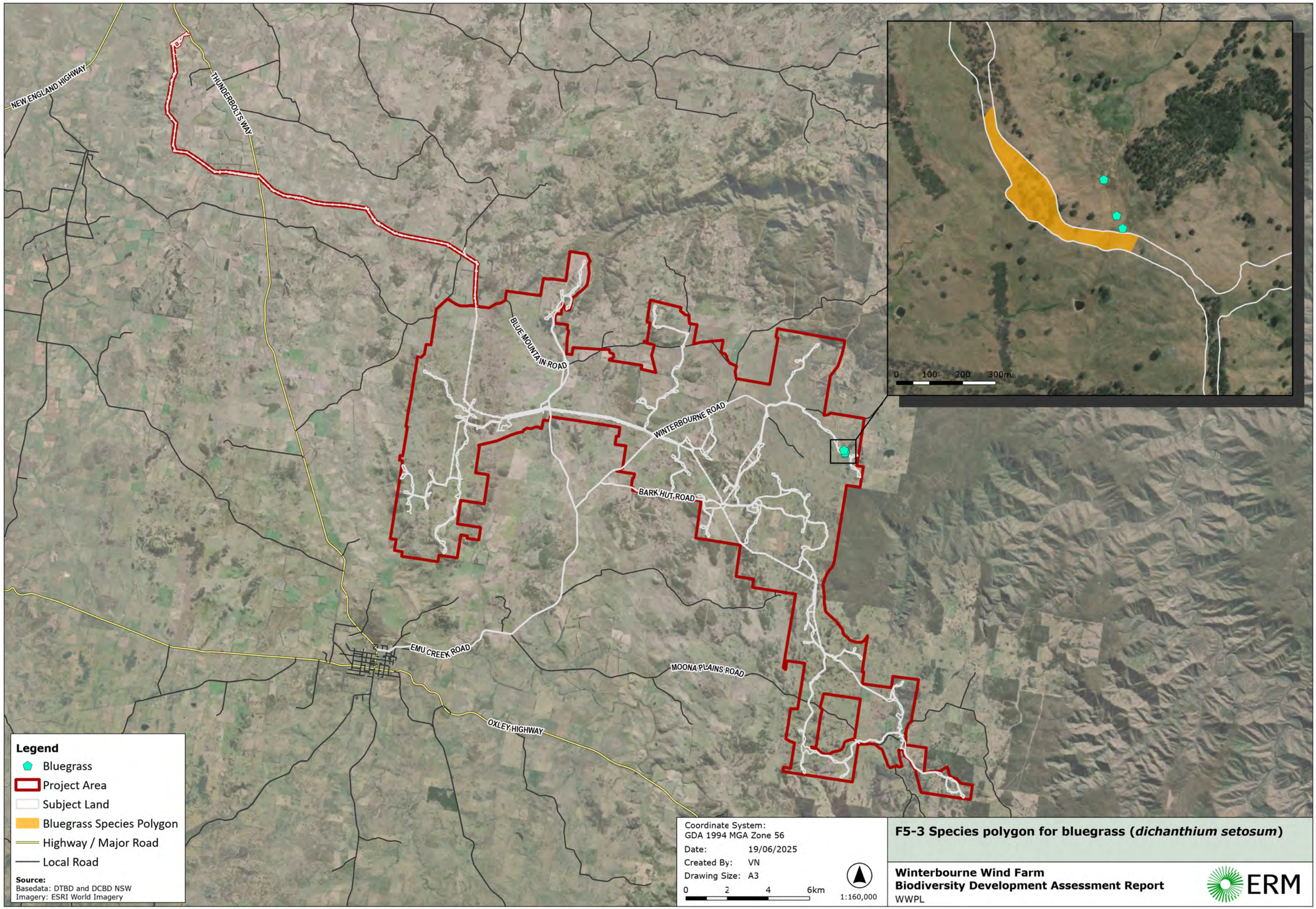

F5-3 Species polygon for bluegrass (*dichanthium setosum*)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

Legend

- Subject Land
- Project Area
- Koala Species Polygon
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

1:56,000

F5-4 Species polygon for koala (*phascolarctos cinereus*) Map 1 of 5

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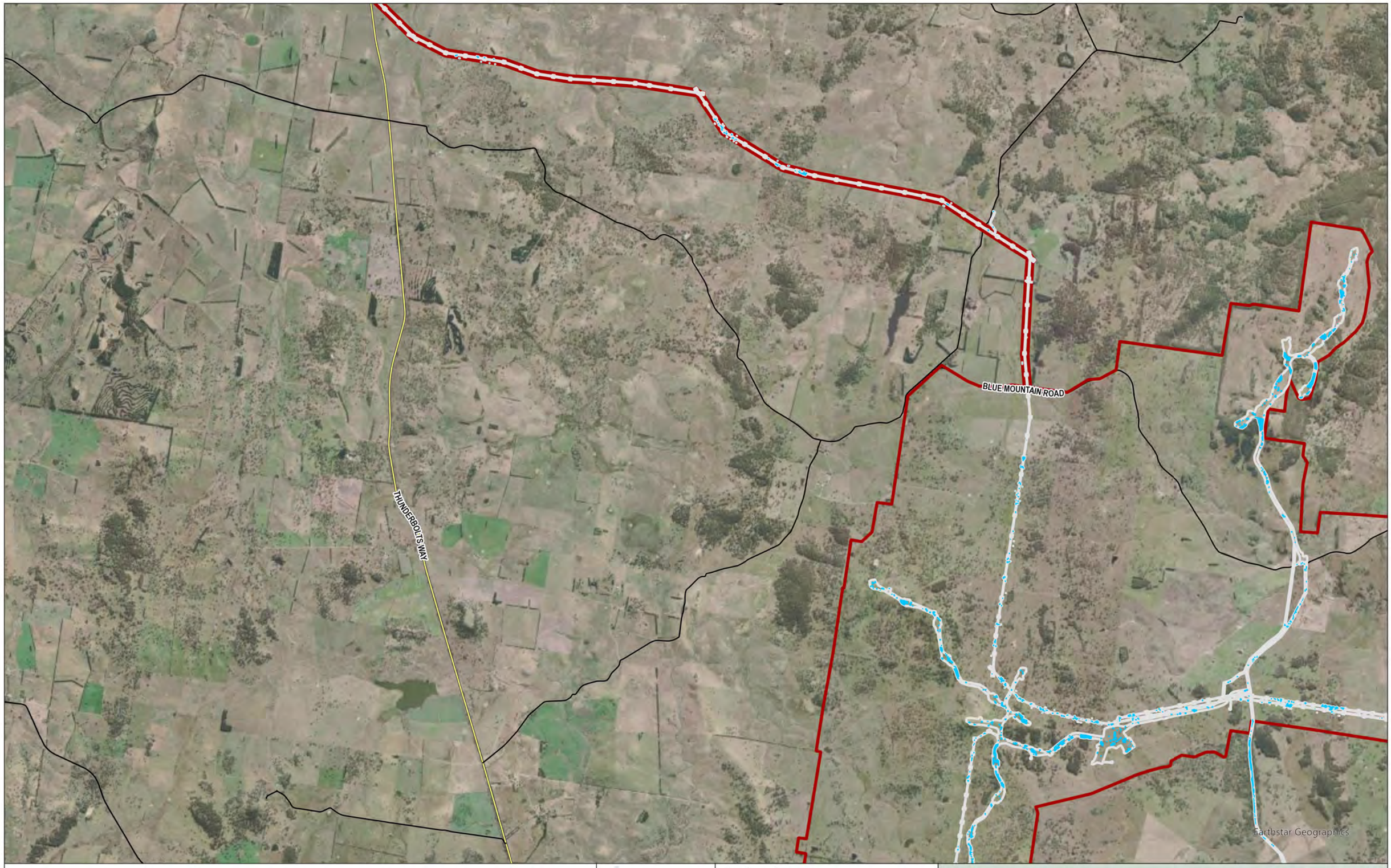

Legend

- Subject Land
- Project Area
- Koala Species Polygon
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 500 1,000 1,500m

1:56,000

F5-4 Species polygon for koala (*phascolarctos cinereus*) Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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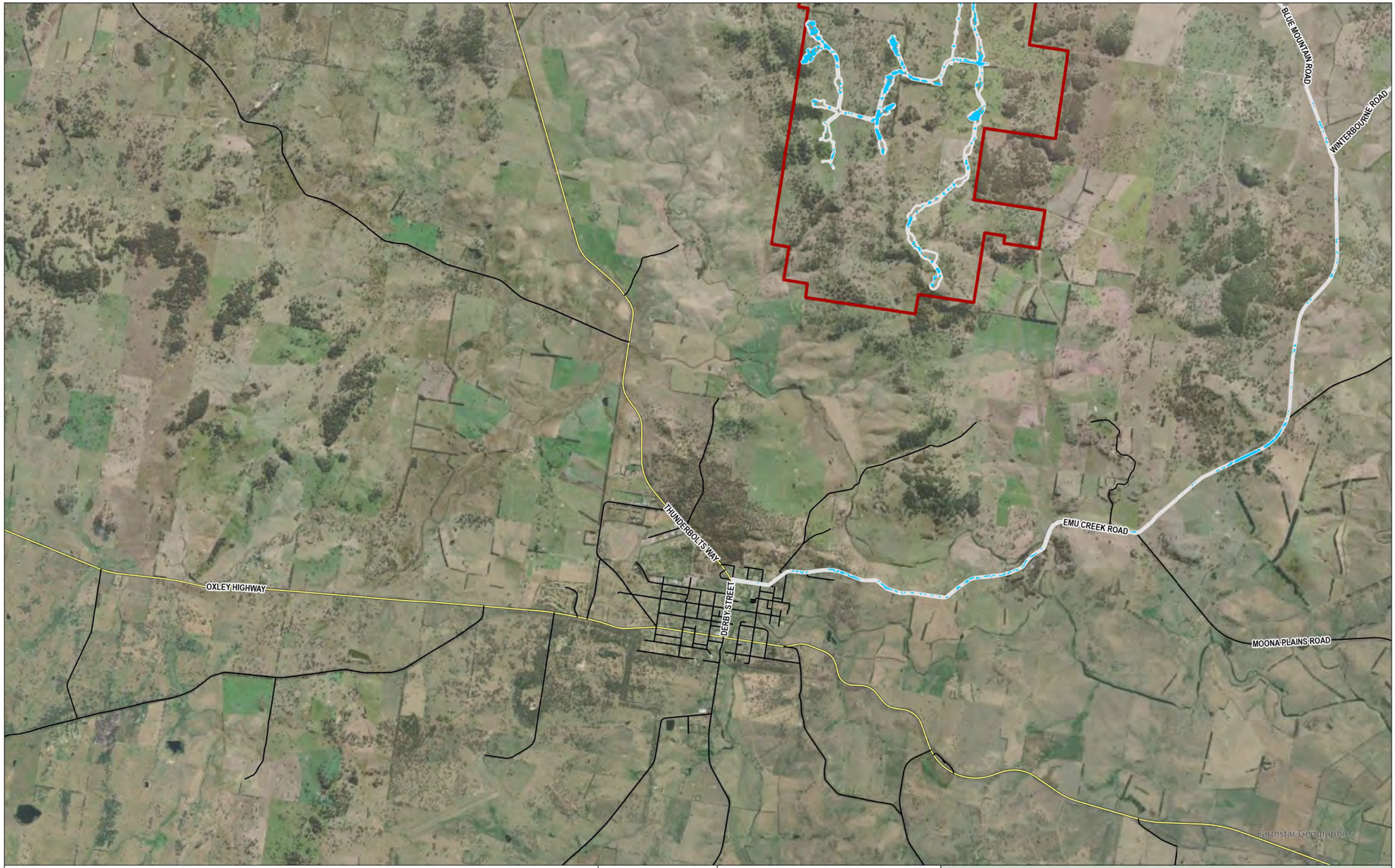

Legend

- Subject Land
- Project Area
- Koala Species Polygon
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 18/06/2025

Created By: VN

Drawing Size: A3

0 500 1,000 1,500m

1:56,000

F5-4 Species polygon for koala (*phascolarctos cinereus*) Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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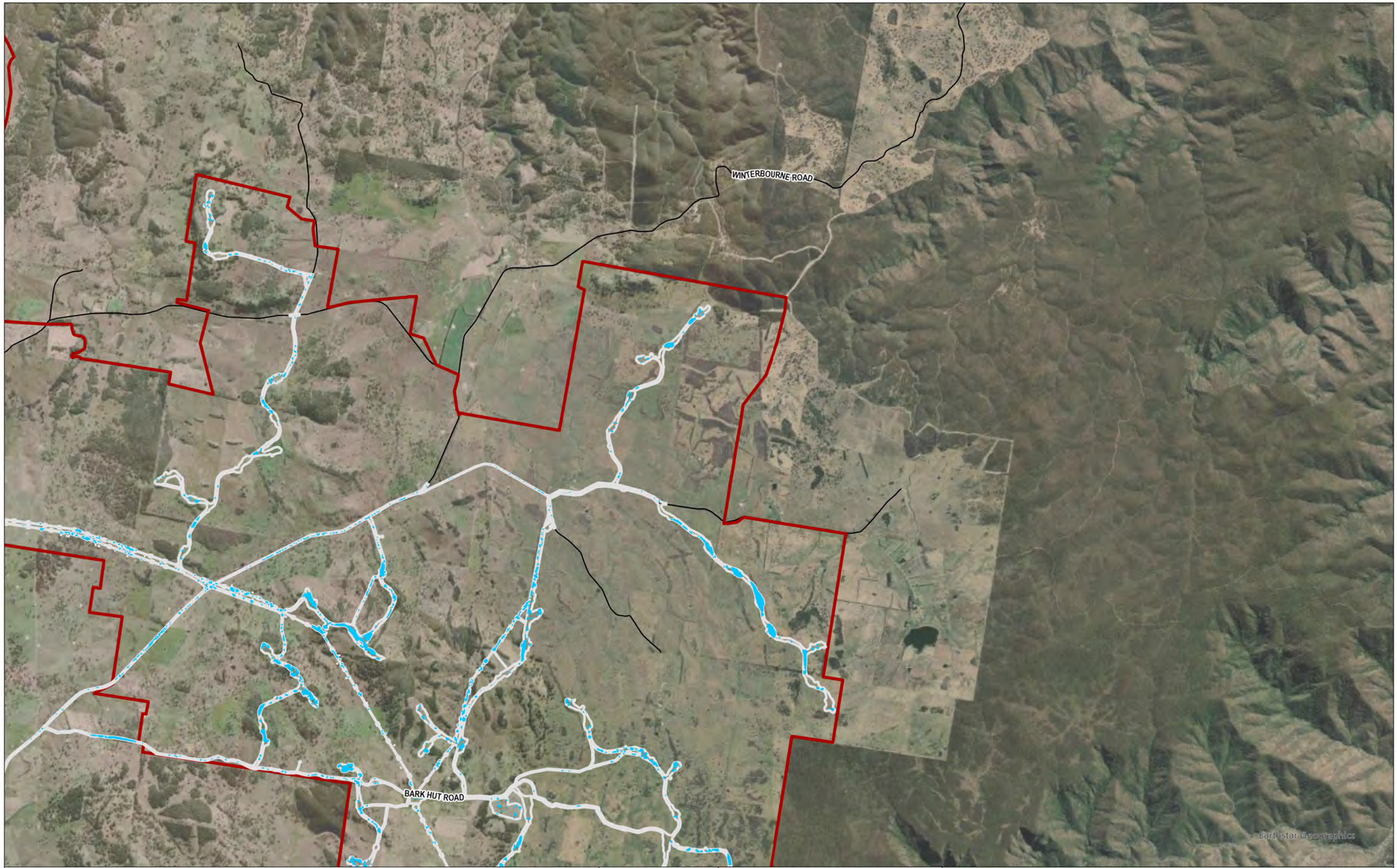

Legend

Subject Land
Project Area
Koala Species Polygon
Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:56,000

F5-4 Species polygon for koala (*phascolarctos cinereus*) Map 4 of 5

Winterbourne Wind Farm
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WWPL

ERM

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MOONA PLAINS ROAD

OXLEY HIGHWAY

Earthstar Geographics

Legend

- Subject Land
- Project Area
- Koala Species Polygon
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:56,000

F5-4 Species polygon for koala (*phascolarctos cinereus*) Map 5 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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NEW ENGLAND HIGHWAY

THUNDERBOLT'S WAY

BLUE MOUNTAIN ROAD

WINTERBOURNE ROAD

BARK HUT ROAD

MOONA PLAINS ROAD

0 100 200 300m

Legend

- Narrow-leaved black peppermint (95 records)
- Narrow-leaved black peppermint Species Polygon
- Subject Land
- Project Area
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3

0 2 4 6km

1:160,000

F5-5 Species polygon for narrow-leaved black peppermint (*eucalyptus nicholii*)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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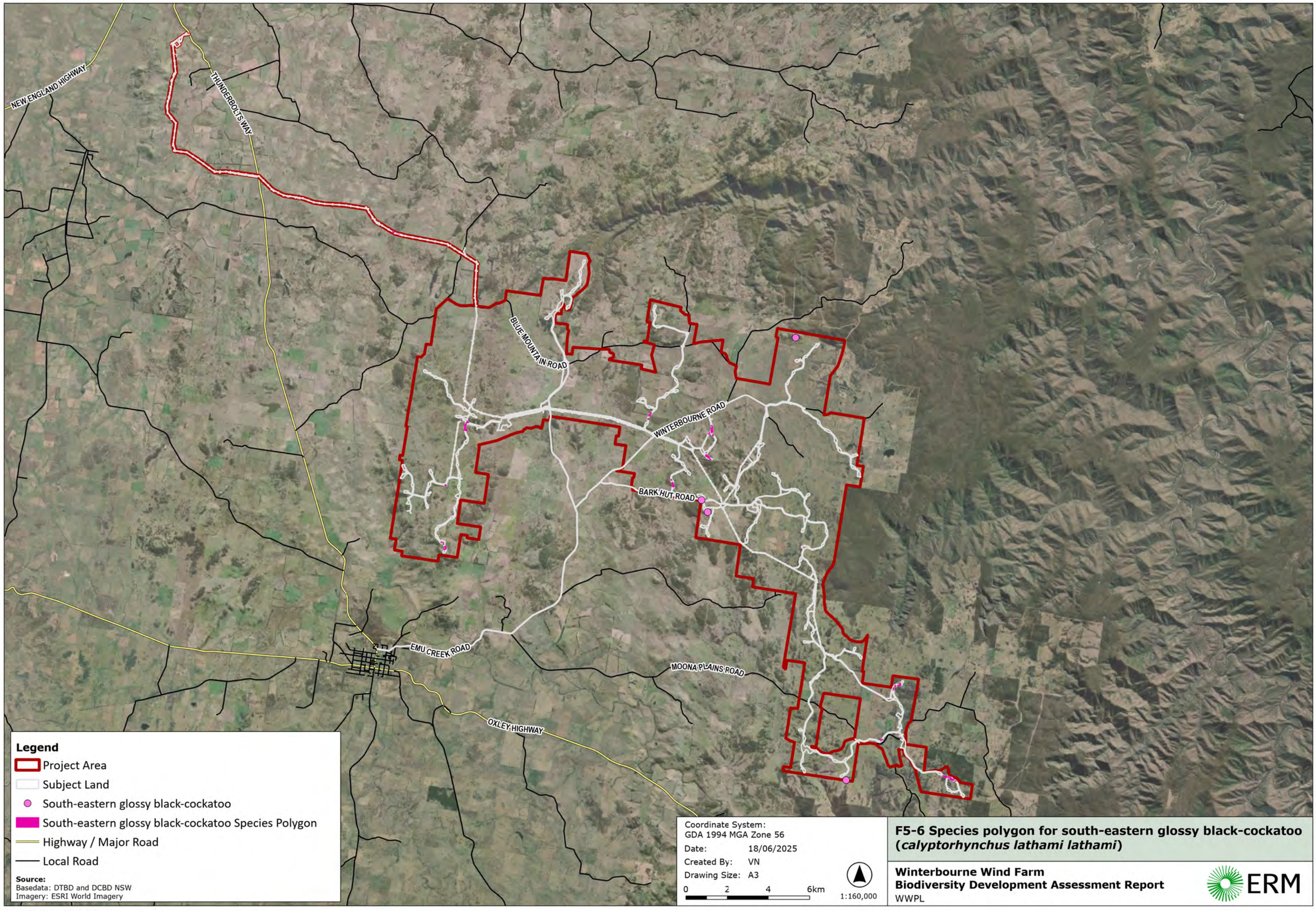

F5-6 Species polygon for south-eastern glossy black-cockatoo (*calyptorhynchus lathami lathami*)

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NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
MOONA PLAINS ROAD
OXLEY HIGHWAY

Legend
- Project Area
- Subject Land
- Southern Greater Glider
- Southern Greater Glider Species Polygon
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

F5-7 Species polygon for southern greater glider (*petauroides volans*)

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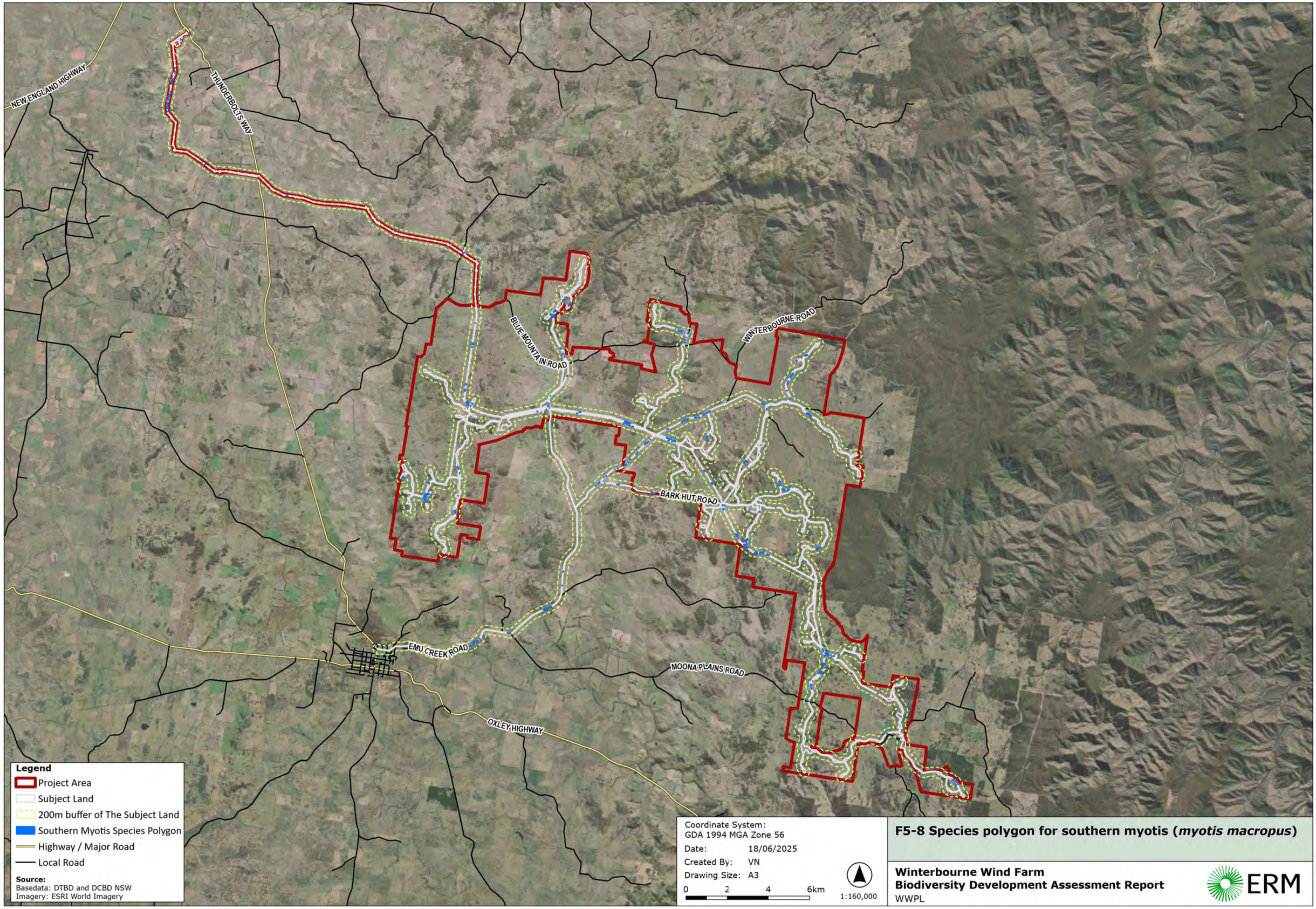

F5-8 Species polygon for southern myotis (*myotis macropus*)

Winterbourne Wind Farm
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NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
MOONA PLAINS ROAD
OXLEY HIGHWAY

Legend
- Project Area
- Subject Land
- Squirrel Glider Species Polygon
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

F5-9 Species polygon for squirrel glider (*petaurus norfolcensis*)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
MOONA PLAINS ROAD
OXLEY HIGHWAY

0 100 200 300m

0 100 200 300m

Legend
- Project Area
- Subject Land
- Leafless Tongue Qrchid Species Polygon
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

F5-10 Species polygon for leafless tongue orchid (*cryptostylis hunteriana*)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_R7.aprx

NEW ENGLAND HIGHWAY

THUNDERBOLTS WAY

BLUE MOUNTAIN ROAD

WINTERBOURNE ROAD

BARK HUT ROAD

EMU CREEK ROAD

MOONA PLAINS ROAD

OXLEY HIGHWAY

Legend

- Project Area
- Subject Land
- Austral Toadflax Species Polygon
- Highway / Major Road
- Local Road

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 18/06/2025
Created By: VN
Drawing Size: A3

0 2 4 6km

1:160,000

F5-11 Species Polygon for Austral Toadflax (*thesium australe*)

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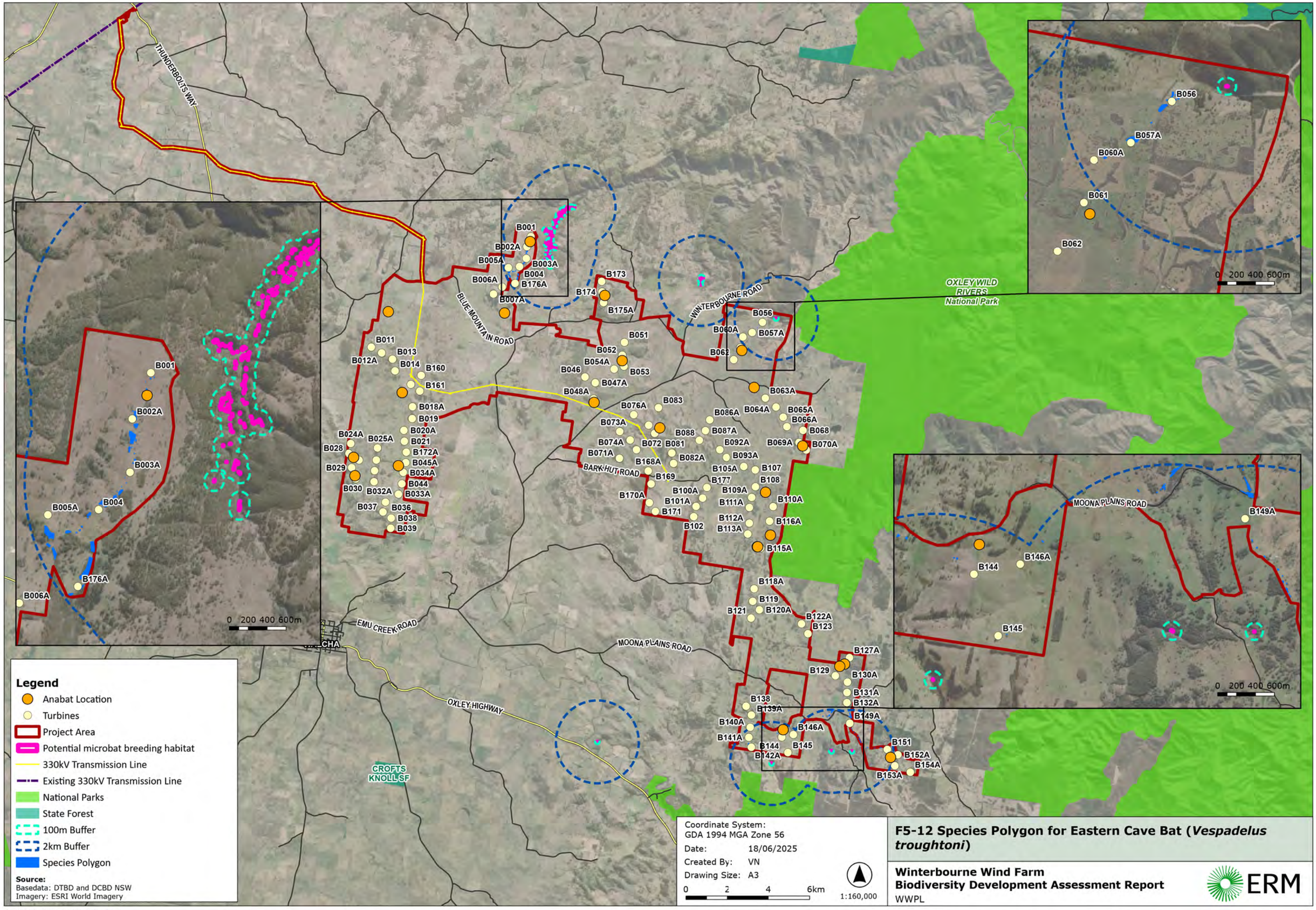

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5.3 SUPPLEMENTARY SEARS REQUIREMENTS

Supplementary SEARs provided by the Commonwealth, identified additional matters for consideration, as listed in **Table 1-1**. **Table 5-8** discusses the methods used to determine presence and impact of the Project to the identified threatened entities.

TABLE 5-8 SUPPLEMENTARY SEARS OUTCOMES

Threatened Species/Community	EPBC Act Listing	Survey Method	Outcome
Threatened Species and Communities			
New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community	Critically Endangered	Rapid vegetation assessments BAM Plots Desktop assessment against the Key Diagnostic Criteria and Condition Thresholds	This community has been determined to occur within the Subject Land in association with areas of PCT 534 and 533. Avoid and minimise outcomes have been achieved to reduce the impact on this TEC, as discussed in Section 7.1.2.2. Residual impacts have been determined to calculate the offset liability in accordance with the BAM. A Significant Impact Assessment (SIA) for the ecological community has been completed in Section 8.7. An assessment for Serious and Irreversible Impacts (SAII) has been completed in Section 9.1.2.2.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community	Critically Endangered	Rapid vegetation assessments BAM Plots Desktop assessment against the Key Diagnostic Criteria and Condition Thresholds	This community has been determined to occur within the Subject Land in association with areas of PCT 510. Avoid and minimise outcomes have been achieved to reduce the impact on this TEC, as discussed in Section 7.1.2.2. Residual impacts have been determined to calculate the offset liability in accordance with the BAM. A SIA for the ecological community has been completed in Section 8.7. An SAII assessment has been completed in Section 9.1.2.1.
Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*)	Endangered	Targeted threatened fauna survey	The Spotted-tail Quoll was detected during field surveys. Avoid and minimise outcomes have been achieved to reduce the direct impact on this threatened species. Mitigation measures to reduce prescribed and indirect impacts to this species are described in Sections 7.2 and 8.4. This species is assessed as an ecosystem credit species and the appropriate ecosystem credits have been generated. A SIA for the species has been completed in Section 8.7.
Koala (combined populations of QLD, NSW and ACT) (*Phascolarctos cinerus*)	Endangered	Targeted surveys in accordance with Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE, 2022)	Koala scats were detected during field surveys and positively identified by Koala experts thus requiring preparation of a species polygon and offset for residual impacts. Avoid and minimise outcomes have been achieved to reduce the impact on this threatened species by designing the Project away from woody vegetation where possible.

Threatened Species/Community	EPBC Act Listing	Survey Method	Outcome
			Mitigation measures to reduce prescribed and indirect impacts to this species are described in Sections 7.2 and 8.4. A SIA for the species has been completed in Section 8.7.
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	Vulnerable	Targeted threatened flora surveys BAM Plots	Several Narrow-leaved Black Peppermint individuals were detected within the Project Area. Subsequent Project design changes were implemented to avoid individuals, where possible, is further discussed in Section 7.1. Several individuals will be cleared and appropriate credits have been generated. Mitigation measures to reduce indirect impacts to this species are described in Section 8.4. A SIA for the species has been completed in Section 8.7.5.
Greater Glider (*Petauroides volans*)	Endangered	Targeted threatened fauna survey	Greater Gliders were detected during targeted surveys and the extent of habitat within the Subject Land was determined. Efforts to minimise impacts to the species habitat (i.e. woody vegetation) is further discussed in Section 7.1. Mitigation measures to reduce prescribed and indirect impacts to this species are described in Sections 7.2 and 8.4. A SIA for the species has been completed in Section 8.7.
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	Endangered	Targeted threatened fauna survey	Targeted surveys conducted are considered sufficient for the detection of this species. The species was not detected in the impact area and is excluded from further assessment of direct and prescribed impacts. A SIA for the species has been completed in Section 8.7.
White-throated Needletail (*Hirundapus caudacutus*)	Vulnerable	Bird Utilisation Surveys	An impact assessment was conducted as part of the BBAMP process and the risk to this species has been identified, presented in Sections 7.3 and 7.3.7. Mitigation measures to reduce prescribed and indirect impacts to this species have been identified in Sections 7.2 and 7.4.13. A SIA for the species has been completed in Section 8.7.
Beadle's Grevillea (*Grevillea beadleana*)	Vulnerable	Targeted threatened flora survey	Targeted surveys conducted are considered sufficient for the detection of this species. The species was not detected in the impact area and is excluded from further assessment of direct and prescribed impacts. A SIA for the species has been completed in Section 8.7.

Threatened Species/Community	EPBC Act Listing	Survey Method	Outcome
Narrow-leaved Bertya (*Bertya ingramii*)	Endangered	Targeted threatened flora survey	Targeted surveys conducted are considered sufficient for the detection of this species. The species was not detected in the impact area and is excluded from further assessment of direct and prescribed impacts. A SIA for the species has been completed in Section 8.7.
Austral Toadflax (*Thesium australe*)	Vulnerable	Targeted threatened flora survey	Austral Toadflax was detected during targeted surveys and the extent of occurrence within the Subject Land was determined. Mitigation measures to reduce indirect impacts to this species are described in Section 8.4. A SIA for the species has been completed in Section 8.7.
World Heritage properties and National Heritage places			
Gondwana Rainforests of Australia World Heritage Property and National Heritage Place	N/A	Considered through the indirect impact assessment	Indirect impacts as described by the BAM have been assessed in Section 8.7 of this report.
Listed Migratory Species			
Fork-tailed Swift (*Apus pacificus*)	Migratory	Bird Utilisation Surveys	While this species was not detected during field surveys, an impact assessment was conducted as part of the BBAMP process and the risk to this species has been identified, as presented in Sections 7.3 and 7.3.7. Mitigation measures to reduce prescribed and indirect impacts to this species have been identified in Sections 7.2 and 7.4.13. A SIA for the species has been completed in Section 8.7.
Additional MNES			
Long-nosed Potoroo (northern) (*Potorous tridactylus tridactylus*)	Vulnerable	Threatened fauna surveys	While this species was not a candidate species for the Subject Land, an individual was detected on a camera trap deployed approximately 90 m beyond the Subject Land and outside the Project Area. The species has not been observed within the Subject Land. Mitigation measures to reduce prescribed and indirect impacts to this species have been identified in Sections 7.2 and 8.4. A SIA for the species has been completed in Section 8.7.

6. IDENTIFYING PRESCRIBED IMPACTS

Prescribed impacts are identified in Clause 6.1 of the BC Regulation. Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development impacts on the habitat of threatened species or ecological communities associated with:
  - Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
  - Human-made structures; and
  - Non-native vegetation.
- Development impacts on areas connecting threatened species habitat, such as biodiversity corridors;
- Impacts on water quality, waterbodies and hydrological processes that sustain threatened species and TECs;
- Wind turbine strikes on protected animals; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

The BAM does not provide an approach to determine the number and class of biodiversity credits that are required for a prescribed impact. However, the additional prescribed impacts on biodiversity may be considered by a consent authority when they determine the biodiversity credits required to be retired (or other conservation measures required to be taken) under a planning approval.

An assessment of the relevance of these prescribed impacts to the Project is provided in **Table 6-1.**

TABLE 6-1 ASSESSMENT OF PRESCRIBED IMPACTS

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☒Yes ☐No	Areas of rocky outcrops are present within the Subject Land. No karst, caves, crevices, cliffs or other geological features of significance are present.	Rocky outcrops may act as areas of suitable habitat for threatened species such as the Pale-headed Snake and Parma Wallaby. No species that may utilise this feature were found to occur within the Subject Land. These areas are also considered to have low habitat value due to degradation of surrounding vegetation and therefore no further assessment is required.
Human-made structures	☒Yes ☐No	Human-made structures subject to impacts as a result of the Project include fences, gates and other agricultural infrastructure.	Raptors and other avian species are known to frequently use human-made structures for foraging, perching and nesting.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
			While current human-made structures may be removed during construction of the Project, it is noted that additional fencing and infrastructure will be installed with the Project and therefore there is no expected limitation to the availability of this feature and no further assessment is required.
Non-native vegetation	☒Yes ☐No	Areas comprised of non-native vegetation or lacking vegetation entirely occur throughout the Subject Land. These areas are subject to high levels of disturbance including grazing, cropping and vehicle movements.	It is considered unlikely that the impacts to this feature will have a significant impact on threatened species due to their history of high levels of disturbance and therefore no further assessment is required.
Habitat connectivity	☒Yes ☐No	Habitat connectivity to the neighbouring Oxley Wild Rivers National Park is present in the east of the Subject Land. Little habitat connectivity occurs in the centre and west of the Subject Land.	Impacts to habitat corridors between the Subject Land and the neighbouring National Park will impact species that utilise the canopy for movement, such as the Squirrel Glider, Greater Glider and Koala. Mitigation measures to reduce this risk are discussed in Section 7.2.1.
Waterbodies, water quality and hydrological processes	☒Yes ☐No	Several natural and artificial waterbodies such as creeks, dams and irrigation channels occur throughout the Subject Land that may be subject to alteration of water quality or hydrological processes.	These features within the landscape are not sustaining any threatened species or threatened ecological communities and therefore no further assessment is required.
Wind turbine strikes	☒Yes ☐No	The operation of 118 wind turbines is proposed for the Project.	Threatened and migratory avian and microbat species have potential to be impacted by wind turbine strike. A detailed assessment is provided for this impact. Mitigation measures will be implemented to reduce the risk of turbine strike, this is discussed in Section 7.2.2.
Vehicle strikes	☒Yes ☐No	The Project will include the construction of internal access tracks and use of existing roads and tracks within the Subject Land as well as the transportation of materials from the Port of Newcastle to the Project Area. An increase in vehicular traffic will occur during construction and operation of the Project.	Ground-dwelling species such as the Spotted-tail Quoll are most at risk of vehicle strike resulting from the Project. Mitigation measures will be implemented to reduce the risk of vehicle strike, discussed in Section 7.2.3.

STAGE 2: IMPACT ASSESSMENT (BIODIVERSITY VALUES AND PRESCRIBED IMPACTS)

7. AVOID AND MINIMISE IMPACTS

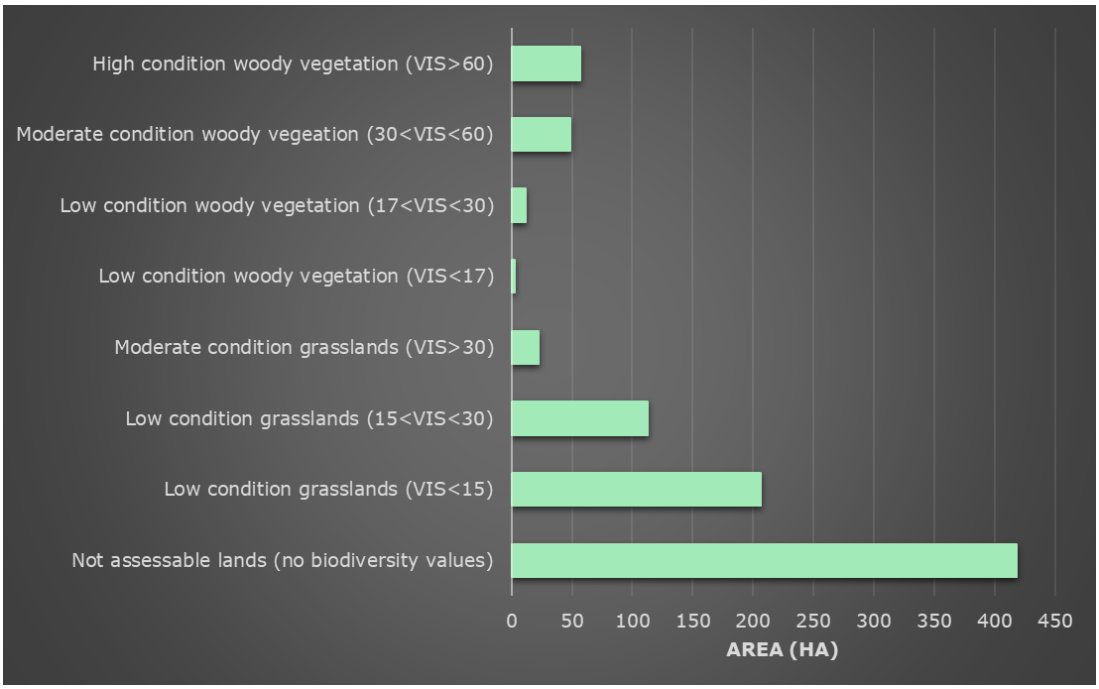
The Applicant has focused on attaining impact avoidance outcomes through site selection and avoidance of higher quality native vegetation and habitat. This approach is consistent with the BAMs focus on avoiding or minimising impacts during site selection and design.

The EIS Project Layout was for a development footprint of 586.17 ha (NGH 2022). This total impact area has increased to an assessable development footprint of approximately 882.08 ha (296 ha increase in disturbance), with this increase in assessable impacts due to the following:

- Inclusion of local road network in the Subject Land. Previously the assessment of impacts on the roadside environment was based on 'pinch points', which has now been amended to include a quantitative assessment of a widened road surface including roadside drainage and cut and fill for affected local roads between Uralla and the Project;
- Revision of design to avoid impacts on high biodiversity values resulting in a more sinuous design with greater area;
- Revision of design to include detail of required cut and fill for construction (including temporary impact areas); and
- Inclusion of a quarry, which was not previously considered.

The mapping of native vegetation at a high resolution (i.e., capture scale of 1:1,000 or better [Section 4.1 of the BAM]) substantially aided the design process. At a high level, the broad condition state mapping that separated woody from non-woody vegetation has greatly improved the avoidance of high VIS vegetation cover; this being a core principle of the BAM for demonstrating impact avoidance (Section 7.1 of the BAM). The quantified effect of the design process is summarized in **Chart 7-1**.

CHART 7-1 SUMMARY OF BIODIVERSITY VALUES IMPACTED BY THE PROJECT



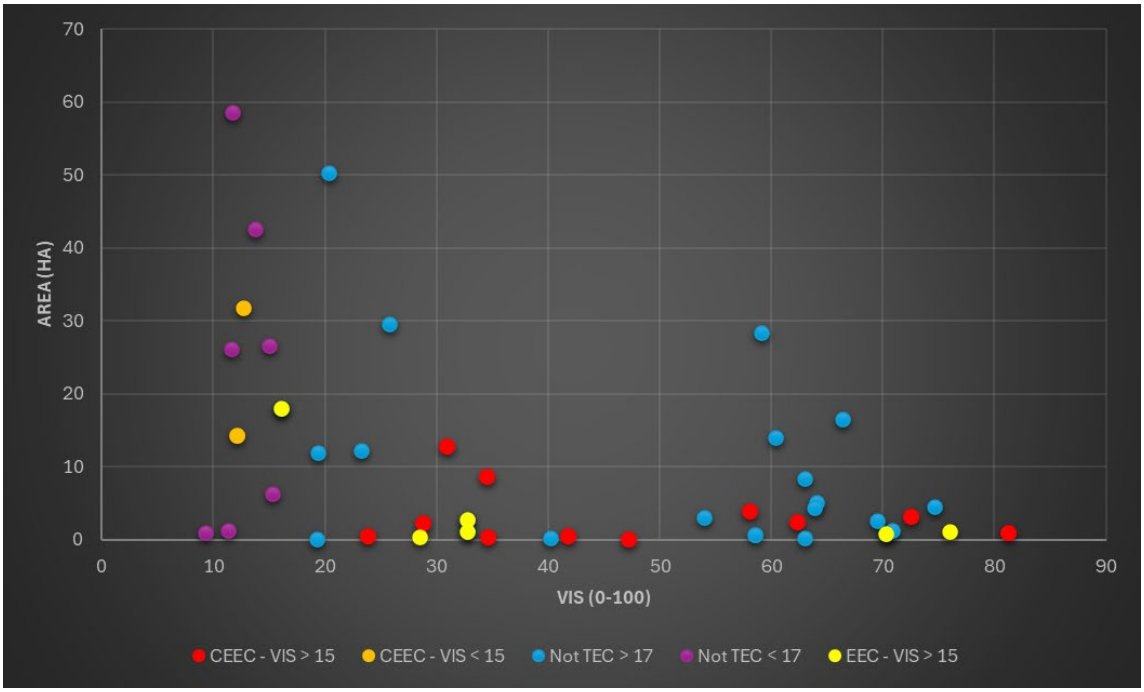
The Project design has incorporated considerable impact avoidance measures, which is reflected in a revised and greatly reduced residual impact on biodiversity values. The high-resolution vegetation mapping used in this assessment encouraged the Applicant's design team to preferentially locate the development footprint within Category 1 – Exempt Land and low condition grasslands and, where unavoidable, use low-moderate condition grasslands. The SVTM's coarser mapping is not suitable for this task as the scale at which it is captured overestimates vegetation extent (e.g., 5 m pixel scale for woody vegetation). Such mapping is informative at a landscape scale but lacks the detail necessary to support a design process involving the mitigation hierarchy.

Despite the increased development footprint, which largely comprises Category 1 – Exempt Land and low condition grasslands, there is an overall reduction in impacts on areas of higher biodiversity value. This reduction has focused largely on avoiding impacts on woody vegetation and vegetation associated with a CEEC (i.e., SAII entities), these being:

- Box Gum Woodland CEEC; and
- New England Peppermint Woodland CEEC.

The reduced impact on CEEC/SAII by careful Project Placement is demonstrated in **Chart 7-2**.

CHART 7-2 CEEC VIS AND AREA OF VEGETATION ZONES ASSESSED IN BDAR



The Applicant designed the Project to avoid and minimise impacts on high quality vegetation and habitat, including:

- Ensuring landscape scale connectivity would be maintained (as far as practicable) between the site and the adjoining national park estate to the east;
- Avoiding/minimizing impacts on riparian corridors by limiting crossing points; and
- Minimising impacts to areas of Box Gum Woodland CEEC and New England Peppermint Woodland CEEC, including targeting retention of areas of woodland and higher quality moderate condition grassland vegetation zones.

Unavoidable impacts exist within the local road reserve following inclusion of this in the Subject Land footprint. These impacts are unavoidable as the works proposed include the widening of existing infrastructure to include proximal vegetation. Where possible, these impacts have been minimised.

The following sections outline the process involved in defining the impact avoidance outcomes.

7.1 AVOID AND MINIMISE DIRECT AND INDIRECT IMPACTS

Since the origination of this Project, the design has evolved through consideration of technical, environmental, social, and commercial constraints. A significant aspect of this design refinement was engagement with landowners, neighbours to the Project, the broader community, local government, State and Federal Agencies, and business and stakeholder groups. This engagement, along with technical studies undertaken, has helped to shape the current layout of the Development Footprint.

7.1.1 AVOID AND MINIMISE FRAMEWORK

For the reasons outlined in the following sections, the Project will utilise lands that will result in unavoidable impacts. This is because the landscape, since European settlement, has only ever been used for agricultural purposes and has retained biodiversity values. The retained biodiversity values range from highly degraded grasslands to woody vegetation with increased habitat values.

This assessment has sought to differentiate between high and low biodiversity values, to aid in identifying opportunities for impact avoidance and minimization outcomes. **Table 7-1** outlines the factors considered in Project design.

TABLE 7-1 BIODIVERSITY FACTORS CONSIDERED IN PROJECT REDESIGN

Factor	Design preference	Metric	Outcome
SAII Entities	Avoid moderate to high condition VIS	VZ mapping separating woody from non-woody vegetation. VIS calculated by BAM plot using BAM-C. <15 for TEC, and <17 for non-TEC	Project footprint avoids, where possible, SAII entities in moderate to high condition VZs.
VIS	Non-woody vegetation Low calculated VIS	VZ mapping separating woody from non-woody vegetation. VIS calculated by BAM plot using BAM-C. <15 for TEC, and <17 for non-TEC	Project footprint aligns, where possible, with native vegetation in the least condition state
Grassland condition	'Low conservation value grasslands'	Non-woody vegetation BAM plots. Native vegetation cover <50% for full floristic plot nested within a BAM plot	Project aligns with low conservation value grasslands where possible (i.e., Category 1 – Exempt Land)
Connectivity	Avoid or minimise impacts on connected vegetation	-	Reduction in fragmentation

Factor	Design preference	Metric	Outcome
Patch size	Design to coincide with smaller patches and paddock trees. Minimise impacts on larger patches by avoiding unnecessary clearing	Reduced average patch size within clearing footprint	Project preferentially aligns with small vegetation patches rather than larger patches
Proximity to World Heritage	Locate all turbines at least 500m away from World Heritage areas	-	Avoid turbine placement within 500 m of World Heritage areas.

The Project design had regard for survey results, with emphasis placed on locating the Project within areas of least biodiversity value (i.e., Category 1 – Exempt Land and VZs with VIS<15 for TECs and VIS <17 for non-TECs avoidance). This area is shown in **Figure 7-1** and amounts to approximately 71.1% of the Subject Land (i.e., 627.02 ha of 882.08 ha), which is characterised as follows:

- 415.34 ha of Category 1 – Exempt Land;
- 2.61 ha of non-vegetated lands (e.g., water and roads);
- 207.60 ha of low condition grasslands (i.e., VIS <15 for TECs or <17 for non-TECs); and
- 1.47 ha of low condition open woodlands with VIS <17.

Except for some vegetation zones with open woodland and shrubland areas that have a VIS <17, these lands no longer comprise functional habitat features such as trees, hollow-bearing trees and fallen logs. Consequently, the leaf litter layer of these lands is generally compromised (i.e., absence of trees and presence of overabundance groundcover grass species) with the presence of high-threat weeds likely to be higher in these chronically degraded environments. Native plant diversity is generally low with much of the vegetated surface comprising exotic species and/or over-abundant natives tolerant of livestock grazing.

Where impacts on offsetable native vegetation and habitat are unavoidable (i.e., VIS>15 for TECs and VIS >17 for non-TECs), then an impact minimization approach was adopted by preferentially locating the Project within:

- Moderate condition grasslands to avoid impacts on native vegetation with degraded habitat character (i.e., low function scores). These lands typically have a VIS of ~30 or less; and/or
- Isolated trees and open woodland vegetation, as these lands are typically nested within Category 1 – Exempt Land and/or low to moderate condition grasslands. These lands typically have a VIS of ~50 or less.

VISs by BAM plots is shown in **Figure 7-2** to illustrate this process.

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Exotic vegetation cover
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

Created By: VN

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F7-1 Areas of Least Biodiversity Value

Map 1 of 40

Winterbourne Wind Farm
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THUNDERBOLTS WAY

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 2 of 40

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 3 of 40

Winterbourne Wind Farm
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THUNDERBOLTS WAY

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
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F7-1 Areas of Least Biodiversity Value

Map 4 of 40

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 5 of 40

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F7-1 Areas of Least Biodiversity Value

Map 6 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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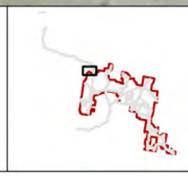
BLUE MOUNTAIN ROAD

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands



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F7-1 Areas of Least Biodiversity Value

Map 7 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

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F7-1 Areas of Least Biodiversity Value

Map 8 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Isolated trees
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 9 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

Map 10 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

Map 11 of 40

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

Map 12 of 40

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

Map 13 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 14 of 40

Winterbourne Wind Farm
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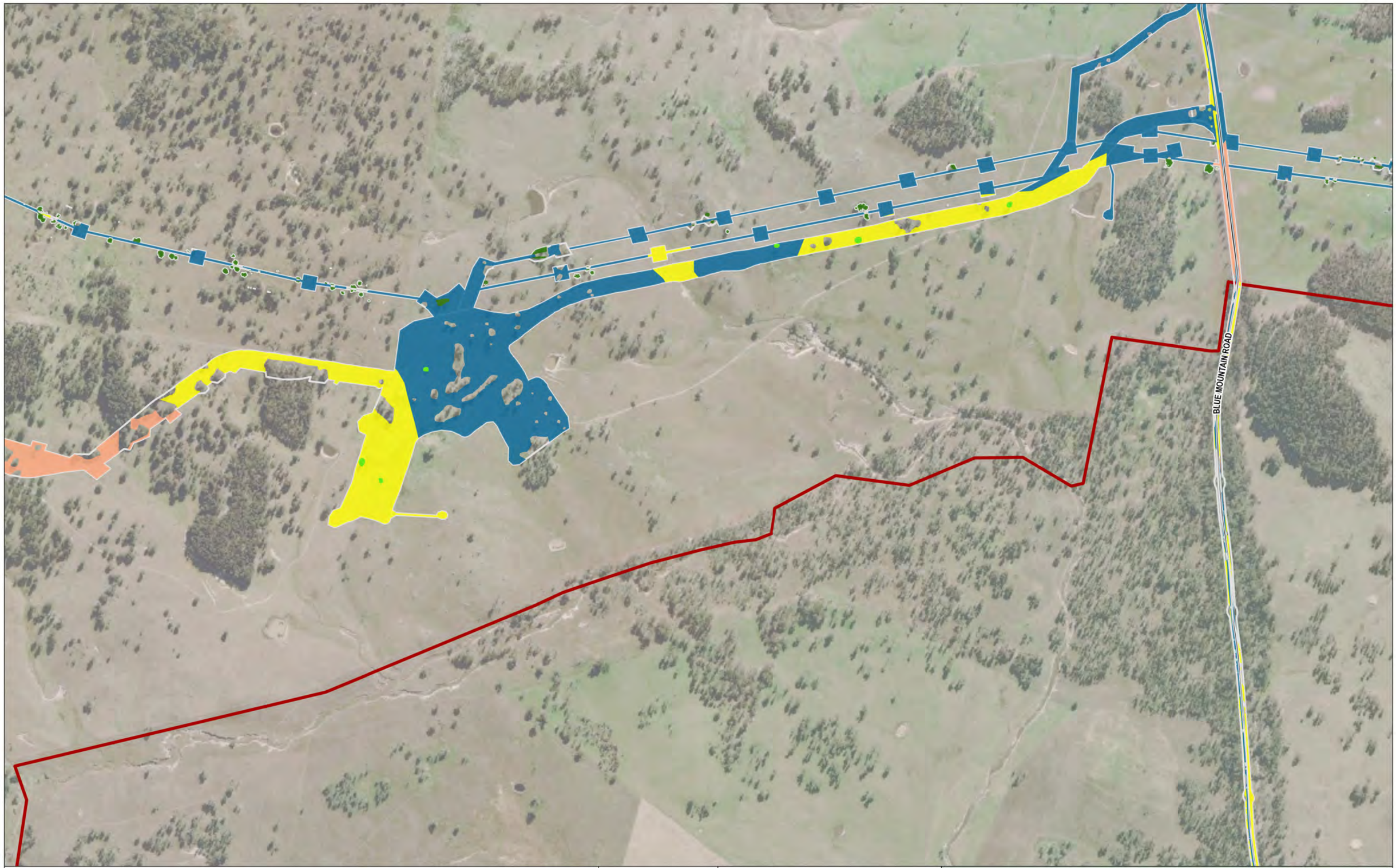

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Isolated trees
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Exotic vegetation cover

Coordinate System:
GDA 1994 MGA Zone 56
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
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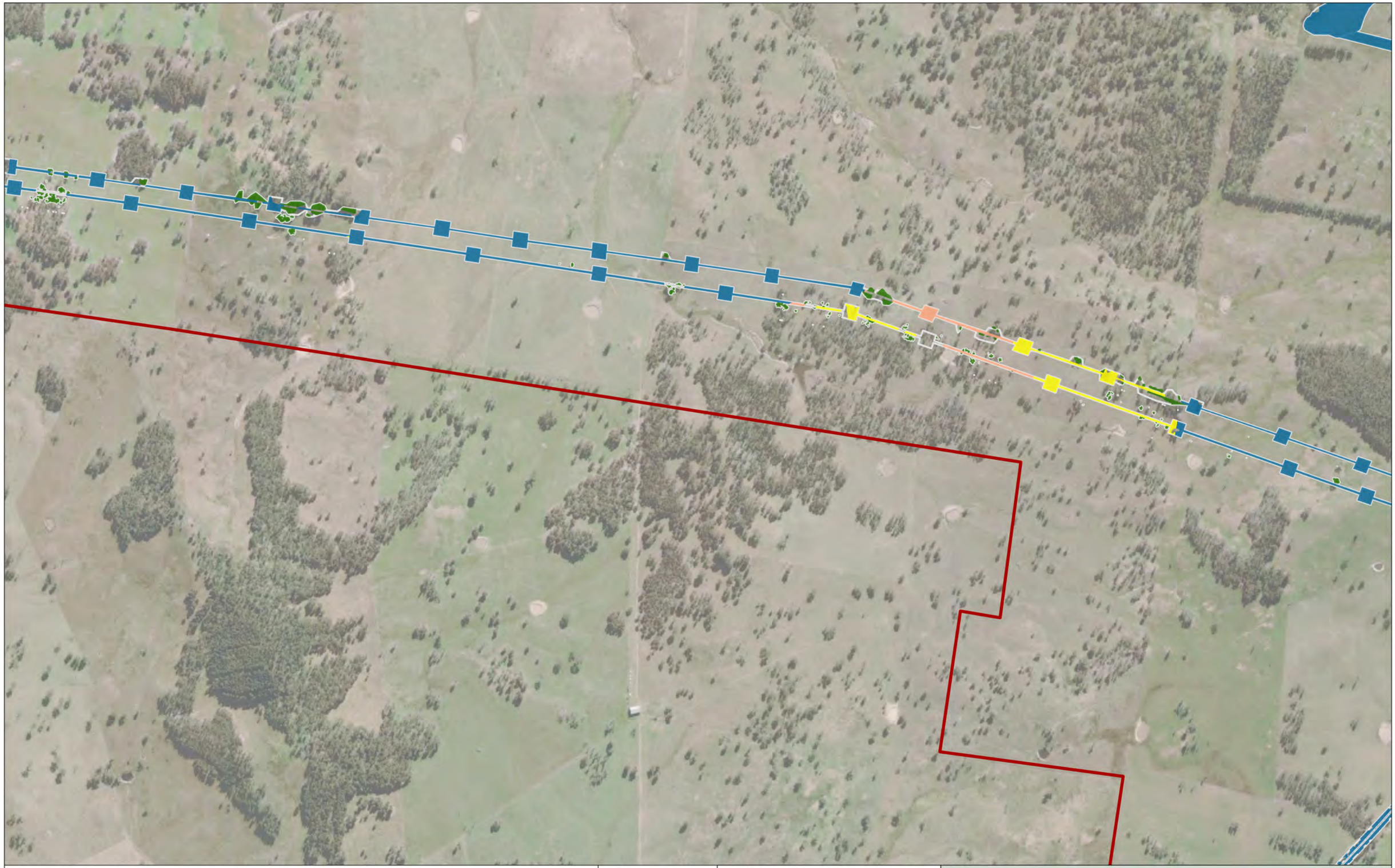

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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WINTERBOURNE ROAD

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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WINTERBOURNE ROAD

EMU CREEK ROAD

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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EMU CREEK ROAD

MOONA PLAINS ROAD

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands
- Exotic vegetation cover
- Non-native vegetation

Coordinate System: GDA 1994 MGA Zone 56
Date: 19/06/2025
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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URALLA ROAD

DERBY STREET

EMU CREEK ROAD

OXLEY HIGHWAY

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Moderate condition grasslands
- Exotic vegetation cover
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

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F7-1 Areas of Least Biodiversity Value

Map 25 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Low condition open woodland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F7-1 Areas of Least Biodiversity Value

Map 28 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 29 of 40

Winterbourne Wind Farm
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BARK HUT ROAD

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 31 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

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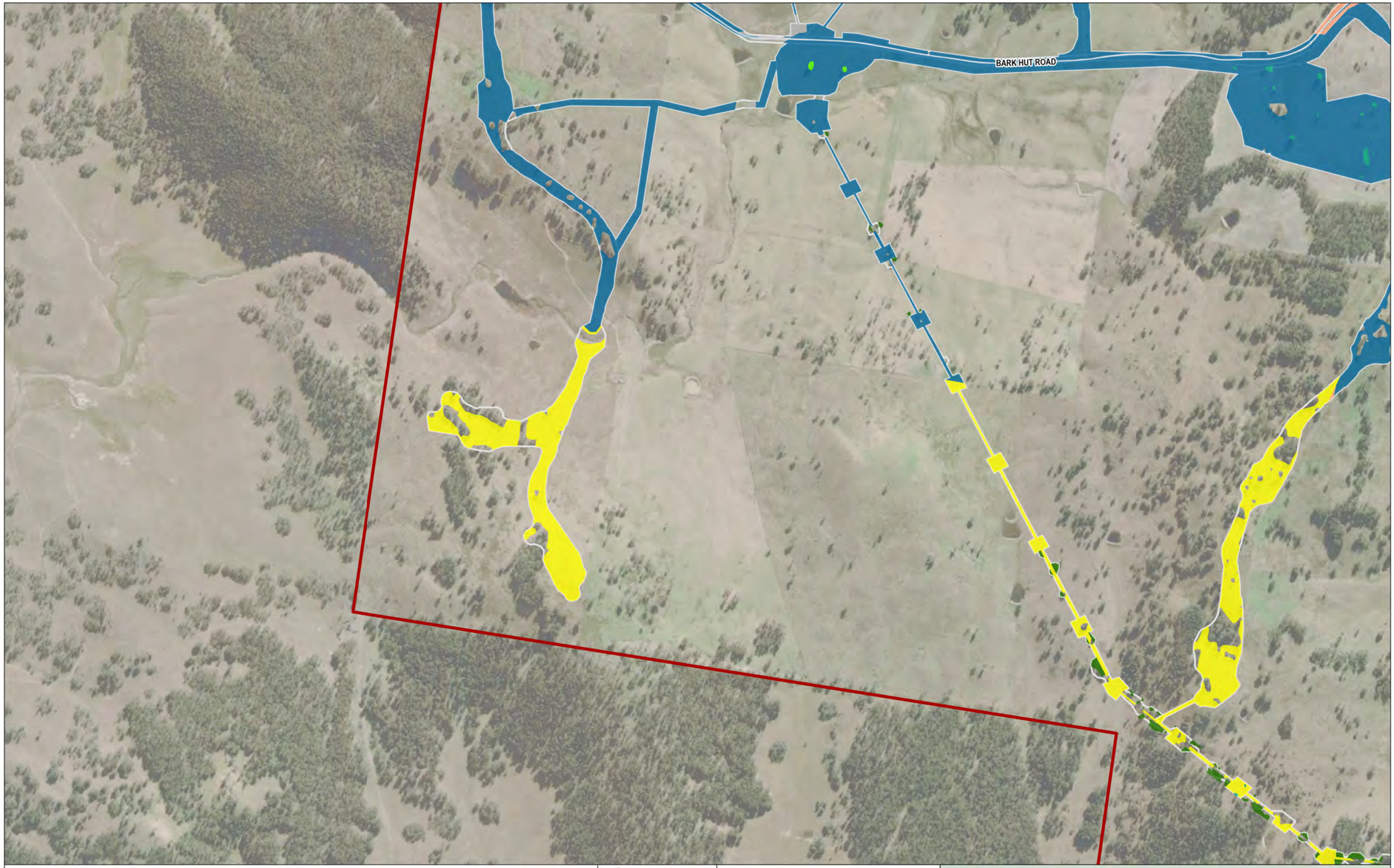

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Isolated trees
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands
- Low condition open woodland
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F7-1 Areas of Least Biodiversity Value

Map 32 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Low condition open woodland
- Non-native vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 33 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
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F7-1 Areas of Least Biodiversity Value

Map 34 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Partial impact (tree canopy only)
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F7-1 Areas of Least Biodiversity Value

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Winterbourne Wind Farm
Biodiversity Development Assessment Report
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0526676_WWF_BDAR_E_R1.aprx

MOONA PLAINS ROAD

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

Created By: VN

Drawing Size: A3

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F7-1 Areas of Least Biodiversity Value

Map 36 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F7-1 Areas of Least Biodiversity Value

Map 37 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands
- Moderate condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F7-1 Areas of Least Biodiversity Value

Map 38 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
Drawing Size: A3

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F7-1 Areas of Least Biodiversity Value

Map 39 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Low condition grasslands

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

Created By: VN

Drawing Size: A3

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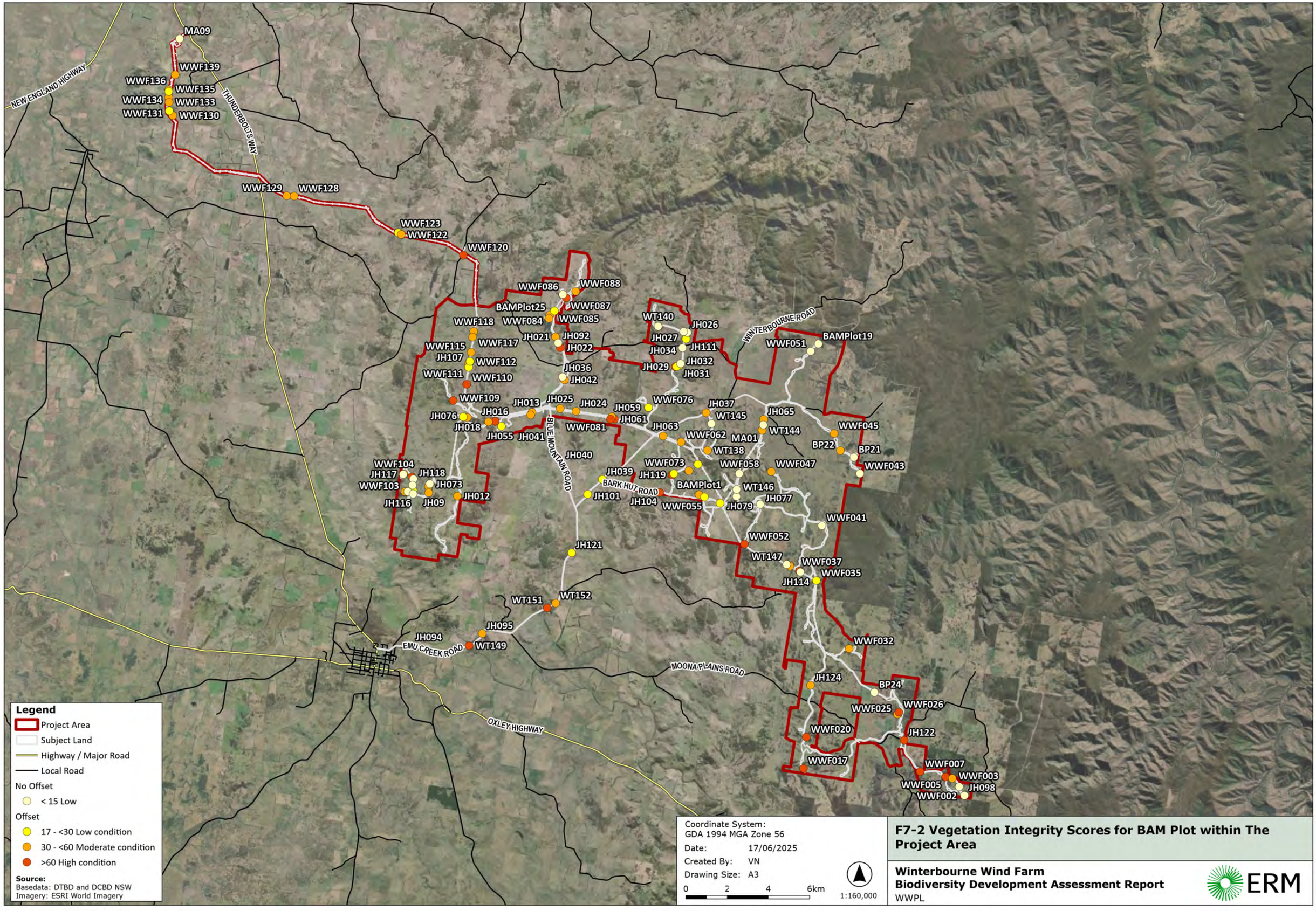
F7-1 Areas of Least Biodiversity Value

Map 40 of 40

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx



F7-2 Vegetation Integrity Scores for BAM Plot within The Project Area

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

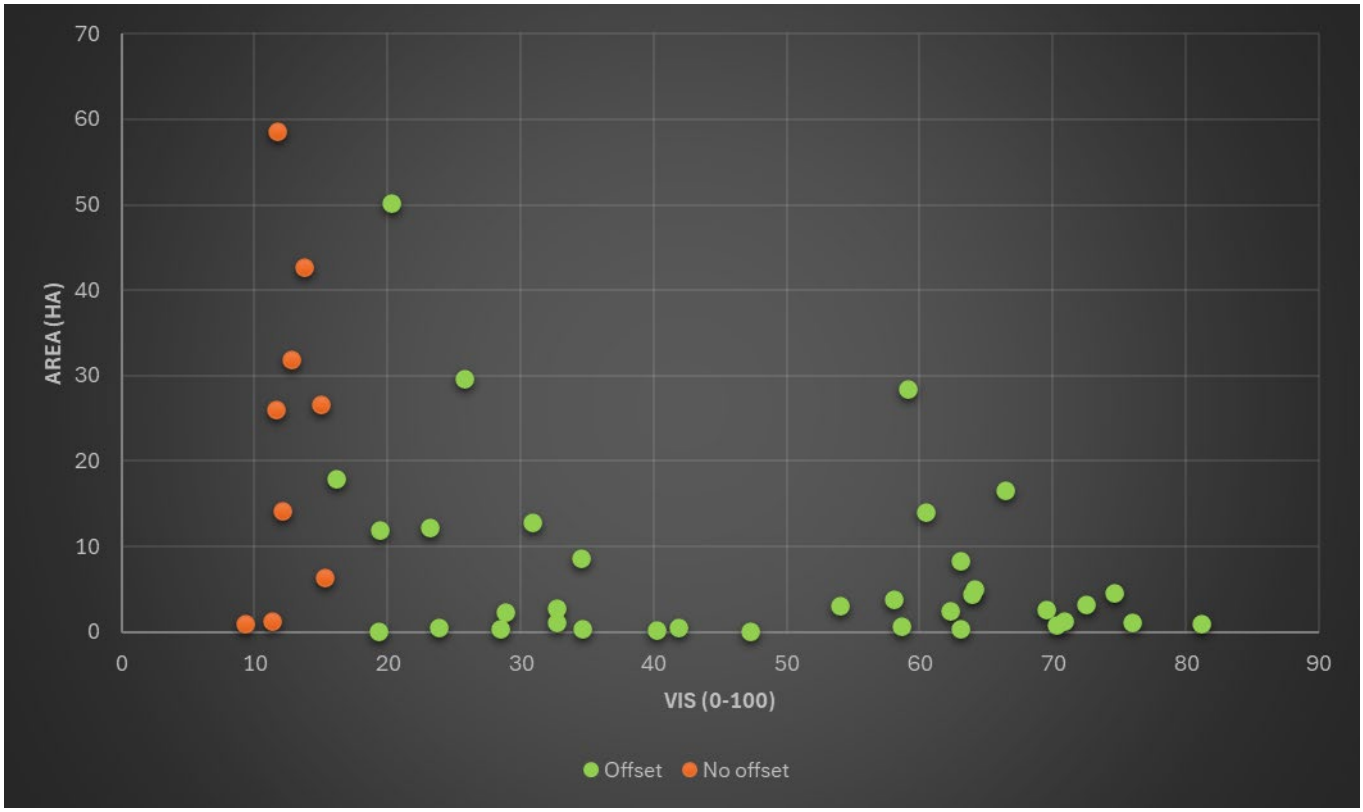
ERM

0526676_WWF_BDAR_E_R1.aprx

7.1.2 PROJECT LOCATION AND DESIGN

In general, impact avoidance and minimization have involved locating the Project in areas of least biodiversity value, wherever possible. **Chart 7-3** shows the assessable vegetation (i.e., 464.13 ha) by vegetation zone (i.e., VIS on the x -axis and VZ area on the y-axis) (chart excludes Category 1 – Exempt Land as this is not assessable vegetation).

CHART 7-3 VIS AND AREA OF VEGETATION ZONES ASSESSED IN BDAR



This chart demonstrates the Project has preferentially biased the use the non-woody vegetation with low biodiversity value (i.e., vegetation zones with no offset requirement and/or low VIS). Direct impacts on TECs are detailed in **Table 7-2**.

TABLE 7-2 PROJECTS IMPACT ON TECS

TEC	PCTs	Structure	Condition	Area (ha)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	510	Woody	Moderate to high	5.28
		Non-woody	Moderate	11.12
			Low	14.27[33]
New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	533, 534	Woody	Moderate to high	6.54
		Non-woody	Moderate	13.40
			Low	31.84[33]

[33] Impact on low condition grassland vegetation zone with VIS<15. No offset incurred.

TEC	PCTs	Structure	Condition	Area (ha)
Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	766	Wetland	Moderate	1.18
			Low	0.40[33]
Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion	1192, 1194	Woody	Moderate to high	3.75
		Non-woody	Moderate	0.00
			Low	19.24

7.1.2.1 STRATEGIC DEVELOPMENT CONTEXT

The Project is in the New England REZ. The New England REZ encompasses some of Australia's best natural energy resources. The location of the New England REZ was selected based on detailed geospatial mapping, which identified areas of high renewable energy resource (e.g., wind speed, solar irradiance) potential, proximity to existing transmission infrastructure, and interactions with existing land uses. The New England REZ was declared by the Minister for Energy and Environment in December 2021. The declaration begins the process of formalising the REZ under the *Electricity Infrastructure Investment Act 2020*, establishes EnergyCo as the Infrastructure Planner for the REZ, and sets the intended network capacity. The declaration of the New England REZ also supports the implementation of the Australian Energy Market Operator's Integrated System Plan.

The objectives of REZs are to:

- Deliver affordable energy into the future;
- Diversify the NSW energy mix;
- Expand electrical transmission capabilities; and
- Open up new parts of the NEM for energy generation in locations that can benefit from diverse weather patterns.

The Project is strategically located within the New England REZ and aligns with the strategic objectives of the New England REZ as identified above. The Project will deliver affordable clean energy, contribute to the diversification of the NSW energy sector, and facilitate the expansion of electrical transmissions capabilities and opening new parts of the NEM for energy generation. The Project has been optimised to make the most of the wind resource to produce clean, reliable energy that can be matched with transmission and demand. The intent of the REZ is to set up renewable resource rich areas with the right infrastructure and transmission capacity to facilitate the delivery of clean energy where it is needed. While the Project is not connecting to any proposed new REZ infrastructure, it will augment both the generation and transmission of clean energy within the REZ.

7.1.2.2 PROJECT DESIGN AND ITERATION RESULTS

The Applicant has completed environmental assessment of the Project Area in accordance with the SEARs and has modified the Project layout based on the outcomes of these assessments, consideration of technical, environmental, and constructability issues, and community feedback. This section describes Project alternatives that were considered, and modifications made to previous designs.

Throughout the Project design process, the Applicant has undertaken additional surveys and design work to avoid and minimise potential environmental impacts and optimise the Project layout and constructability. Where the potential for impacts could not be avoided, design principles were sought to minimise environmental impacts, and mitigation measures have been proposed to manage the extent and severity of any residual impacts.

The Scoping Report initially proposed up to 126 WTGs with a maximum tip height of 250m (ERM, 2020a). An Addendum Scoping Report proposed four additional turbine locations increasing the total number to 130 WTGs (ERM, 2021). The Project Layout, as assessed in the EIS BDAR by NGH (2022), consisted of up to 119 WTGs with a maximum tip height of 230 m and a development footprint of 581.41 ha. The Amended Project has been refined and proposes up to 118 WTGs with a maximum tip height of 230 m.

The Amendment Report included the following changes:

- Changes to the Project configuration and layout including 21 WTG relocations (moved >100 m), 52 WTG micro-sitings (moved <100 m), addition of one WTG, and removal of two WTGs;
- Updates to the Project Area including the addition of two land parcels and the removal of thirteen land parcels;
- Realignment of site access locations, internal access tracks, and electrical reticulation;
- Relocation of both substations, the operation and maintenance facility, construction compound, BESS and laydown areas;
- Inclusion of an on-site quarry to supply gravel, aggregates and bedding materials required for Project construction; and
- New transport route for OSOM vehicles along Staces Road between New England Highway and Thunderbolts Way to avoid Oxley Highway.

The Amended Project increased the disturbance footprint to approximately 882 ha. The increase in the disturbance footprint is attributable to further design of earthworks and civil infrastructure (to address constructability), the addition of the quarry and 33 kV overhead transmission lines within the Project Area and inclusion of local roads used for OSOM vehicle haul routes between Uralla and the Project site. **Figure 7-3** illustrates key amendments to the Project.

While the disturbance footprint has increased between the EIS and the Amended Project (by ~294 ha), the impacts on biodiversity values have not seen a similar proportional increase. This is because the footprint expansion has predominantly occupied areas with exotic and non-native vegetation (i.e., Category 1 – Exempt Land) or native vegetation with low condition grasslands (i.e. VIS <15 for TECs and <17 for non-TECs) which do not require any offsetting for direct impacts.

Additional considerations for the amended Development Footprint included:

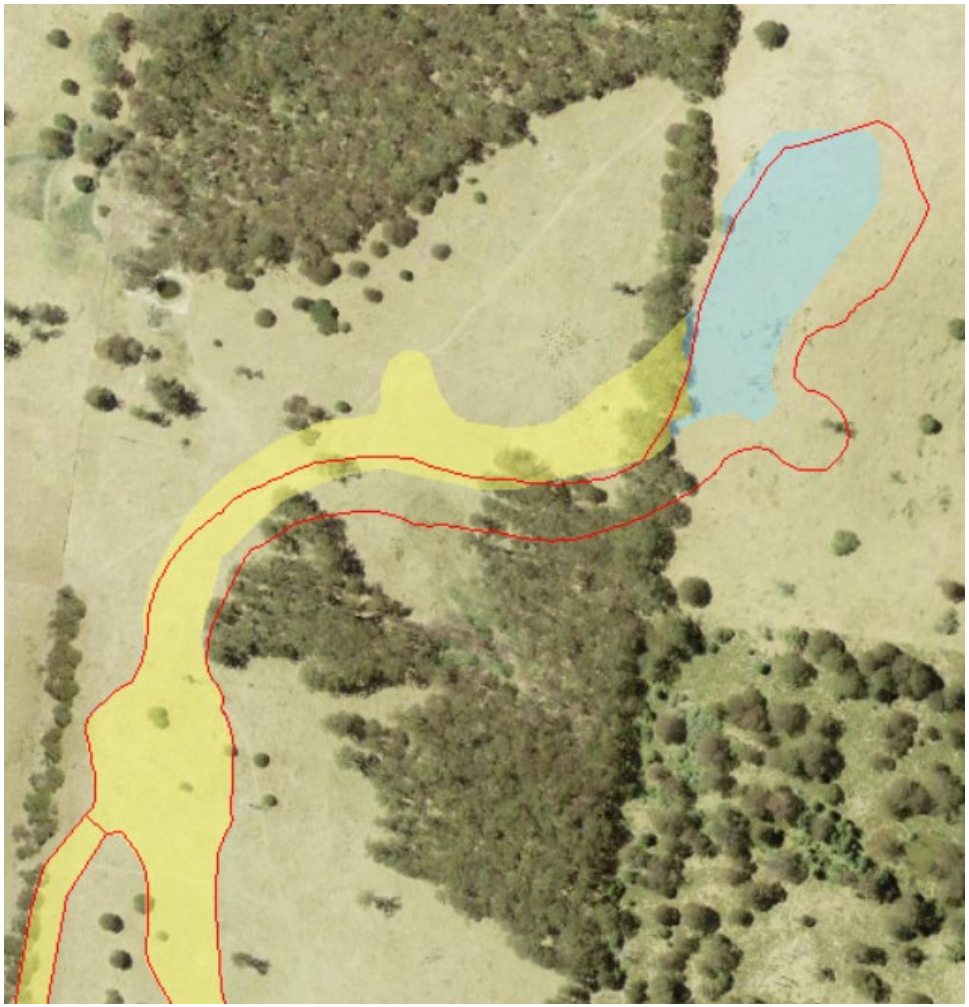
- Retention of existing native vegetation which avoided areas of high biodiversity value, notable areas of woody vegetation with elevated VIS and lands containing SAII entities (i.e., CEECs); and
- Avoidance of impacts to affected species credit species following review of further survey results and design amendment.

The purposeful alignment of the Project with low condition grasslands, where possible, has significantly reduced impacts on biodiversity values. The mean VIS for low condition grasslands (i.e., 11.6) verified the benefit of aligning the Project to vegetation in this broad condition state (i.e., VIS <15 for TECs and <17 for non-TECs). Similarly, the Project minimized impacts on biodiversity values by aligning the footprint to moderate condition grasslands (i.e., mean VIS = 25.3). Low condition grasslands typically have high exotic plant species richness and cover, low native plant species richness and cover resulting in lower diversity measures. These grasslands are heavily modified and are, by definition, sufficiently degraded to not support habitat constraints or microhabitats of species credit species.

The Project has been designed to maximise use of existing public and internal access tracks and access points across the Project Area minimising vegetation clearance required and preventing an increase to access routes and activity. The width of clearing required for tracks and transmission lines has been designed at less than 40 m to retain habitat connectivity. In the instance that clearing of greater than 50 m widths are found to be required in areas of glider habitat, habitat connectivity infrastructure such as glide poles and rope bridges will be installed.

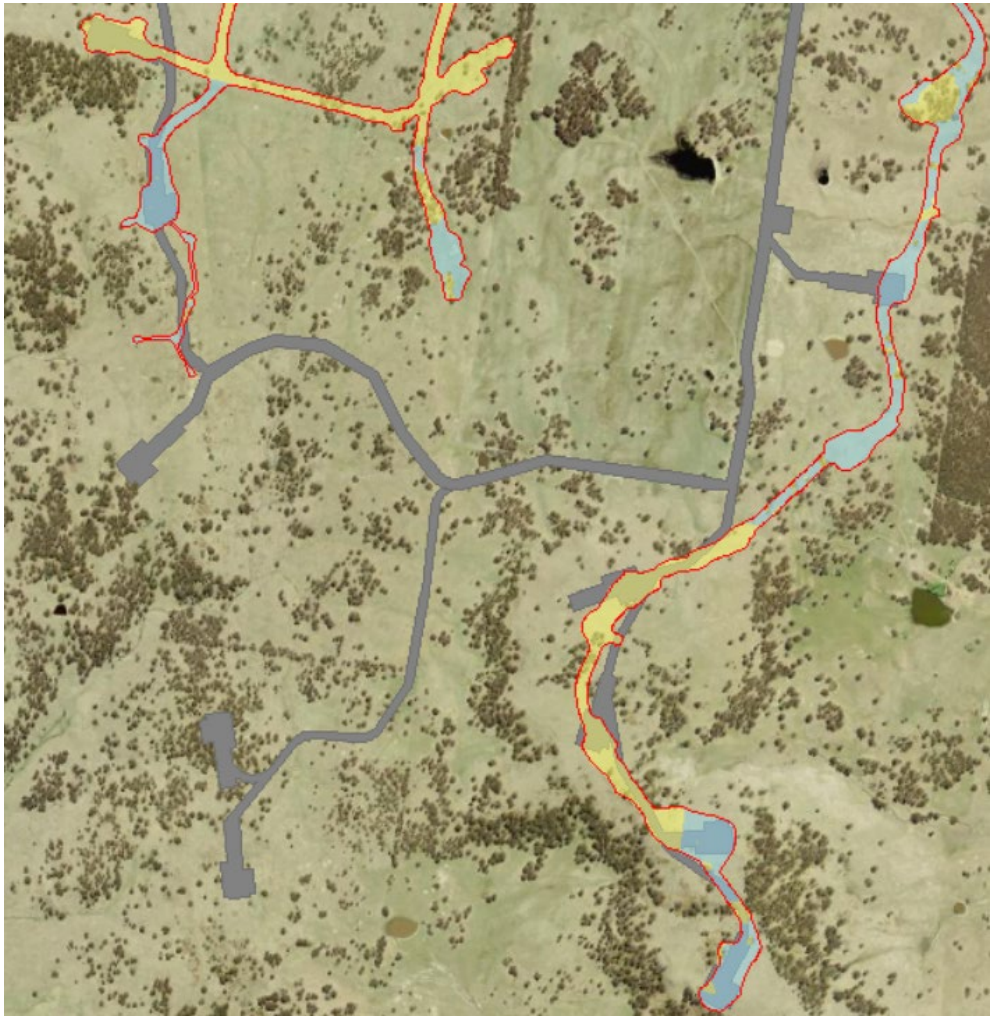
Example locations where impact avoidance measures have been considered are further discussed in **Table 7-3**.

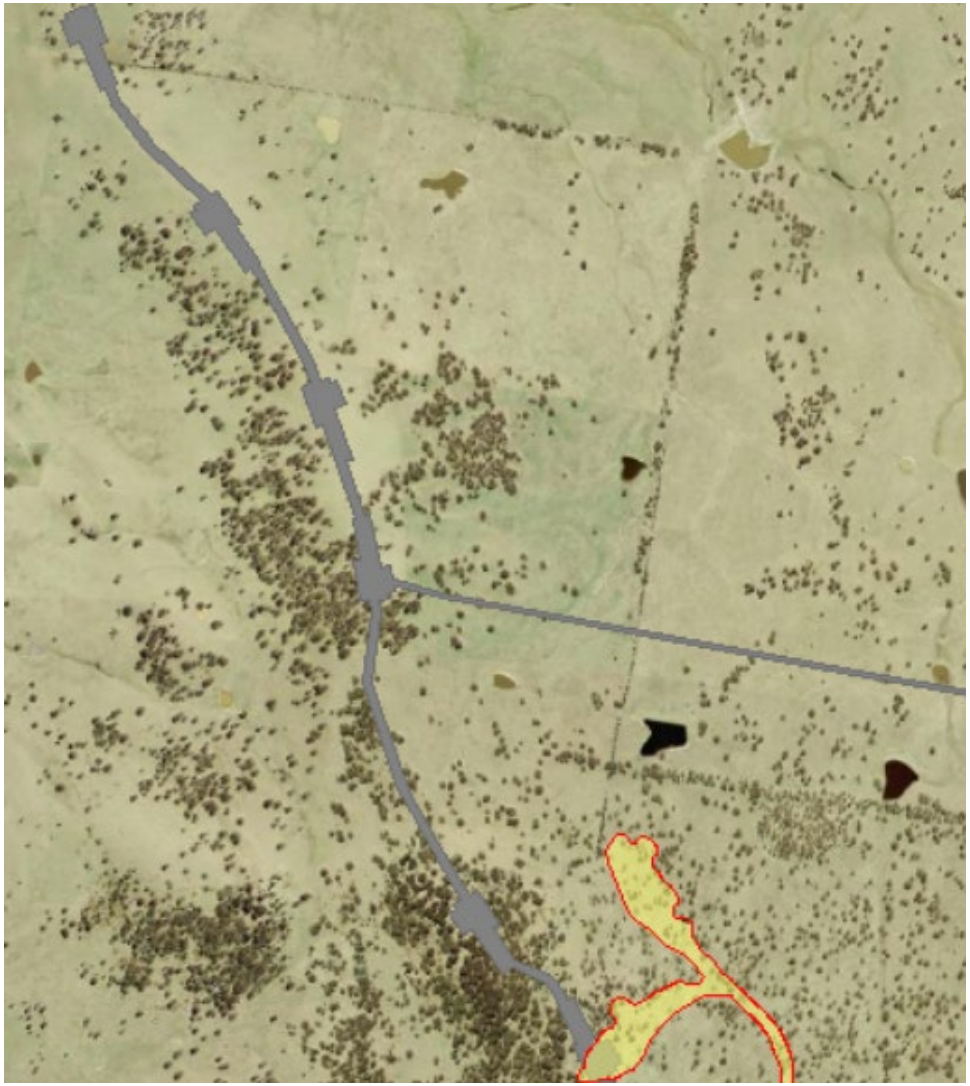
TABLE 7-3 DESIGN AMENDMENT EXAMPLES SHOWING

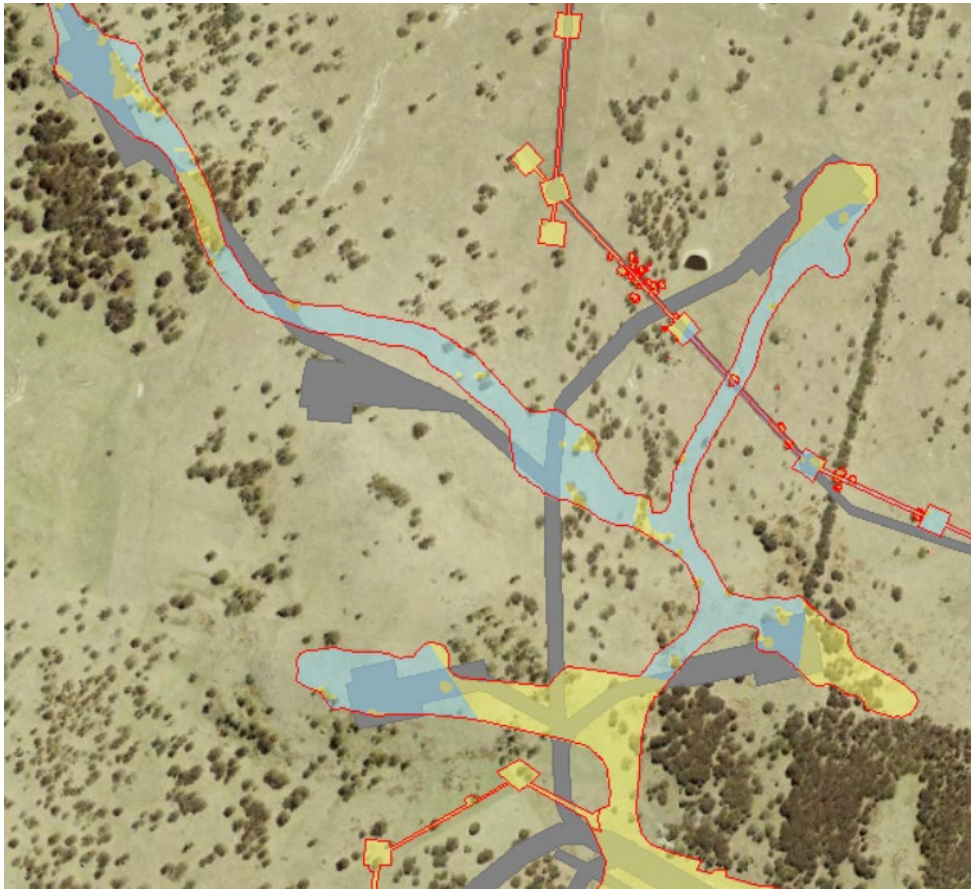
Location	Comments
	Several design considerations are active at this location including land ownership, topography and woody vegetation. The disturbance footprint of the design assessed in ERM (2024) (i.e., red outline) has been optimised to reduce impacts as outlined below. The Amended design in this location has taken advantage of a small area of Category 1 – Exempt Land (blue shading) and, where possible, has limited the clearing of Category 2 – Regulated Land (yellow shading) where coincident with woody vegetation (i.e., areas of higher biodiversity value). This location comprises observations of the Southern Greater Glider. The Amended design has reduced impacts on woody vegetation that may be used for foraging and movement. While the woody vegetation link will be fragmented by the Project, it is considered that movement will continue through the landscape as this species has capacity to glide distances greater than the gap created. Mitigation measures may be applied at this location to aid movement. The optimised design has been adopted resulting in an avoidance and impact minimisation outcome.

Location	Comments
	The Amended Design is larger at this location to accommodate constructability issues (e.g., avoidance of significant slope cross falls, integration of turning radii for OSOM, minimum distance between wind turbines, minimising cut and fill requirements to reduce the extent of land disturbance). A review of the footprint at this location identified significant topographic limitations that significantly reduced the scope for avoiding impacts on biodiversity values. However, the optimised design identified a small area of native vegetation that could be avoided (see island of vegetation excluded from footprint). The vegetation that could not be avoided is located on the ridgeline with significant slopes restricting the design to this landscape feature. Further impact avoidance in this area would require a significant increase in cut and fill resulting in a substantially greater impact footprint.

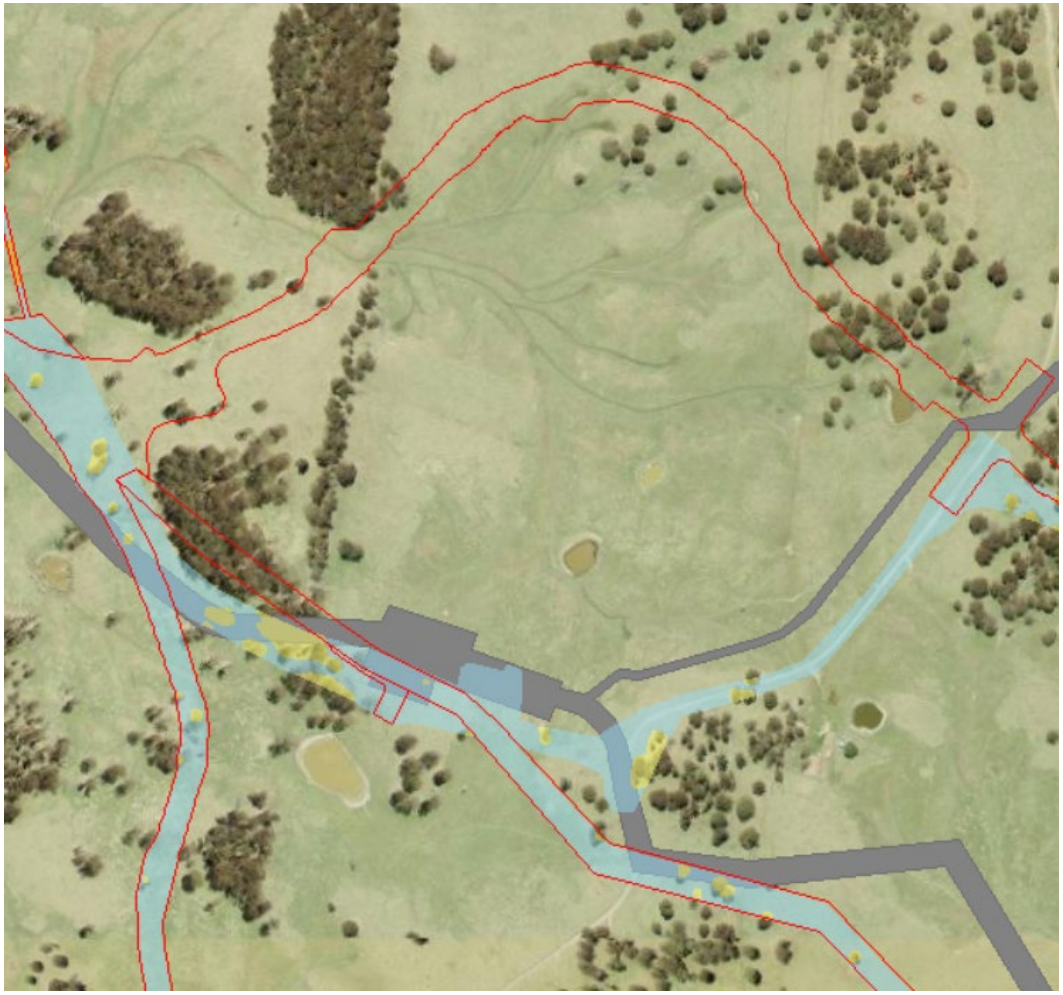
Location	Comments
	An optimised design was considered at this location of the Amended design. This process required the consideration of significant cross falls in slope and woody vegetation. A significant quantum of earthworks was required to achieve a modest reduction on woody vegetation. The larger disturbance footprint associated with the optimised design was not adopted as the broader impact on the environmental impacts were generally regarded as being greater than the Amended design.

Location	Comments
	The EIS design (i.e. solid grey shading) shows an access track design with total length and alignment that is inefficient for the number of wind turbine locations it services. This was optimised in the Amended design to reduce unnecessary impacts. In some cases, the design involved the removal and/or relocation of wind turbine locations. The Amended design has utilised, where possible, occurrences of Category 1 – Exempt Land (blue shading) and grasslands that are Category 2 – Regulated Land, thus showing an avoid and minimise outcome. The Amended design also shows a reduced impact on woody vegetation, which generally has the highest biodiversity values of the Subject Land as all condition attributes used to calculate the VIS are present (i.e., composition, structure and function attributes).

Location	Comments
	As was the case above, the EIS design (i.e. solid grey shading) was optimised to reduce impacts on the environment including, but not limited to, woody vegetation. Several wind turbines have been removed from this part of the Project Area, resulting in a lesser impact on woody vegetation.

Location	Comments
	The EIS Layout (i.e., grey shade) and Amended design (i.e., red outline) at this location shows a complex set of design revisions and inclusion of transmission line easement. Design has adopted an avoid and minimise approach by aligning the development footprint to areas of Category 1 - Exempt Land (i.e., blue shading) in preference to Category 2 – Regulated Land (i.e., yellow shading), in particular woody vegetation. While the impact footprint is larger to accommodate constructability issues, the alignment is more sensitive to impacts on woody vegetation. These design amendments occur elsewhere in and collectively has reduced impacts on the biodiversity values inherent in woody vegetation, which includes habitat for species dependent on a tree canopy such as the Koala, Southern Greater Glider, Squirrel Glider, Glossy-black Cockatoo and Barking Owl.

Location	Comments
	The Amended design has incorporated provisions for a quarry, which is shown as the large area of blue shading (i.e., aligns with Category 1 – Exempt Land except for some isolated trees). This represents a substantial part of the increased development footprint as does the local road reserve also evident in this example. The Amended design shows an increased impact on woody vegetation in this location, which exemplifies the unavoidable nature of some impacts arising from this design. However, thematically, the Amended design at this location continues to show an avoid approach (i.e., use of Category 1 – Exempt Land).

Location	Comments
	Broad similarity exists between the EIS layout (i.e., grey shading) and Amended design (i.e., blue and yellow shading) at this location, with parts of the design assessed in the Amended BDAR (ERM 2024) (red outline) no longer forming part of the Amended design (i.e., areas with no coincident blue or yellow shading). The Project was optimised at this location to align the disturbance footprint to an existing access road/track that is surrounded by Category 1 – Exempt Land. By removing the northern part of the red outline, there has been a minor reduction in impacts on woody vegetation representing an avoidance outcome. Unavoidable impacts have been minimised where possible.

7.1.2.3 ALTERNATIVE LOCATIONS THAT WOULD AVOID OR MINIMISE IMPACTS ON BIODIVERSITY VALUES AND JUSTIFICATION FOR SELECTING THE PROPOSED LOCATION

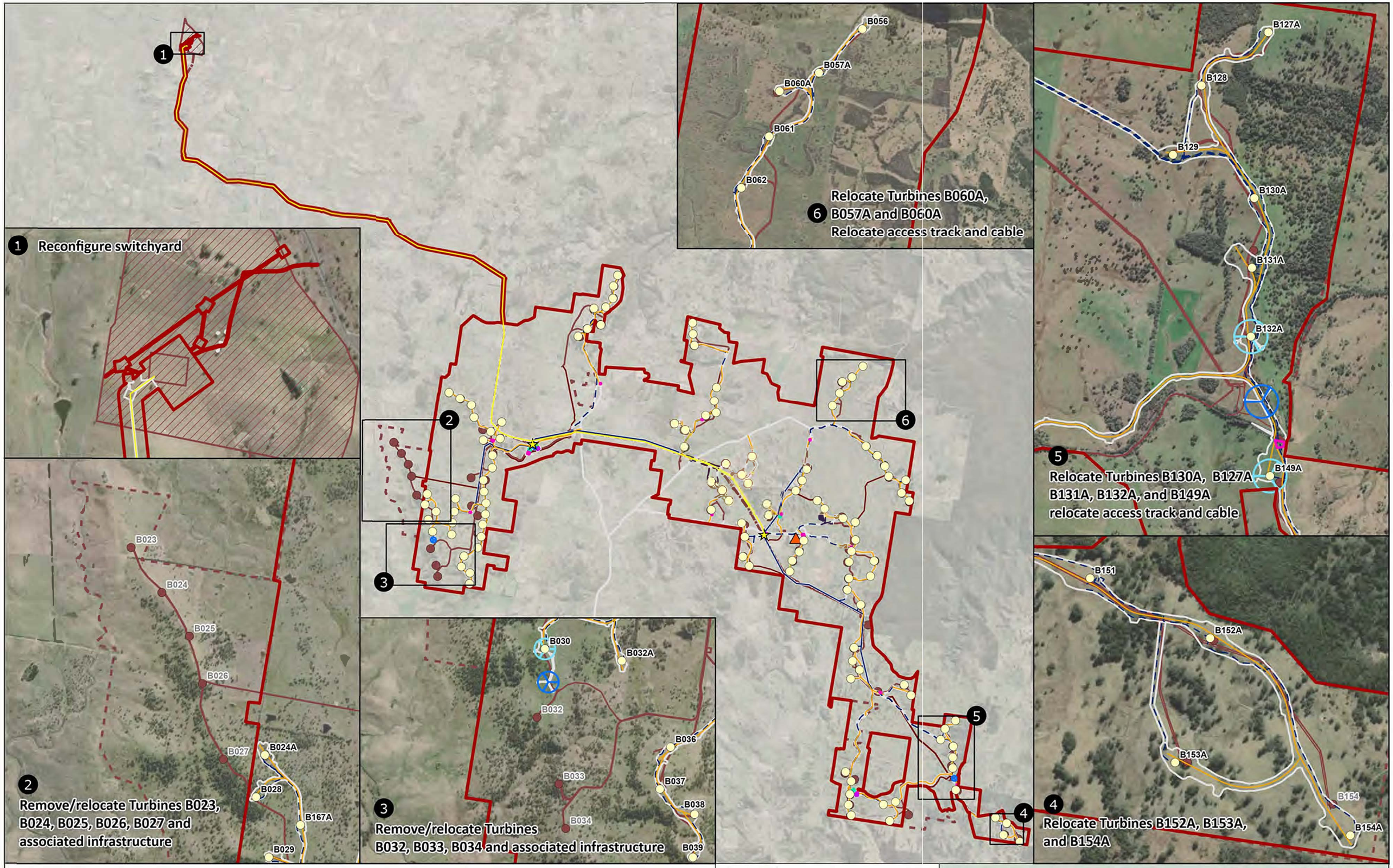
Conservation of biodiversity has been a fundamental consideration throughout development of the Project. Extensive desktop, field assessment and additional design work have been undertaken to understand the anticipated biodiversity impacts. The findings of the biodiversity assessment have informed an ongoing iterative design for the layout of the amended Project and siting of WTGs and other key infrastructure.

Impacts to biodiversity will be avoided, mitigated and offset where necessary to ensure that there is no net loss in biological diversity and that ecological integrity is maintained. The environmental impacts of the amendments to the Project have been carefully evaluated and, where practicable, have or will be avoided, mitigated, managed or offset. Various options have been considered for the WTGs, BESS and associated infrastructure having regard to environmental risks. Ultimately, options with lower environmental impacts and risks have been selected to avoid and minimise potential biodiversity impacts. Management measures have been proposed for all significant environmental impacts, and where uncertainty exists, measures have been suggested to address the uncertainty.

7.1.3 FURTHER MEASURES TO AVOID AND MINIMISE IMPACTS

Impacts will be further avoided and minimised where possible through additional detailed design. Notably, it is anticipated that additional impact avoidance outcomes will be achieved in the local road reserve network as the Project currently assumes a conservative design in these areas.

A Biodiversity Management Plan (BMP) will be prepared in consultation with relevant regulators prior to construction in conjunction with several other management plans including a Bird and Bat Adaptive Management Plan (BBAMP), Traffic Management Plan, Soil and Water Management Plan and Waste Management Plan. Further discussion of these management measures and their application to the prescribed impacts are detailed in **Section 7.2** of this BDAR.



Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Ancillary Infrastructure
- Transmission Line
- Substations
- Access Tracks

Coordinate System: GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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7-3 Key Project Amendments (Map 1 of 4)

Winterbourne Wind Farm
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1
Relocate Turbines B015A,
B016A, B018A
Relocate access track and cable
Add 33kv overhead line
Add Contractor Laydown

2
Relocate turbines B020A, B025A,
B026A, B027A, B028A, B034A,
B045A, B167A, B172A
Relocate access track and cable
Remove cable
Add 33kv overhead line

3
New access track and cable

4
Relocate Turbine B146A
Relocate access track and cable

5
Relocate Turbines B139A,
B140A, B141A, B142A
Relocate access track and cable
Relocate Ancillary Infrastructure

6
Relocate Ancillary Infrastructure
Add 33kV overhead line
Remove cable
Modify 330kv Transmission Line

B014 B160 B015 B015A B161 B016A B018A B019 B167 B020A B020 B021 B025A B172A B172 B167A B026A B045A B027A B034A B032A B044 B138 B139 B139A B140A B141A B142A B144 B146A B146 B145

Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Ancillary Infrastructure
- Transmission Line
- Substations
- Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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7-3 Key Project Amendments (Map 2 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

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1 Relocate Turbine B175A
Relocate access track and cable

B173
B174
B175A

2 Relocate Turbines B005A, B007A, B176A, B002A, B003A
Relocate access track and cable
Relocate Ancillary Infrastructure

B001
B002A
B003A
B004
B005A
B005
B176
B176A
B006A
B007A
B007

3 Relocate Turbines B071A, B074A
Relocate access road and cable
Add Ancillary Infrastructure

B074A
B072
B071A

6 Relocate turbine B122A
Relocate access track and cable

B092A
B093A
B093
B105A
B107

Remove Turbine B116
Remove Ancillary Infrastructure
Relocate Turbines B115A, B118A
Add overhead 33kV line
Relocate access track
Remove cables

5

B115A
B116
B118A
B119
B120A
B121

4 Remove Turbine B124
Relocate Turbine B122A
Add Ancillary Infrastructure
Relocate access track and cable

B122A
B124
B123

Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Transmission Line
- Substations
- Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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7-3 Key Project Amendments (Map 3 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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ERM

0526676_WWF_BDAR_E_R1.aprx

1 Relocate access track and cable
Add Ancillary Infrastructure

B051
B052
B053
B054A
B046
B047A
B048A

Relocate Turbines B082A, B086A, B087A, B092A, B093A
Relocate access track and cable
Add 33kV Overhead Line
Add Ancillary Infrastructure
7

B086A
B087A
B088
B092A
B093A
B081
B082A
B093
B105A

6
Relocate Turbines B063A, B064A, B066A, B065A, B069A, B070A
Relocate access track and cable

B063A
B064A
B065A
B066A
B068
B069A
B070A

5 Relocate Turbines B105A, B109A, B110A, B111A, B112A, B116A
Relocate Ancillary Infrastructure
Relocate access track and cable

B105A
B107
B108
B109
B109A
B111A
B110A
B116A
B112A

Relocate Turbines B073A, B076A, B078A., B079A
Relocate access track and cable
Relocate Transmission Line
Add Ancillary Infrastructure
2

B083
B076A
B078A
B073A
B079A

3
B169
B170A
B171
Relocate Turbine B170A
Relocate access track and cable
Add Ancillary Infrastructure

B102
B112A
B113A
B115A
4
Relocate Turbines B112A, B113A, B115A
Replace cable with 33kV overhead line

Legend

Amendment Layout
- Project Area
- Subject Land
- Turbines
- 330kV Transmission Line
- Substation/Switchyard
- Quarry
- Battery Energy Storage System
- Concrete Batch Plant
- Contractor Laydown
- O&M Building
- Construction Compound
- Permanent Met Mast
- Temporary Met Mast
- Access Tracks
- 33kV Overhead Line
- Underground Electrical Cable

EIS Layout
- Wind Farm Boundary
- Turbines
- Transmission Line
- Substations
- Access Tracks

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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7-3 Key Project Amendments (Map 4 of 4)

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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7.2 AVOID AND MINIMISE PRESCRIBED IMPACTS

7.2.1 HABITAT CONNECTIVITY

The Project poses risk to habitat connectivity for threatened species between the Subject Land and the adjoining Oxley Wild Rivers National Park because of clearing native vegetation in proximity to the National Park boundary. The Subject Land has been historically cleared and altered for agricultural use; however, some vegetation has been retained and serves as habitat corridors and connectivity to nearby National Parks.

The eastern portion of the Project Area has the highest concentration of remnant vegetation and connects with Oxley Wild Rivers National Park. The value of this connectivity is already compromised by fencing and permissible land uses.

Vegetation connectivity decreases substantially in the western half of the Subject Land in step with the arable nature of this area (i.e., topographically less diverse), which has given rise to considerable historical land clearing for agricultural production (e.g., livestock grazing and cropping). **Figure 3-2** displays the extent of native vegetation within the Subject Land and the surrounding areas to demonstrate the habitat connectivity features present.

Localised impacts to habitat connectivity for arboreal mammals such as the Greater Glider, Squirrel Glider, and Koala is expected, with the former two requiring relatively continuous canopies for movement through a home range and dispersal. The Project has been designed to maximise use of existing public and internal access tracks and access points across the Project Area, minimising vegetation clearance required and avoiding development on much of the eastern side of the Project Area where the highest concentration of habitat connectivity is present. The width of clearing required for tracks and transmission lines has been designed at less than 40 m to retain habitat connectivity. In the instance that clearing of greater than 50 m widths are found to be required in areas of glider habitat, habitat connectivity infrastructure such as glide poles and rope bridges will be installed.

7.2.2 WIND TURBINE STRIKES

A BBAMP will be prepared to minimise any potential impacts on bird and bat species associated with operation of the WTGs in the vicinity of the Subject Land. The purpose of the BBAMP is to enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory species. Monitoring will also identify any potential changes to the species' utilisation of the Subject Land and the surrounding landscape.

In accordance with the Draft BBAMP guidance provided by DPE in 2023 and 2024, the following aspects of the Draft BBAMP have been detailed in the following sections:

- BBAMP objectives and consent conditions;
- Baseline data;
- Proposed monitoring program;
- Preliminary turbine risk assessment;
- Proposed trigger action response plan;
- Offsetting and compensatory means; and
- Proposed turbine strike notification process.

The final BBAMP is to be prepared in consultation with the CPHR, following approval of the Project.

7.2.3 VEHICLE STRIKES

Vehicle strikes can pose a threat to wildlife, including ground-dwelling species such as the Spotted-tail Quoll, Long-nosed Potoroo and Koala during dispersal. The Project includes the construction of internal access tracks and will result in an increased vehicular presence across the Subject Land. It is possible that fauna will venture onto these roads and access tracks resulting in vehicle strikes.

The highest risk period for vehicle collision is anticipated during the construction and decommissioning stages, which generate trips associated with the workforce accessing and traversing the site and the delivery/removal of raw materials and plant. During operation, vehicle movement will be considerably reduced; however, plant operation also presents a potential collision hazard with a limited number of vehicles entering for routine maintenance and monitoring purposes.

The construction period is expected to take approximately 52 months with a peak construction phase of 16 months. A construction workforce of up to 390 personnel would be on-site during the peak construction phase. Most workers will generally arrive on-site between 6am-7am and depart between 5pm-7pm. Heavy vehicle movements will occur throughout the day.

Native wildlife mortality due to vehicle strike above current/baseline levels is possible; however, if evident, such mortality is expected to be relatively low following implementation of mitigation measures. These measures would be included in the Traffic Management Plan and could include on-site education, identifying and reporting hazards, use of appropriate warning signs, and driver protocols such as designated vehicle routes, vehicle speed limits and vehicle schedules.

7.3 BIRD AND BAT ADAPTIVE MANAGEMENT PLAN FRAMEWORK

7.3.1 OBJECTIVES AND POLICY

The objective of the BBAMP is to minimise and manage the impact of operation of the WTGs associated with the proposed development on birds and bats that occur within the vicinity of the wind farm. Specifically, the BBAMP will:

- Detail potential mitigation measures and implementation strategies to minimise impacts to birds and bats;
- Establish an adaptive management framework for managing and mitigating impacts on birds and bats;
- Outline a monitoring program to understand the impact of the proposed development to at-risk birds and bats;
- Document an agreed decision-making framework that identifies operational-phase impact triggers leading to a management response;
- Identify any additional measures that can be used to manage impacts based on the outcomes of ongoing monitoring; and
- Aim to offset mortality impacts to listed threatened species where applicable.

The BBAMP will aim to achieve the following environmental outcomes:

- An improved understanding of the risk of turbine collision and barotrauma impacts on listed bird and bat species;
- An improved understanding of weather and how project site usage changes as a result of wind farm construction and operation;
- An improved monitoring approach for the timely identification of turbine collisions and collection and analysis of data;
- An improved approach to the timely and regular validation and update to the Collision Risk Modelling (CRM) using monitoring data, and a robust adaptive management approach; and
- Development of management and corrective actions to minimise risk of turbine collision and other impacts on threatened bird and bat species.

7.3.1.1 LEGISLATION AND POLICY REQUIREMENTS

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) *Onshore Wind Farms – interim guidance on bird and bat management* (DCCEEW, 2023) states that:

> "The BBAMP (Bird and Bat Adaptive Management Plan) must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines. The BBAMP must be informed by desktop and field-derived information, and best available practices, and include the following key requirements at a minimum:
>
> standards for pre- and post-commissioning surveys that are appropriate to the scale and environmental risks of the project;
>
> evidence of effectiveness of the methods used for other similar actions;
>
> demonstration that the proposed measures and outcomes of the BBAMP are supported by published scientific evidence; and
>
> where innovative measures are proposed, details about how desired outcomes will be met."

In line with the Onshore Wind Farm Guidance (DCCEEW, 2023), specific objectives of individual species to achieve outcomes will be provided. Specific objectives include the implementation of mitigations measures against not to exceed designated thresholds. If thresholds are reached, corrective actions will be implemented.

The BBAMP will be adaptive in response to outcomes of monitoring, detection of potential species triggers that could result due to identified impacts to bird and bats from WTG collisions. This adaptive management framework will involve consultation with CPHR for a management response following identification of mortality considered to meet trigger levels for at risk species.

The BBAMP will be implemented during pre-commissioning and construction, and it is proposed to be implemented across the first two years of operation, commensurate to the level of potential risk to birds and bats resulting from the Project.

7.3.1.2 BASELINE DATA

Baseline data collected to date to inform the BBAMP has been determined through survey events across the broader Project Area completed between 2020 and 2025, literature reviews, desktop searches and statistical analysis.

Prior to field surveys, several desktop sources were reviewed to identify ecological values that may occur within the Subject Land. Desktop analysis was also used to guide development of field survey sampling techniques, followed by a field survey program to collect data to describe on-ground conditions. The information from the desktop sources and field surveys were used to assess and document the likelihood of occurrence and potential occurrence of bird and bat species within the Subject Land.

7.3.2 BIRD AND BAT SURVEY METHODS

A summary of the survey efforts undertaken to date to inform this report were conducted between October 2020 and April 2025. The survey design, including targeted surveys for candidate species with potential to occur in the Subject Land, was developed based on the survey guidelines detailed below. Additional survey effort will be completed to inform the final BBAMP.

BUS were undertaken across the broader Project Area, which involved fixed point surveys aimed to provide data based on the species present and their height, speed and direction of flight as stipulated by the Band Model (Band W. , 2000). These survey methods are detailed in **Section 2.2.5**.

7.3.2.1 2020 – 2022: DAWE ONSHORE WIND FARMS – INTERIM GUIDANCE ON BIRD AND BAT MANAGEMENT

BUS undertaken between 2020 and 2022 were completed in accordance with guidance by DAWE (DAWE, 2022), provided in the *Onshore Wind Farms – interim guidance on bird and bat management.* Searches were conducted between 15 and 20 minutes at each survey site per season and were primarily focused on birds most likely to be affected by the development, such as raptors (birds of prey) and large flocks of birds. Under the interim guidance, BUS were required to be completed over each relevant season over a minimum of 24 months prior to commissioning of the wind farm.

Survey Guidelines for Australia's threatened birds (DEWHA, 2010) outlines steps that aid in determining survey effort and timing, noting a particular focus on optimal timing for surveys of 'target' taxa. With the timing of surveys critical to species detection, it is important that surveys be timed to maximise potential detection across the year. As such, BUS events were initially proposed over distinct seasons in NSW over a 12-month period.

7.3.2.2 2023: DRAFT WIND FARM ASSESSMENT GUIDANCE

The Draft Wind Farm Assessment Guidance was released in July 2023 and was inclusive of a suggested BUS method. This method was adopted and applied to the Winter - Spring 2023 and Summer – Autum 2024 BUS events. Survey locations were adjusted where required to best align with the current development layout. The Subject Land presents as an open landscape with flat topography allowing for high levels of visibility for avifauna in flight.

7.3.3 TURBINE RISK ASSESSMENT

A turbine risk assessment has been developed, considering the likelihood and consequences of events including collision with WTGs and the impact of construction and operation on the proposed development causing changes in site utilisation by bird and bat species.

Before-After-Control-Impact (BACI) is recommended as a survey design principle where the Subject Land is determined to support significant bird species.

The aim of the BACI design is to compare environmental variables before and after a human activity and between the area affected by the development (impact) and an unaffected area (control) (Stewart-Oaten, Murdoch, & Parker, 1986). In this instance, this would compare control and impact areas, before and after the construction of the windfarm, to determine if there are any avian impacts because of the development.

CRM will be undertaken in accordance with the Band CRM Method (Band, Madders, & Whitfield, 2007) for any non-threatened raptor species and listed threatened and migratory species recorded in the Subject Land and assessed as having a potential collision risk. This will be dependent on the collection of additional data in accordance with the latest BUS guidance.

7.3.3.1 PRELIMINARY TURBINE RISK RATING

An initial preliminary turbine risk rating was undertaken for the Project where horizontal distance of WTGs from woody vegetation was used as a proxy for risk. This assessment identified three turbines as medium risk, nine turbines as high risk and the remaining turbines as very high risk. While proximity to wooded vegetation is likely to influence risk, the reliance on one metric is limited in its ability to assess the impact of different habitat variables.

7.3.3.2 UPDATED TURBINE PRELIMINARY RISK RATING

A total of 118 WTGs have been proposed across the Subject Land. The Amended Project layout has been refined following preliminary ecological investigations to ensure the suitable avoidance of areas of high ecological value and habitat quality. Risk factors associated with the current turbine layout can be categorized by the proximity of turbines to important habitat features, such as woodlands, waterbodies, microbat roosting habitat (see **Section 4.6**) and ridgelines. In this response to submission stage, an updated turbine risk assessment has been completed using a weighted scoring system with the final risk rating calculated based on the cumulative score of each turbine (**Table 7-5**).

The assessment of buffer distances to vegetation used the formula for required buffers to areas of vegetation developed in Natural England Technical Information Note TIN051- Bats and onshore wind turbines interim guidance (see **Figure 7-4**). This method takes into consideration the hub height and blade length of turbines as well as the canopy height and horizontal distance of vegetation and calculates the diagonal buffer distance between blade tip and nearest vegetation canopy. The following formula and variables were used in the calculation:

$$x = \sqrt{b^2 + z^2 - 2tz + t^2} - y$$

Where:

x = Buffer Distance

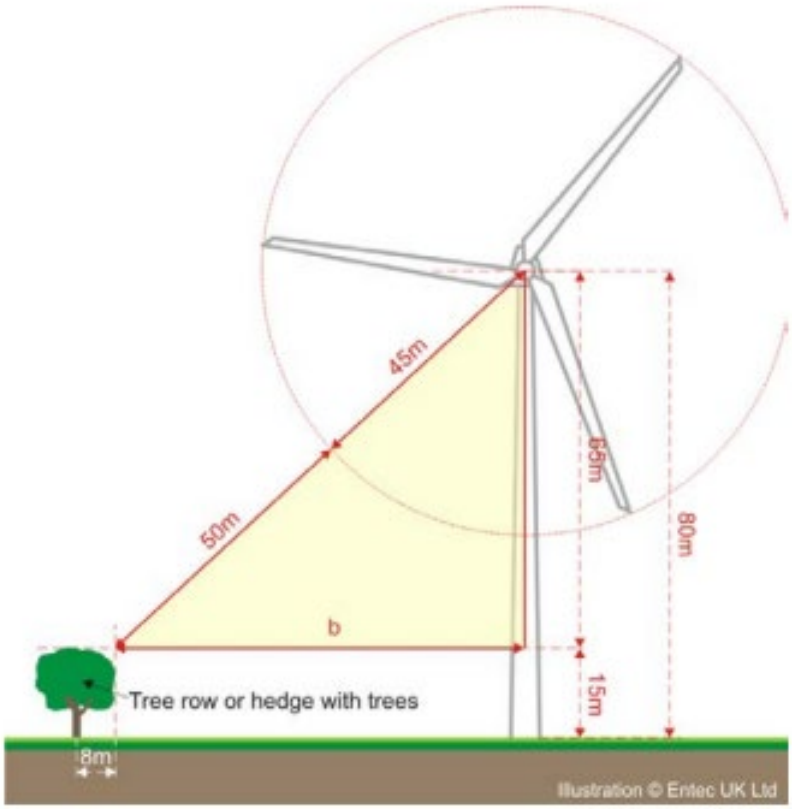
y = Blade length

z = Hub Height

t = Feature Height

b = Horizontal Distance

FIGURE 7-4 EXTRACT FROM TECHNICAL INFORMATION NOTE TIN051 BATS AND ONSHORE WIND TURBINES



Feature height of canopy was obtained from the BioNet Vegetation Classification profile for each relevant PCT. Where no canopy heights estimates were available, the average canopy heights of all PCTs were calculated and applied. Horizontal distance was calculated using the measuring tool in GIS to measure the distance from the wind turbine to the nearest patch of native vegetation mapped as woody vegetation using the NSW Woody Vegetation Extent 2011 layer sourced from SEED.

TABLE 7-4 TURBINE RISK WEIGHTED SCORING SYSTEM

Variable	Description	Score Triggered
Distance from potential microbat roosting habitat	Is the turbine located within the following buffer distances of mapped Microbat roosting habitat: Over 1000 m Within 500 m to 1000 m Within 200 m to 500 m Less than 200 m	Over 1000 m: 0 Within 500 m to 1000 m: 1 Within 200 m to 500 m: 2 Within 0-200 m: 3
Buffer distance between canopy height and turbine blade calculated from linear distance of woody vegetation	Is the turbine located within the following buffer distances of water sources: Over 200 m Within 100 m to 200 m Within 50 m to 100 m Less than 50 m	Over 200 m: 0 Within 100 m to 200 m: 1 Within 50 m to 100 m: 2 Within 0-50 m: 3

Variable	Description	Score Triggered
Distance from permanent water source. Inclusive of large agricultural dams defined as those with an area equal to or greater than 2500m^2	Is the turbine located within the following buffer distances of water sources: Over 1000 m Within 500 m to 1000 m Within 200 m to 500 m Less than 200 m	Over 1000 m: 0 Within 500 m to 1000 m: 1 Within 200 m to 500 m: 2 Within 0-200 m: 3
Distance from topographic features (escarpments, ridgelines)	Is the turbine located within 200 m of topographic features	Within 200 m: 1 Beyond 200 m: 0

TABLE 7-5 CALCULATION OF RISK RATING BASED ON TOTAL SCORE

Total Score	Risk Rating
8-10	Very High
6-7	High
4-5	Moderate
0-3	Low

Using the habitat scoring system presented in Table 7-4 and Table 7-5, a preliminary risk rating for each turbine has been established and is presented in Table 7-6. While this preliminary assessment of turbine risk establishes an estimate of theoretical risk based on the proximity of topographic and habitat features to turbines, species are only considered at risk of collision during flight behaviours at heights within the rotor swept area (RSA). As such, flight paths and collision estimates informed by site specific bird utilisation data are presented in **Section 7.3.6** and **Section 7.3.7** of the BDAR.

TABLE 7-6 UPDATED TURBINE PRELIMINARY RISK RATING

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B001	45.14	59.45	2	737.23	1	2647.15	0	614.89	0	3	Low
B002A	13.42	52.68	2	936.46	1	2619.33	0	619.55	0	3	Low
B003A	71.38	69.95	2	891.53	1	2514.42	0	390.08	0	3	Low
B004	65.74	67.36	2	1254.30	0	2830.09	0	321.17	0	2	Low
B005A	58.21	64.18	2	1789.71	0	2845.28	0	698.57	0	2	Low
B006A	38.39	52.35	2	2424.68	0	2871.86	0	261.18	0	2	Low
B007A	34.08	51.17	2	2964.29	0	2676.23	0	78.14	1	3	Low
B011	0.00	45.00	3	9371.65	0	544.60	1	1.94	1	5	Moderate
B012A	1.02	45.00	3	9056.18	0	743.08	1	67.27	1	5	Moderate
B013	31.14	48.79	3	8770.04	0	687.75	1	46.05	1	5	Moderate
B014	23.56	47.18	3	8991.76	0	638.75	1	23.50	1	5	Moderate
B015A	28.08	48.09	3	8819.42	0	927.00	1	884.10	0	4	Moderate
B016A	29.14	48.33	3	9325.47	0	699.37	1	999.41	0	4	Moderate
B018A	12.43	45.11	3	9493.55	0	945.94	1	1800.47	0	4	Moderate
B019	26.97	54.71	2	9919.40	0	760.59	1	2327.66	0	3	Low

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B020A	0	44.50	3	10607.60	0	638.25	1	2787.32	0	4	Moderate
B021	10.34	45.42	3	10990.33	0	695.14	1	3309.85	0	4	Moderate
B024A	3.52	45.05	3	12881.34	0	365.13	2	4048.58	0	5	Moderate
B025A	0	44.50	3	12100.85	0	383.41	2	3725.59	0	5	Moderate
B026A	3.69	44.55	3	12566.94	0	269.38	2	4307.39	0	5	Moderate
B027A	3.93	44.56	3	13005.99	0	616.57	1	4824.03	0	4	Moderate
B028	0	40.50	3	13278.59	0	852.40	1	4509.98	0	4	Moderate
B029	20.27	42.18	3	13652.28	0	1153.44	0	5048.95	0	3	Low
B030	2.60	44.53	3	13909.77	0	1376.27	0	5471.99	0	3	Low
B032A	37.88	50.09	2	13435.74	0	680.76	1	5354.78	0	3	Low
B033A	32.74	48.70	3	13210.40	0	295.83	2	5845.20	0	5	Moderate
B034A	0.29	44.50	3	12213.58	0	636.39	1	4802.09	0	4	Moderate
B036	69.19	68.92	2	13885.09	0	843.83	1	6252.05	0	3	Low
B037	100.11	85.47	2	14348.52	0	772.04	1	6739.94	0	3	Low
B038	64.91	66.99	2	14372.46	0	872.13	1	7002.21	0	3	Low
B039	9.20	52.32	2	14358.54	0	579.57	1	7494.50	0	3	Low

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B044	54.55	55.84	2	12703.29	0	202.92	2	5348.63	0	4	Moderate
B045A	21.88	46.39	3	11759.95	0	966.06	1	4342.07	0	4	Moderate
B046	46.97	60.05	2	5583.66	0	1837.43	0	5583.66	0	2	Low
B047A	17.21	41.71	3	6014.79	0	1298.08	0	6014.79	0	3	Low
B048A	64.43	66.79	2	6718.57	0	819.07	1	6705.94	0	3	Low
B051	65.59	67.29	2	4632.55	0	2931.29	0	4632.55	0	2	Low
B052	44.78	59.34	2	5104.95	0	2376.42	0	5104.95	0	2	Low
B053	44.95	59.39	2	5420.67	0	1876.48	0	5420.67	0	2	Low
B054A	65.78	67.38	2	5831.87	0	1661.68	0	5831.87	0	2	Low
B056	23.20	54.01	2	679.08	1	1174.45	0	679.08	0	3	Low
B057A	14.76	52.09	2	1336.57	0	878.03	1	1336.57	0	3	Low
B060A	15.93	52.95	2	1831.94	0	796.37	1	1831.94	0	3	Low
B061	40.02	51.20	2	2221.58	0	1275.51	0	2221.58	0	2	Low
B062	26.04	61.40	2	2850.77	0	1323.91	0	2850.77	0	2	Low
B063A	0.00	52.00	2	3881.80	0	959.90	1	2295.37	0	3	Low
B064A	0.00	52.00	2	4276.95	0	910.32	1	1628.22	0	3	Low

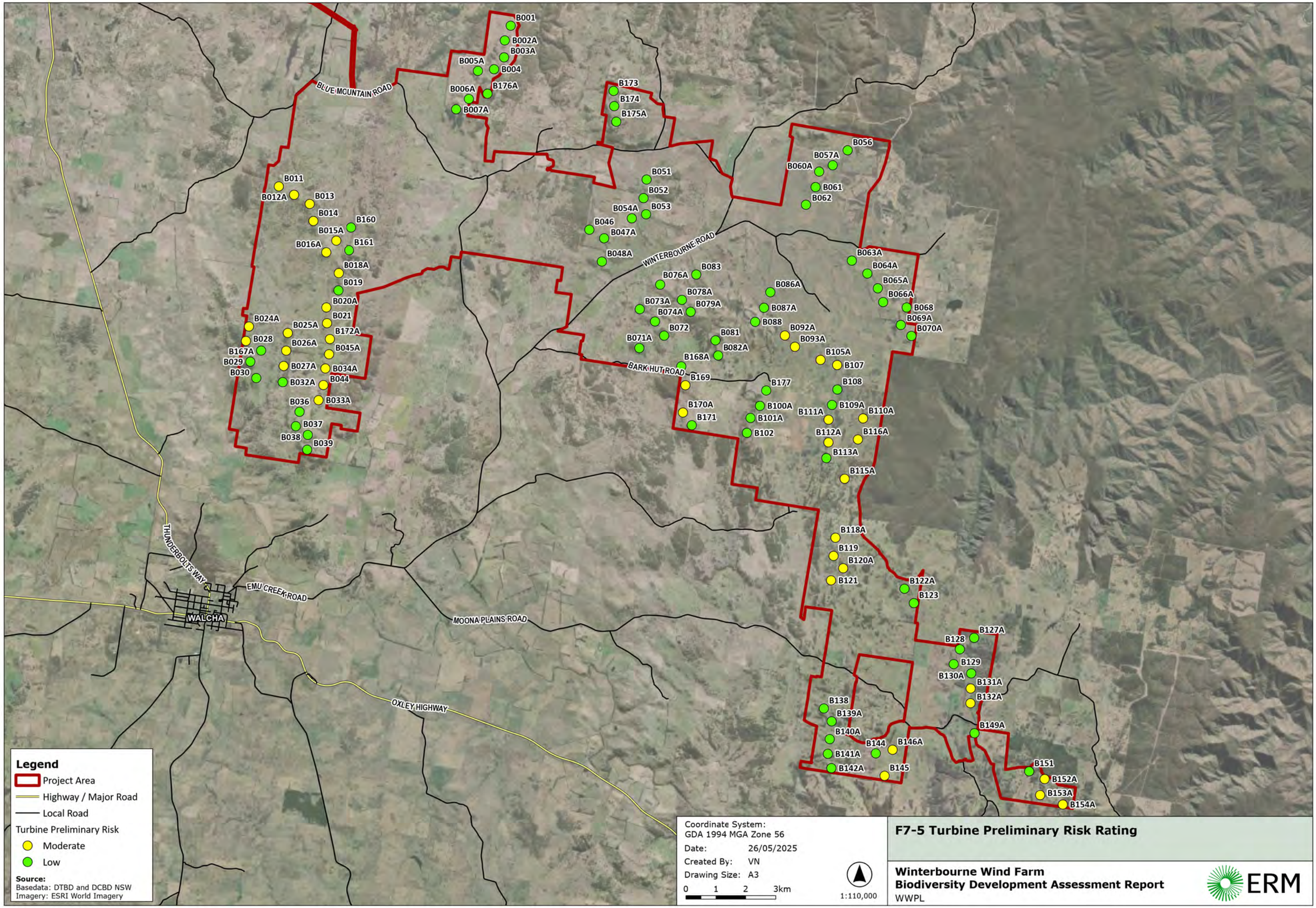
Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B065A	0.00	46.70	3	4777.77	0	1107.56	0	1035.42	0	3	Low
B066A	0.00	46.70	3	5249.38	0	1349.35	0	631.38	0	3	Low
B068	73.95	66.57	2	5554.30	0	1121.84	0	26.23	1	3	Low
B069A	85.65	72.76	2	6084.46	0	1574.25	0	63.27	1	3	Low
B070A	97.37	79.59	2	6512.09	0	1320.46	0	54.94	1	3	Low
B071A	26.33	57.53	2	9274.30	0	1052.77	0	8729.40	0	2	Low
B072	0.00	52.00	2	8571.19	0	1381.13	0	7864.18	0	2	Low
B073A	22.78	53.94	2	8116.13	0	517.74	1	8116.13	0	3	Low
B074A	0.00	52.00	2	8254.83	0	966.30	1	8137.18	0	3	Low
B076A	0.00	52.00	2	7077.92	0	676.80	1	7077.92	0	3	Low
B078A	28.44	55.01	2	7250.67	0	1502.36	0	7250.67	0	2	Low
B079A	1.02	52.00	2	7532.48	0	1933.13	0	6949.30	0	2	Low
B081	46.35	59.85	2	8234.38	0	2043.06	0	6188.27	0	2	Low
B082A	27.41	54.79	2	8585.74	0	1806.00	0	6192.68	0	2	Low
B083	0.00	52.00	2	6297.82	0	1894.70	0	6297.82	0	2	Low
B086A	16.16	52.98	2	5862.75	0	986.21	1	4346.45	0	3	Low

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B087A	0.00	52.00	2	6411.90	0	1418.96	0	4502.77	0	2	Low
B088	142.55	113.96	1	6963.46	0	1131.77	0	4799.69	0	1	Low
B092A	12.24	47.29	3	6903.89	0	492.40	2	3874.41	0	5	Moderate
B093A	29.85	50.14	2	7128.79	0	88.81	3	3628.80	0	5	Moderate
B100A	13.25	45.69	3	9379.47	0	1143.30	0	5423.84	0	3	Low
B101A	11.66	52.51	2	9871.89	0	1520.26	0	5865.92	0	2	Low
B102	26.04	54.53	2	10373.28	0	1827.42	0	6182.33	0	2	Low
B105A	3.33	46.74	3	7314.15	0	359.81	2	2967.42	0	5	Moderate
B107	1.09	46.70	3	7386.17	0	551.85	1	2557.98	0	4	Moderate
B108	30.49	50.29	2	8190.56	0	1204.09	0	2852.84	0	2	Low
B109A	65.69	62.61	2	8722.06	0	865.53	1	3275.24	0	3	Low
B110A	41.90	53.40	2	9090.82	0	445.81	2	2827.05	0	4	Moderate
B111A	8.09	46.96	3	9223.46	0	684.04	1	3659.92	0	4	Moderate
B112A	17.31	47.87	3	9970.87	0	855.67	1	4178.05	0	4	Moderate
B113A	0.37	46.70	3	10497.96	0	1002.93	0	4618.06	0	3	Low
B115A	0.00	46.70	3	10380.14	0	578.08	1	4851.90	0	4	Moderate

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B116A	30.12	50.20	2	9794.23	0	468.08	2	3500.52	0	4	Moderate
B118A	8.80	47.00	3	8478.21	0	732.66	1	5451.28	0	4	Moderate
B119	5.54	46.82	3	7884.72	0	312.31	2	5129.30	0	5	Moderate
B120A	22.20	48.62	3	7444.81	0	715.43	1	4634.33	0	4	Moderate
B121	19.12	48.12	3	7088.99	0	763.78	1	4782.39	0	4	Moderate
B122A	5.50	46.82	3	6310.32	0	1310.76	0	2616.29	0	3	Low
B123	35.10	51.43	2	5777.70	0	1539.51	0	2060.60	0	2	Low
B127A	85.30	72.57	2	4529.86	0	1304.41	0	27.85	1	3	Low
B128	49.00	55.78	2	4152.28	0	1557.91	0	25.61	1	3	Low
B129	8.052	46.95	3	3644.52	0	1459.80	0	298.82	0	3	Low
B130A	50.77	56.42	2	3354.84	0	1170.78	0	93.88	1	3	Low
B131A	16.25	47.73	3	2856.01	0	1417.87	0	82.16	1	4	Moderate
B132A	15.96	47.69	3	2369.31	0	1529.06	0	87.46	1	4	Moderate
B138	34.00	49.51	3	3024.12	0	1363.02	0	3024.12	0	3	Low
B139A	5.11	45.10	3	2528.96	0	1057.38	0	2528.96	0	3	Low
B140A	40.46	51.34	2	2027.79	0	1288.32	0	2027.79	0	2	Low

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B141A	36.69	51.87	2	1667.75	0	1630.71	0	1667.75	0	2	Low
B142A	0.00	46.70	3	1251.36	0	1415.13	0	1251.36	0	3	Low
B144	88.92	74.61	2	1363.42	0	661.26	1	1363.42	0	3	Low
B145	52.40	57.03	2	947.04	1	682.17	1	947.04	0	4	Moderate
B146A	170.13	131.72	1	1744.87	0	125.44	3	1744.87	0	4	Moderate
B149A	165.81	128.29	1	1363.94	0	1749.86	0	183.62	1	2	Low
B151	79.29	69.32	2	1702.98	0	819.05	1	836.74	0	3	Low
B152A	10.29	47.11	3	2220.56	0	281.18	2	335.68	0	5	Moderate
B153A	19.28	48.15	3	2178.85	0	375.74	2	657.24	0	5	Moderate
B154A	27.48	49.62	3	2992.20	0	693.27	1	111.09	1	5	Moderate
B160	28.57	47.71	3	8154.00	0	1495.45	0	1205.56	0	3	Low
B161	9.98	45.39	3	8710.53	0	1394.66	0	1422.64	0	3	Low
B167A	73.53	64.45	2	13137.76	0	672.07	1	4565.65	0	3	Low
B168A	0.00	52.00	2	9359.43	0	1119.32	0	7466.08	0	2	Low
B169	33.12	56.06	2	9930.67	0	482.06	2	7493.52	0	4	Moderate
B170A	12.19	52.56	2	10809.80	0	356.98	2	7870.76	0	4	Moderate

Turbine	Distance to woody vegetation (m)	Buffer from Canopy to turbine tip (m)	Woody score	Distance to Microbat roost (m)	Microbat score	Water distance (m)	Water Score	Distance from topographic features (m)	Topography Score	Total Score	Risk rating
B171	88.25	78.61	2	10999.86	0	746.74	1	7774.35	0	3	Low
B172A	6.41	45.16	3	11341.34	0	864.17	1	3844.77	0	4	Moderate
B173	36.46	56.91	2	2582.81	0	1318.54	0	2582.81	0	2	Low
B174	55.25	63.02	2	2784.63	0	1675.34	0	2784.63	0	2	Low
B175A	51.88	61.76	2	3102.48	0	2129.10	0	3102.48	0	2	Low
B176A	20.63	53.59	2	1816.01	0	3179.29	0	26.99	1	3	Low
B177	30.94	48.26	3	8828.39	0	1046.00	0	5034.27	0	3	Low



Legend

- Project Area
- Highway / Major Road
- Local Road

Turbine Preliminary Risk

- Moderate
- Low

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 26/05/2025
Created By: VN
Drawing Size: A3
0 1 2 3km
1:110,000

F7-5 Turbine Preliminary Risk Rating

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R0.aprx

7.3.4 BIRD AND BAT RISK ASSESSMENT

For the purposes of this BBAMP framework, impacts to avian species during the operation of the Project are limited to direct mortality through collision with WTGs and the indirect impacts of barotrauma. Other impacts on avian species are assessed in the Updated BDAR.

Although suitable habitat for avian species is present throughout the Subject Land, not all avian species move at heights considered to be at risk of collision with WTGs. The operation of the WTGs will pose a negligible risk to avian species which do not fly within the RSA. A literature review was undertaken to identify the following aspects of avian species' behaviour and ecology:

- Are flight heights known for avian species?
- Is the avian species known to be behaviourally restricted by the height of available vegetation?
- Is it known whether the species disperses over long distances, utilises relatively rigid territory boundaries or is behaviourally sedentary?

The results of the literature review and knowledge of whether the species is listed as threatened, migratory or is a raptor were used to delineate the level of risk that turbines pose to avian species which are known to or likely to utilise the Subject Land. Risk has been determined as a function of the consequence of turbine strike and / or barotrauma caused by turbines on a species and the likelihood that turbine strike and / or barotrauma will occur.

The consequence scale for turbine strike and / or barotrauma on avian species are summarised in **Table 7-7 Table 7-7**, the likelihood ratings in **Table 7-8**, and a risk matrix combining the consequences and likelihood of turbine strike are presented in **Table 7-9**.

TABLE 7-7 TURBINE STRIKE CONSEQUENCE SCALE

Minor	Moderate	Major	Severe
Protected (non-threatened) species AND Occasional loss of individuals not reducing local or regional population viability	Species listed as vulnerable under BC Act or EPBC Act OR Species listed as migratory under EPBC Act OR Moderate loss of numbers of individuals leading to minor reduction in viability of localised population of species for up to five years.	Species listed as endangered under BC Act or EPBC Act OR Major loss in numbers of individuals, leading to a reduction in the viability of regional or state population between five and ten years.	Species listed as critically endangered under BC Act or EPBC Act OR Extreme loss in numbers of individuals, leading to a reduction in regional or state population viability for a period of at least ten years.

TABLE 7-8 TURBINE STRIKE LIKELIHOOD SCALE

Likelihood	Description
Very Likely	*Very High* likelihood of turbine strike based on a combination of the following: • Species known to occur within the Subject Land; • High amounts of species-specific critical breeding and/or foraging habitat known to be present within the Subject Land and likely to impacted by the Project; • Flying heights of species are known to occur within the RSA and species exhibits flight characteristics more susceptible to collision (soaring, circling at height etc.); • The Project is located within known avian migratory or habitual flight pathways; and • Landscape feature(s) likely to increase avian activity are present within the Subject Land (including woody canopy, waterbodies, riparian corridors, updraft locations, caves etc.).
Likely	*High* likelihood of turbine strike based on a combination of the following: • Species likely to occur within the Subject Land based on an analysis of recent (≤ 10 years old) records within 10 km of the Assessment Area; • Moderate amounts of suitable breeding or foraging habitat present within the Subject Land and likely to be impacted by the Project; • Flying heights of species may occur within the RSA and species exhibits flight characteristics more susceptible to collision (soaring, circling at height etc.); and • Landscape feature(s) likely to increase avian activity are present within the Subject Land (including woody canopy, waterbodies, riparian corridors, updraft locations, caves etc.).
Moderately Likely	*Moderate* likelihood of turbine strike based on a combination of following: • Species has the potential to occur within the Subject Land based on an analysis of records > 10 years old within 10 km of the Assessment Area; • Low amounts of suitable breeding or foraging habitat present within the Subject Land and likely to be impacted by the Project; • Species occasionally flies at heights within the RSA; and • Landscape feature(s) likely to increase avian activity are present within the Subject Land (including woody canopy, waterbodies, riparian corridors, updraft locations, caves etc.), but only in small areas.
Less Likely	*Low* likelihood of turbine strike based on a combination of the following: • Species not detected or is considered unlikely to occur based on based on an analysis of records within 10 km of the Assessment Area; • No suitable breeding or foraging habitat is present within the Subject Land; • Species does not usually fly at heights within the RSA; and • Landscape feature(s) likely to increase avian activity are not present within the Subject Land (including woody canopy, waterbodies, riparian corridors, updraft locations, caves etc.).
Unlikely	*Almost zero* likelihood of turbine strike based on a combination of the following: • Species not detected and is considered unlikely to occur based on an analysis of records within 10 km of the Assessment Area; • No suitable breeding or foraging habitat is present within the Project Area. • Species is very unlikely or almost never flies at heights within the RSA; and • Landscape feature(s) likely to increase avian activity are not present within the Subject Land (including woody canopy, waterbodies, riparian corridors, updraft locations, caves etc.).

TABLE 7-9 BIRD AND BAT TURBINE STRIKE RISK MATRIX

Likelihood scale	Consequence scale			
	Minor	Moderate	Major	Severe
Unlikely	Low	Low	Moderate	Moderate
Less Likely	Low	Low	Moderate	High
Moderately Likely	Low	Moderate	High	Very High
Likely	Moderate	High	High	Very High
Very Likely	Moderate	High	Very High	Very High

7.3.4.1 BIRD AND BAT RISK ASSESSMENT ASSUMPTIONS

The risk assessment of resident threatened, resident raptor, migratory and nomadic avian species has been undertaken in **Table 7-10**.

The species assessed for risk of collision with turbines and/or barotrauma are based on a combination of the following:

- All ecosystem species predicted to occur by the BAM-C and listed candidate species;
- EPBC Act listed threatened and migratory species which are subject to risk of turbine collision and / or barotrauma and are known or likely to occur within the Subject Land;
- Raptors and other species known to fly within the RSA within the Subject Land (refer to **Section 7.3.1** of the BDAR); and
- The shortlist of migratory and / or nomadic species likely to experience impacts from turbine collision and / or barotrauma provided in Section 5 of the BDAR Resubmission.

The results of the risk assessment (**Table 7-10)** can be summarized as follows:

- No species were assessed as having **very high** risk;
- The risk assessment outcome for five species was considered **high** risk. This included the Little Eagle (*Hieraaetus morphnoides*), White-Throated Needletail (*Hirundapus caudacutus*), Wedge-tailed Eagle (*Aquila audax*), Brown Falcon (*Falco berigora*) and Nankeen Kestrel (*Falco cenchroides*);
- The risk assessment outcome for 75 species was considered **moderate** risk; and
- The risk assessment outcome for 76 species was considered **low** risk.

7.3.5 COLLISION AND/OR BAROTRAUMA RISK ASSESSMENT OF RESIDENT THREATENED, RESIDENT RAPTOR, NOMADIC AND MIGRATORY AVIAN SPECIES

TABLE 7-10 COLLISION RISK ASSESSMENT OF LISTED PRIORITY SPECIES

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Listed Birds						
Botaurus poiciloptilus Australasian Bittern	E	E	Major	Unlikely	Moderate	The Australasian Bittern is found in coastal and sub-coastal areas of south-eastern and south-western mainland Australia, and the eastern marshes of Tasmania. The species frequents reedbeds and other areas, particularly those dominated by sedges, rushes, reeds or cutting grass. The species is generally sedentary and spends most of their time on the ground, both nesting and hunting. Historic observations are not known within the Project Boundary within the last 10 years. The Project Area is not considered to be within the likely distribution of the species. The species is assessed as having a low collision risk.
Rostratula australis Australian Painted Snipe	E	E	Major	Unlikely	Moderate	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Australian Painted Snipe breeding habitat requirements is quite specific, shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands (D. Rogers 2002, pers. comm.) There are no historical observations recorded in the Project Area or locality. Breeding habitat is considered absent however artificial dams may provide temporary habitat for the species. Due to the absence of important habitat it is considered less likely that the species will collide with WTG. As a listed endangered species under the EPBC and BC Acts a mortality will result in a major reduction to regional populations. The species is assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Ninox connivens Barking Owl	-	V	Moderate	Moderately Likely	Moderate	The barking owl is a medium sized owl that typically inhabits woodlands and open forests, including those in disturbed agricultural landscapes. The barking owl preferentially hunts small arboreal mammals but will persist on birds, invertebrates and terrestrial mammals when tree hollows become less abundant. Barking owls are reliant on the presence of suitably sized hollows for breeding and maintain permanent defines territories which can be up to 6000 ha. Maximum flight heights are not known for the species however as a specialist of arboreal mammals it is unlikely that the species will regularly fly at heights much greater than the canopy unless flying over gullies. The species is known to be present in the Project Area following positive detections by Nature Advisory (on behalf of NGH). The species is considered moderately likely to collide with WTGs based on the proximity of suitable woodland habitat. As a listed vulnerable specie sunder the BC Act a mortality has the potential to result in a moderate reduction in the regional population. The species is assessed as having a moderate collision risk.
Falco subniger Black Falcon	-	V	Moderate	Less Likely	Low	The black falcon is widely distributed across mainland Australia but is typically found in arid and semi-arid zones. Hunting occurs over open wooded grasslands, saltbush plains and other areas low and open shrublands, particularly within close proximity to watercourses or remnant patches of isolated trees. While hunting the black falcon often soars for long periods of time at height and takes prey in the air or on the ground (NSW DCCEEW, 2024b). The species is generally thought to occur primarily within arid and inland regions with records from the tablelands and coastal NSW likely to be referrable to the visually similar dark morph brown falcon (NSW DCCEEW, 2024b). The species has not been detected within the Project Area following seasonal surveys. Two records are present within the locality of the project (approximately 5 km south and 8 km west).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						The Project Area is considered on the edge of species distribution and presence is likely to be restricted to occasional individual flyovers, therefore it is considered less likely that a collision will occur. As a listed vulnerable species under the BC Act a mortality has the potential to result in a moderate reduction of regional populations. The species has been assessed to possess a low risk of collision.
Grus rubicunda Brolga	-	V	Moderate	Less Likely	Low	The Brolga is found across tropical northern Australia, southwards through north-east and east central areas, as well as central New South Wales to western Victoria. The Brolga inhabits large open wetlands, grassy plains, coastal mudflats and irrigated croplands and, less frequently, mangrove-studded creeks and estuaries. It is less common in arid and semi-arid regions but will occur close to water. There are no historical observations recorded in the Project Area or adjacent. The Project Area is not considered to be within the distribution of the species and no suitable habitat is present. The species is assessed as having a low collision risk.
Burhinus grallarius Bush Stone-curlew	-	E	Major	Less Likely	Moderate	Bush stone-curlew are nocturnal, ground-dwelling birds preferring open forests and grassy woodlands (Murialdo, Kleisner, Wolfenden, & Old, 2015). Although capable of flight, the species rarely does so unless threatened and rarely, if ever, at heights considered to be at risk of collision. While potential habitat may be impacted, no detections have been made of bush stone-curlews across any survey efforts for Project. No historic records are present within the Project Area with the closest known record located in the town of Armidale approximately 34 km north. While suitable habitat is present within proximity to turbines this species is considered less likely to collide with a WTG. As a listed endangered species under the BC Act, a mortality may result in a major reduction in regional populations. The species is assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	V	V	Minor	Less Likely	Low	The Brown Treecreeper is found along the east coast of Australia. Specifically, from South Australia, Victoria through NSW to Queensland. The Brown Treecreeper does not always forage in trees. Unlike most other treecreepers, it often spends just as much time foraging on the ground in eucalypt forests and woodlands. It hops over fallen branches and other debris where it gleans insects and other invertebrates from among the deep layers of leaf litter. However, when foraging in trees, the Brown Treecreeper spirals up the trunk in the characteristic manner of other treecreepers, gleaning insects from the surface or probing cracks and crevices in the bark. The brown treecreeper is not known to move far beyond the canopy and dispersal is limited to connected patches of eucalypt-dominated woodland, or where there are paddock trees in suitable distances for dispersal. The species is assessed as having a low collision risk.
Stagonopleura guttata Diamond Firetail	V	V	Minor	Less Likely	Low	The diamond firetail is a mostly sedentary species with some local movements. They occur primarily in open eucalypt forest, grassy woodland, heaths and farmland or grassland with scattered trees. Diamond firetails are predominantly ground feeders that eat seeds of various grasses but are also known to feed on seeds of herbs, bushes and trees, as well as insects and worms (Immlemann 1982, Read 1987). They fly low below the canopy and are not known to fly at heights above the canopy unless disturbed. Diamond Firetails are often recorded building their nests into the base of the large stick-nest of a bird of prey, others choose to build their nests among the prickly foliage of shrubs. Although nine individuals were recorded by Nature Advisory at BUS3 during the Summer 2022 survey and woodland habitat is present throughout the Project Area, the species is unlikely to be flying at heights considered within the RSA. The species is assessed as having a low collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Artamus cyanopterus Dusky Woodswallow	-	V	Moderate	Moderately Likely	Moderate	The Dusky Woodswallow typically inhabits woodlands and dry open sclerophyll forests, including regenerating forests, as well as farmlands and agricultural lands. The Dusky Woodswallow primarily eats invertebrates which are captured in the air above the canopy or over water. Although maximum flight heights for the species are not known, low number of individuals have been recorded colliding with wind turbines on other sites (Moloney, Lumsden, & Smales, 2019). Anecdotal records indicate that flocks, which may be large, also circle high above the ground when preparing to migrate northward in autumn (Lloyd undated, COG undated). One Dusky Woodswallow has been recorded during mortality surveys at an operating wind farm in Australia, based on publicly available information (Moloney, Lumsden, & Smales, 2019). The species is known to be present within the Project Area with multiple detections made across multiple survey locations over various survey seasons. The species is assessed as having a moderate collision risk.
Petroica phoenicea Flame Robin	-	V	Minor	Less Likely	Low	The flame robin is a small woodland species considered to be a ground-foraging insectivore but have been found to 'hawk' for aerial insects. The flame robin is generally migratory throughout its range, moving from alpine and sub-alpine areas to lowlands during colder months. Although recognized as a highly mobile species, movement is within the canopy with known heights not considered to extend far beyond these heights. While an individual was observed at BUS5 by ERM in Spring 2023 and suitable habitat is present within 200m of WTG, the species is unlikely to be flying at heights. The species is assessed as having a low collision risk.
Stagonopleura guttata Freckled Duck	-	V	Minor	Moderately Likely	Low	The freckled duck is mainly situated throughout inland regions of the Eastern section of the country. Due to habitat requirements, distribution of the freckled duck directly correlates to water flow, preferring large bodies of fresh water with thick vegetation.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Usual contenders are recently flooded wetland systems and swamps. This species does not appear to have any sort of distinct migratory pathway or seasonal migration to find suitable breeding habitat (Blakers, M.; Davies, S.; Reilly, P. N. (1984)). There are no historical observations recorded in the Project Area, closest records have been observed approximately 20 km northwest of the Project Area. The Project Area is not considered to be suitable habitat. The species is assessed as having a low collision risk.
Falco hypoleucos Grey Falcon	V	V	Major	Less Likely	Moderate	The Grey Falcon is a highly mobile and dispersive or migratory species, occurring in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant and Higgins 1993). When they have been occasionally seen outside of these areas, they have been found in similar dry, low altitude, open woodland or grassland, however they are essentially confined to the arid and semi-arid zones at all times (Schoenjahn 2018). The species is always found at very low densities, with population size estimated at about 1,000 mature individuals (Schoenjahn 2011, 2013; Mullin et al. 2020b; Schoenjahn et al. 2020). Historic observations are not known within the Project Boundary within the last 10 years with the closest record being located southeast of Uralla and approximately 19 km northwest of the Project Area. While it is considered unlikely that the species will interact with the Project due to a lack of suitable habitat, a single mortality is likely to have a major impact due to the low population size for the species. The species is assessed as having a moderate collision risk.
Melanodryas cucullata cucullate Hooded Robin (south-eastern form)	E	V	Minor	Less Likely	Low	The hooded robin is a largely sedentary species of robin typically seen in pairs or small groups in areas characterized by dry eucalypt and acacia woodlands and shrublands with an open understory, some grassy areas and a complex understory.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Being a shy and unobtrusive species, Hooded Robins are often rather quiet during the day, especially in the afternoon, but are one of the first birds to call in the morning (Birdlife, 2024). Foraging typically occurs at ground level or the first few meters of vegetation height and is not considered to exceed that of the canopy (Antos, Bennett, & White, 2008). The Hooded Robin sits on exposed perches, such as dead branches and stumps and pounces on arthropods. Due to minimal movement ecology and flight and foraging not considered to be at heights at risk of collision, this species has been assessed as low risk.
Hieraaetus morphnoides Little Eagle	-	V	Moderate	Likely	High	The little eagle has a broad range throughout mainland Australia and can be found in a variety of ecosystems with the exception to the heavily forested pars of the Great Dividing Range. It typically occurs in open woodland, grassland and arid regions particularly within close proximity to open woodland and riparian zones suitable for breeding. While hunting, the little eagle is known to soar up to 500 m in search prey and will typically take prey on the ground or from trees and shrubs in open woodlands. Although the species wasn't observed throughout the survey efforts, two incidental observations were made, one within the Project Area and the other in close proximity to the Project Area. Suitable habitat is present within 500 m of turbine locations. The species is assessed as having a high collision risk.
Glossopsitta pusilla Little lorikeet	-	V	Moderate	Less Likely	Low	The Little Lorikeet is a nectivore that primarily forages in the canopy of open Eucalypt forests and woodlands, particularly those within riparian woodlands. The species is gregarious and is known to travel and feed in small flocks usually up to 10 individuals and will often mix flock with other lorikeets. Nesting is typically within proximity to feeding areas and are within tree hollows with an entrance of approximately 3cm wide. The species is known to occur within the Project following the positive detection of a single individual by Nature Advisory (on behalf of NGH) in Summer 2022.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						While the flight height of the species is not known and the individual observed was not flying within the RSA it is possible that the species may fly at heights considered at risk of collision. Due to the lack of observations across all survey periods to date it is considered unlikely that the species will be present in any large numbers. The species is assessed as having a low collision risk.
Anseranas semipalmata Magpie Goose	-	V	Moderate	Less Likely	Low	The magpie goose is a widespread waterbird throughout Australia and is typically found in areas of open wetlands, floodplains and swamps (Morcombe M. , 2000). Although the species is thought to be largely sedentary, large flocks are known during periods of inundation. Although agricultural dams are present throughout the Project Area, these are small and unlikely to provide suitable habitat for breeding and foraging. Historic observations are not known within the Project Boundary within the last 10 years with the closes record being located at Dangars lagoon near the town of Uralla approximately 20 km northwest of the Project Area. While it is possible that individuals may occasionally occur. The species is assessed as having a low collision risk.
Tyto novaehollandiae Masked Owl	-	V	Moderate	Less Likely	Low	The Australian masked owl inhabits forests, woodlands and timbred waterways particularly in areas with a dense shrub cover. The species is reliant on the presence of mature hollow bearing trees located within proximity to foraging areas for roosting and breeding (Todd, Kavanagh, Penman, Bell, & Munks, 2018). While specific maximum flight heights are not known, the species is noted to be heavily influenced by the behaviours of suitable prey species which are taken at ground level or below the canopy (McNabb, McNabb, & Barker, 2003). Masked Owl hunts by low quartering through forest or clearings or by perch-pounce from vegetation or the ground (Schodde & Tidemann 2007).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Although little information is available about dispersal methods, it is likely that the dispersing owls fly between patches of similar habitat along vegetated corridors. No records are known within the Project Area and the species has not been detected following survey effort to date. Isolated records are present along the Apsley River approximately 3.1 km south of the Project Area within the Oxley Wild Rivers National Park. Although woodland habitat is abundant throughout the Project, the species is considered unlikely to fly at heights considered within the RSA. In the event of a collision, the consequence is considered minor (may cause non-significant changes to the local abundance of species), as the species is not known to occur on site and breeding is not known to occur in the project area. The species is assessed as having a low collision risk.
Pachycephala olivacea Olive Whistler	-	V	Minor	Less Likely	Low	The olive whistler are small and largely sedentary woodland species found typically in wet forests between 500 and 1500m. Olive whistlers are known to forage between the canopy and the ground and are not known to fly at heights that extend beyond the tree line (Higgins & Peter, 2002). The Olive Whistler mainly feeds on invertebrates, some seed and leaves. It forages from the trees down to the ground, usually in dense vegetation. While suitable habitat is present within 500 m of a WTG, the known behaviour of the species is unlikely to result in flight considered within the RSA. The species is assessed as having a low collision risk.
Pandion cristatus Osprey	Mi	V	Moderate	Unlikely	Low	The eastern osprey is a large, water-dependent bird of prey found throughout coastal areas of Australia as well as inland in association with major rivers and permanent wetlands (Morcombe M. , 2000). Nesting occurs in the crowns of large trees or artificial structures and is usually within 1 km of the sea (NSW DCCEEW, 2020). Due to the paucity of permanent inland lakes and major rivers, breeding habitat is largely confined to coastal areas (Dennis & Clancy, 2014).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						No observations of the species within the Project Area have been made following seasonal surveys and no records within the locality are known. Two records within approximately 20 km of the Project Area are known however are associated with Macleay River and Dangars Lagoon. Doe to the absence of large, permanent wetlands and rivers within the Project Area it is considered less likely that a collision would occur. As a listed Vulnerable species under the BC Act, a mortality would result in a moderate reduction of regional populations. The species is assessed as having a low collision risk.
Ninox strenua Powerful Owl	-	V	Moderate	Less Likely	Low	The powerful owl inhabits forests, woodlands, and riparian vegetation. The species is reliant on the presence of hollow-bearing trees for nesting as well as to support arboreal prey items. The Powerful Owl swoops upon prey (mostly arboreal mammals) within the canopy and sub-canopy of woodland and forest. It is unlikely to encounter the rotor-swept area during foraging. Although powerful owls may occasionally fly at large heights over gullies, flight and foraging behaviour is thought to be largely restricted to just above or below the available canopy (Carter, et al., 2019; Bradsworth, et al., 2022). While dispersing, it is likely that the dispersing owls fly between patches of similar habitat along vegetated corridors. Although woodland habitat is abundant throughout the Project, the species is unlikely to fly at heights considered within the RSA. The species is assessed as having a low collision risk.
Lophochroa leadbeateri Pink Cockatoo	E	V	Moderate	Unlikely	Low	The Pink Cockatoo occurs in the Murray– Darling, Eyre and Bulloo River basins from Isisford and Roma in the north, through western New South Wales to north-west Victoria and west to eastern South Australia (Higgins 1999).The pink cockatoo is associated with arid and semi-arid woodlands of inland Australia (DCCEEW, 2023).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						In fragmented landscapes, they tend to travel along vegetated corridors to feeding sites (DSE 2004) where they take seeds of native shrubs and trees, especially cypress pines, and also some insect larvae and seeds of some crops and weeds (Higgins 1999). The Project Area is not considered to be within the distribution of the species and no suitable habitat is present. The species is assessed as having a low collision risk.
Petroica boodang Scarlet Robin	-	V	Minor	Less Likely	Low	The Scarlet Robin is found in south-eastern and south-western Australia, as well as on Norfolk Island. In Australia, it is found south of latitude 25°S, from south-eastern Queensland along the coast of New South Wales (and inland to western slopes of Great Dividing Range). The Scarlet Robin lives in open forests and woodlands in Australia, while it prefers rainforest habitats on Norfolk Island. During winter, it will visit more open habitats such as grasslands and will be seen in farmland and urban parks and gardens at this time. The Scarlet Robin feeds mainly on insects and forages on or near the ground. It will sit on a perch and fly down to catch prey. While the species disperses seasonally, movement heights are considered to be restricted to the canopy height of available woodland vegetation (Robinson, 1992). Although multiple observations were made at various BUS locations, as well as opportunistically over multiple surveys by ERM, the species is not considered to fly at heights at risk of collision. The species is assessed as having a low collision risk.
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo	V	V	Moderate	Moderately Likely	Moderate	The south-eastern Glossy Black-cockatoo has an extremely restricted diet comprised of only the seeds of a few species of Allocasuarina and occasionally Casuarina. The species also requires the availability of suitably sized tree hollows for breeding and favours areas of a high density of old growth trees. The species is known to be present within the Project Area following positive detections of individuals by Nature Advisory (on behalf of NGH) in autumn 2021 and Summer 2022.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Maximum flight heights are not known for the species and no observed individuals were flying at heights within the RSA however it is likely that individuals will fly at heights considered at risk of collision, particularly when undertaking larger scale movements between foraging and nesting sites. The species is assessed as having a moderate collision risk.
Chthonicola sagittate Speckled Warbler	-	V	Minor	Less Likely	Low	The speckled warbler is a small bird found in open eucalypt forest, particularly those containing rocky gullies, tussock grasses and scattered logs with a sparse shrub cover. The species is known to forage almost exclusively at lower strata or at ground level however will fly to the canopy when disturbed (Tzaros, 1996). Although four individuals were observed at BUS3 by Nature Advisory in Autumn 2021 and suitable habitat is present within proximity to WTGs, the known behaviour of the species is unlikely to result in flight considered within the RSA. The species is assessed as having a low collision risk.
Circus assimilis Spotted Harrier	-	V	Moderate	Moderately Likely	Moderate	The spotted harrier typically inhabits open wooded country in tropical and temperate Australia, particularly in arid and semi-arid areas. Breeding habitat is characterized by open or remnant woodland with nests rarely being built in isolated trees. The spotted harrier is a diurnal species feeding primarily on ground active birds, mammals, and reptiles. The Spotted Harrier is nomadic and hunts by hedge-hopping, low soaring and low quartering over open vegetation, often within five metres of the ground (BirdLife 2017, Schodde & Tidemann 2007). They breed in response to prey availability and build a new nest. Display flights involve high soaring, spiralling and plummeting (Schodde & Tidemann 2007). The likelihood of collision is considered rare given that they may only encounter the rotor-swept area during breeding display flights. The consequence of collision is minor, considering that the semi-arid and arid parts of Australia are considered the species' stronghold and key breeding areas (BirdLife Australia 2017).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						The species is not known to be present within the Project Area, however suitable habitat is present throughout the site. The species is assessed as having a moderate collision risk.
Lophoictinia isura Square-tailed Kite	-	V	Moderate	Less Likely	Low	The square-tailed kite is a specialised canopy-dwelling predator and can be found in several different habitats. The Square-tailed Kite forages over coastal and subcoastal, eucalypt-dominated open forests and woodlands, and inland riparian woodland. It also forages over coastal heathlands, and often near openings and edges of forest (Marchant & Higgins, 1993). When hunting, the kite quarters and circles over tree canopies and occasionally soars (Schodde & Tidemann 2007). No historic records are present within the Project Area with the closest known record located approximately 27 km west. The NSW Scientific Committee (2009) considers that "windfarms may cause occasional collision mortalities of Square-tailed Kites, although this species is a very manoeuvrable, slow flyer and is probably capable of generally avoiding collisions with turbines blades." However, the consequence of a Square-tailed Kite collision with a turbine is considered potentially significant due to the low fecundity, low breeding density and low recruitment, as well as it being a sparsely distributed species across its range. The species is assessed as having a low collision risk.
Anthochaera phrygia Regent Honeyeater	CE	CE	Severe	Unlikely	Moderate	The regent honeyeater is a critically endangered species with a heavily fragmented population across eastern Australia (Crates, et al., 2018). The species is most commonly associated with box-iron bark eucalypt woodland and dry sclerophyll forest (DOE, 2016). The maximum flight heights for the species are not known and it is unknown to what extent the species is at risk of collision with wind turbines. There are no known observations of the species within the Project Area and due to the small population size it is unlikely that the species will interact with the Project. However, a single mortality will constitute an ecologically significant impact to the species.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Collison with a WTG is unlikely as there are few records of the species within Walcha Plateau and the species behaviourally flies well below the turbine blade tips. The species is assessed as having a moderate collision risk.
Daphoenositta chrysoptera Varied Sittella	-	V	Moderate	Less Likely	Low	Found in Eucalypt woodlands and forests, moving swiftly between trees or foraging busily over branches or the trunk. Flight heights are largely restricted to canopy heights of vegetation. Varied Sitellas feed mainly by gleaning on tree trunks or branches, moving downwards or along branches, searching for insects. They land at the top of a tree and work downwards, searching and poking into cracks and under things. Historic observations are observed within the Project Area, as well as detected at multiple locations across multiple seasons, however none at RSA heights. The species is assessed as having a low collision risk.
Haliaeetus leucogaster White-bellied Sea-eagle (Breeding)	-	V	Moderate	Moderately Likely	Moderate	The white-bellied sea-eagle is distributed throughout coastal areas and in proximity to large waterbodies in inland Australia (Marchant & Higgins, 1993). Breeding habitat is typically located close to water and typically within tall open forests or woodland (Marchant & Higgins, 1993). Although the Project Area lacks large areas of permanent wetlands, an active nest was observed in the north-west of the Project Area from 2019. The species is assessed as having a moderate collision risk.
Hirundapus caudacutus White-throated needletail	V, M	-	Moderate	Likely	High	The white-throated needle-tail is a migratory species with a global distribution. Breeding in Siberia, the species is typically present in Australia between September and April where it is almost exclusively an aerial flyover with only occasional observations made of roosting behaviour. There is evidence that this species will stop to forage or roost within eucalypt forests while in Australia (Vanderduys, Macdonald, & Pavey, 2024). The species is known to occur with detections made in February 2025 of flock sizes of up to 300 individuals.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						While the species is known to occasionally collide with wind turbines (Moloney, Lumsden, & Smales, 2019); it is likely that avoidance rates are also high. Potential foraging habitat is noted to be present throughout the Project and so it is considered likely that a collision will occur. As a listed vulnerable species a mortality will have a moderate impact on the population. The species is assessed as having a high collision risk.
Listed Bats						
Vespadelus troughtoni Eastern Cave Bat	-	V	Moderate	Less Likely	Low	The eastern cave bat is found on either side of the Great Dividing Range and in NSW is present throughout the upper north coast and New England Tablelands (NSW DCCEEW, 2024c). The species ecology is poorly understood but it known to be a cave roosting species typically found within dry open forests and woodlands in proximity to rocky outcrops and overhangs. The species was confirmed to be present following analysis of acoustic bat records and potential foraging habitat is present in parts of the Project Area. The species is considered may collide with a few WTGs. As a listed vulnerable species, a mortality will have a moderate impact on the regional population. The species is assessed as having a low collision risk.
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V	Moderate	Moderately Likely	Moderate	The Eastern False Pipistrelle is known to hunt beetles, moths, weevils and other flying insects above or just below the tree canopy. They inhabit tall, mature, wet forests, generally roosting in eucalypt hollows or in buildings. The species is known to be present within the Project Area following bat call analysis. Potentially suitable woodland habitat is present throughout the Project Area and occurs within proximity to turbines. Maximum flight heights for the species are not well understood however the species is known to collide with wind turbines in other parts of its distribution (Symbolix, 2020). The species is assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Scoteanax rueppellii Greater Broad-nosed Bat	-	V	Moderate	Less Likely	Low	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands; however, does not occur at altitudes above 500 m. Know to utilise a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though is commonly found in tall wet forest. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects. It usually forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. The species is not known to be present within the Project Area following bat call analysis, however there is a probable chance. Potentially suitable woodland habitat is present throughout the Project Area and occurs within proximity to turbines however as the Project Area is located at an elevation above 500m above sea level, the species is unlikely to be present. The species is assessed as having a low collision risk.
Pteropus poliocephalus Grey-headed Flying Fox	V	V	Moderate	Moderately Likely	Moderate	The distribution range is at the eastern regions of the Australian continent, mostly within 200 kilometres of the coast. The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands. The Grey-headed Flying-fox is highly mobile (Menkhorst 1995; Tidemann 1998) and the national population is fluid, moving up and down the east coast in search of food. Potentially suitable woodland habitat is present throughout the Project Area and occurs within proximity to turbines. Maximum flight heights for the species are not well understood however the species is known to collide with wind turbines in other parts of its distribution (Symbolix, 2020). The species is assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Miniopterus orianae oceanensis Large Bent-winged Bat	-	V	Moderate	Less likely	Low	Large Bent-winged Bats occur along the east and north-west coasts of Australia. Usually, caves are their primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. They feed mainly on moths and other flying insects. They fly quickly above the treetops in valleys, making fast dives to catch prey. The species is known to be present within the Project Area following bat call analysis. Potentially suitable woodland habitat is present throughout the Project Area and occurs within proximity to turbines. Maximum flight heights for the species are not well understood and mortality records could not be found for other wind farms within its distribution however emerging literature has identified microbats as being susceptible to mortality due to collision and barotrauma (Cryan, et al., 2014). The species may collide with WTG based on presence; however, collision is less likely due to flight behaviour and recorded activity levels. As a listed vulnerable species, a mortality is considered to result in a moderate impact to regional populations. The species is assessed as having a low collision risk.
Miniopterus australis Little Bent-winged Bat	-	V	Moderate	Less likely	Low	Inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bent-winged Bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. There are only five nursery sites /maternity colonies are known in Australia. The species is known to be present within the Project Area following bat call analysis. Potentially suitable woodland habitat is present throughout the Project Area and occurs within proximity to turbines.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Maximum flight heights for the species are not well understood and mortality records could not be found for other wind farms within its distribution however emerging literature has identified microbats as being susceptible to mortality due to collision and barotrauma (Cryan, et al., 2014). The species may collide with WTGs based on presence; however, collision is less likely due to flight behaviour and recorded activity levels. As a listed vulnerable species, a mortality is considered to result in a moderate impact to regional populations. The species is assessed as having a low collision risk.
Saccolaimus flaviventris Yellow-bellied Sheath-tailed bat	-	V	Moderate	Moderately Likely	Moderate	Yellow-bellied Sheathtail-bats occur in a range of habitats including rainforest, woodland and grassland (Churchill 2008). Yellow-bellied Sheathtail-bats are fast, agile predators that intercept insects in flight. They utilise open and semi-open microhabitat just above the canopy of a range of vegetation communities (McKenzie et al. 2002, Richards 2005a). They may occur more than five metres from the tree canopy (McKenzie et al. 2002). They fly fast and straight most often 15-25 m above the ground even in open habitat, although they may also fly close to the ground (Churchill 2008, Rhodes & Hall 1997, Kitchener 1987). The species is known to be present within the Project Area following bat call analysis. Potentially suitable woodland habitat is present throughout the Project Area and occurs within proximity to turbines. Maximum flight heights for the species are not well understood however the species is known to collide with wind turbines in other parts of its distribution (Symbolix, 2020). The species is assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Non-threatened, migratory avian species						
Apus pacificus Fork-tailed Swift	Mi		Minor	Likely	Moderate	The fork-tailed swift is a medium to large swift with a global distribution that is present within Australia roughly between October and Mid-April, with presence in NSW typically between October-March. The species breeds in Siberia and is present within Australia exclusively during the non-breeding season. Within the species' Australian distribution, it is generally considered to be almost exclusively aerial and highly mobile with very large flocks forming in response to low-pressure systems (Higgins P. J., 1999). No records of the species have been made following seasonal surveys to date. A single record from within the Project Area is present from 2020 with another present North of the Project Area, within the 10 km locality. The species has the potential to have widespread occurrence throughout the Project Area and the species is considered likely to interact with the Subject Land during the operational life of the project. Due to the species ecology and the presence of known records it is considered Likely to occur. As a non-listed migratory species under the EPBC Act a mortality has the potential to result in a Minor impact on the population. The species is assessed as having a moderate collision risk.
Actitis hypoleucos Common Sandpiper *Calidris melanotos* Pectoral Sandpiper	Mi	-	Less Likely	Minor	Low	These non-threatened migratory species have not been observed following field surveys and do not have recent records within 10 km of the Project Area. Suitable wetland habitat is largely absent from the Project Area however agricultural dams may provide temporary habitat. There is a possibility that these species will fly within the RSA, particularly during long distance movements, however the loss of occasional in individual is not considered to lead to a reduction in the local or regional population viability. These species are assessed as having a low collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Motacilla tschutschensis Eastern Yellow Wagtail *Cuculus optatus* Oriental Cuckoo	Mi	-	Less Likely	Minor	Low	These non-threatened migratory species have not been observed following field surveys and do not have recent records within 10 km of the Project. It is considered unlikely that the species will fly at heights considered within the RSA however the loss of occasional in individual is not considered to lead to a reduction in the local or regional population viability. These species are assessed as having a low collision risk.
Non-threatened Raptors						
Aquila audax Wedge-tailed Eagle	-	-	Moderate	Likely	High	The wedge-tailed eagle is a very large eagle and Australia's largest living bird of prey. The species is found throughout Australia and occurs in almost all habitats (Higgins, Peter, & Steele, 2001). Nesting typically occurs in wooded areas, however in areas with minimal treed vegetation isolated trees and artificial structures are readily used (Collins & Croft, 2007). Individual territories are extensive and dependent on the availability of prey however can exceed 50 km^2 (Cherriman, 2013). Foraging and hunting frequently occurs at great heights (up to and potentially exceeding 2 km) with long periods of time spent surveying territories for prey. The species is locally common within the Project Area as is the case in many agricultural precincts where potential food sources and nesting opportunities exist. As soaring and foraging behaviour increases the risk of collision the species is considered likely to collide with WTG infrastructure during operation. Wedge-tailed eagles are a non-listed protected species and so mortalities are likely to have a moderate impact on the population. The species is assessed as having a high collision risk.
Falco berigora Brown Falcon	-	-	Minor	Very Likely	High	The brown falcon is a medium-sized raptor found throughout virtually all habitat types across Australia (Morcombe M. , 2000). The species is locally common within its range and preferred habitat consists of open grassland and agricultural areas (Morcombe M. , 2000).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						The species is relatively common throughout the Project Area and has been observed to fly within heights consistent with the RSA. It is considered very likely that a collision will occur with WTG. As a non-listed and locally abundant species it is considered that a mortality event will have a minor impact on the regional population. The species is assessed as having a high collision risk.
Falco cenchroides Nankeen Kestrel	-	-	Minor	Very Likely	High	The nankeen kestrel is a small raptor occurring largely in open grasslands, woodlands and agricultural areas throughout mainland Australia (Morcombe M. , 2000). Prey species are diverse and include insects, small mammals, lizards and small birds. Prey is located from a perched position or by hovering short distances above the ground (Birdlife Australia, n.d.). The species is locally common within the Project Area and is known to fly at heights within the RSA. It is considered very likely that the species will collide with WTG. As a non-listed and locally-abundant species, a mortality will likely have a minor impact on local populations. The species is assessed as having a high collision risk.
Elanus axillaris Black-shouldered Kite *Haliastur sphenurus* Whistling Kite *Falco longipennis* Australian Hobby *Accipiter fasciatus* Brown Goshawk *Accipiter cirrocephalus* Collared Sparrowhawk *Tyto alba delicatula*	-	-	Minor	Likely	Moderate	These raptor species have been observed throughout seasonal survey events and/or have records within 10 km of the Subject Land. These species have been observed in low numbers and loss of the occasional individual is not considered to lead to a reduction in the local or regional population viability, however, they have the potential to fly within the RSA. These species are assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Eastern barn Owl *Falco peregrinus* Peregrine Falcon *Ninox boobook* Southern Boobook *Circus approximans* Swamp Harrier						
Non-threatened, nomadic avian species*						
Australian Great Pied Cormorant (Phalacrocorax varius hypoleucos) Australian Pelican (Pelecanus conspicillatus) Australian White Ibis (Threskiornis moluccus) Baillon's Crake (Zapornia pusilla) Banded Lapwing (Vanellus tricolor) Black Swan (Cygnus atratus) Stilt Sandpiper (Calidris Himantopus) Chestnut Teal (Anas castanea) Eastern Cattle Egret (Bubulcus ibis coromandus) Eurasian Coot	-	-	Minor	Likely	Moderate	The following species are considered likely to fly at heights within the RSA. While mortalities of individuals are expected to occur, this will not have a negative impact on the regional populations of the species. These species are assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
(Fulica atra) Great Cormorant (Phalacrocorax carbo) Great Crested Grebe (Podiceps cristatus) Grey Teal (Anas gracilis) Little Black Cormorant (Phalacrocorax sulcirostris) Little Pied Cormorant *(Microcarbo melanoleucos)* Magpie Goose *(Anseranas semipalmata)* Nankeen Night-heron *(Nycticorax caledonicus)* Pied Stilt *(Himantopus leucocephalus)* Pink-eared Duck *(Malacorhynchus membranaceus)* Plumed Whistling-Duck *(Dendrocygna eytoni)* Red-necked Avocet						

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
(*Recurvirostra novaehollandiae*) Royal Spoonbill *(Platalea regia)* Straw-necked Ibis *(Threskiornis spinicollis)* Whiskered Tern *(Chlidonias hybrida)* White-faced Heron *(Egretta novaehollandiae)* White-necked Heron (*Ardea pacifica)* Wood Sandpiper *(Tringa glareola*)						
Eastern Koel *(Eudynamys orientalis)* Channel-billed Cuckoo *(Scythrops novaehollandiae)* Black-faced Woodswallow *(Artamus cinereus)* Black-faced Cuckoo-shrike *(Coracina novaehollandiae)* Tree Martin *(Petrochelidon nigricans)* Fairy Martin	-	-	Minor	Likely	Moderate	The following species are considered likely to fly at heights within the RSA. While mortalities of individuals are expected to occur, this will not have a negative impact on the regional populations of the species. These species are assessed as having a moderate collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
(Petrochelidon ariel) Little Corella *(Cacatua sanguinea)* Masked Woodswallow *(Artamus personatus)* Musk Lorikeet *(Glossopsitta concinna)* Pied Currawong *(Strepera graculina)* Welcome Swallow *(Hirundo neoxena)* White-bellied Cuckoo-shrike *(Coracina papuensis)* White-breasted Woodswallow *(Artamus leucorynchus)* White-browed Woodswallow *(Artamus superciliosus)*						
Eastern Spinebill *(Acanthorhynchus tenuirostris)* Eastern White-throated Gerygone *(Gerygone olivacea olivacea)* Eastern Dollarbird	-	-	Minor	Moderately Likely	Low	The following species are unlikely to fly at heights within the RSA. While the occasional mortality may occur, it will not lead to a negative impact on the regional population. These species are assessed as having a low collision risk.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
(Eurystomus orientalis pacificus) Double-barred Finch *(Taeniopygia bichenovii)* Black-faced Monarch *(Monarcha melanopsis)* Blue-faced Honeyeater *(Entomyzon cyanotis)* Brown Songlark *(Cincloramphus cruralis)* Brown-headed Honeyeater *(Melithreptus brevirostris)* Brush Cuckoo *(Cacomantis variolosus)* Fan-tailed Cuckoo *(Cacomantis flabelliformis)* Flame Robin *(Petroica phoenicea)* Forest Kingfisher *(Todiramphus macleayii)* Fuscous Honeyeater *(Ptilotula fusca)* Grey Fantail *(Rhipidura albiscapa)*						

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Horsfield's Bronze-cuckoo *(Chalcites basalis)* Mistletoebird *(Dicaeum hirundinaceum)* Noisy Friarbird *(Philemon corniculatus)* Olive-backed Oriole *(Oriolus sagittatus)* Oriental Dollarbird *(Eurystomus orientalis)* Pallid Cuckoo *(Heteroscenes pallidus)* Rainbow Bee-eater *(Merops ornatus)* Red Wattlebird *(Anthochaera carunculata)* Red-backed Kingfisher *(Todiramphus pyrrhopygius)* Rufous Fantail *(Rhipidura rufifrons)* Rufous Songlark *(Cincloramphus mathewsi)* Sacred Kingfisher *(Todiramphus sanctus)* Scarlet Honeyeater						

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
(*Myzomela sanguinolenta)* Shining Bronze-Cuckoo *(Chalcites lucidus)* Silvereye *(Zosterops lateralis)* Spangled Drongo *(Dicrurus bracteatus)* Spotless Crake *(Zapornia tabuensis)* Striated Pardalote *(Pardalotus striatus)* Stubble Quail *(Coturnix pectoralis)* Topknot Pigeon *(Lopholaimus antarcticus)* White-naped Honeyeater *(Melithreptus lunatus)* White-plumed Honeyeater *(Ptilotula penicillata)* White-throated Gerygone *(Gerygone olivacea)* White-winged Triller *(Lalage tricolor)* Wompoo Fruit-dove *(Megaloprepia magnifica)*						

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Yellow-faced Honeyeater *(Caligavis chrysops)* Yellow-tufted Honeyeater *(Lichenostomus melanops)*						
Non-threatened Microbat Species						
Nyctophilus gouldi Gould's Long-eared Bat	-	-	Minor	Likely	Moderate	The Gould's long-eared bat is a microbat species found in the southern regions of Australia (Parnaby, 2009). The species forages very slowly but exhibits high manoeuvrability, with the species primarily foraging within or above vegetation. The species roosts in caves, tree hollows, hanging bark and artificial structures, with roosting commonly undertaken in solitary or in small colonies with occasional records of up to 300 individuals. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls recorded on Anabat devices. It is not known to what extent the species flies at heights considered at risk of collision within the Subject Land, it is considered likely that a collision event will occur. Due to being listed as a non-threatened species, mortalities have the potential to lead to a moderate impact on regional populations. The species is assessed as having a moderate collision risk.
Austronomus australis White-striped Free-tailed Bat	-	-	Minor	Likely	Moderate	The White-striped Free-tailed bat is found within most habitats from closed forests to open flood plains. The White-striped Free-tailed bat roosts within over-mature to dead eucalypt tree species that contain large trunk cavities (Bullen & Dunlop, 2012). The species primarily predates upon insect species while foraging above flood plain habitat and prefers to not feed in remnant forests. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls recorded on Anabat devices.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						It is considered likely that a collision will occur. The species is not listed and so a mortality will have a minor impact on populations. The species is assessed as having a moderate collision risk.
Miniopterus australis Little Bent-wing Bat	-	-	Minor	Moderately likely	low	The Little bent-wing bat is common in a variety of habitats including rainforest, wet and dry sclerophyll forests, and paperbark swamps, generally in well-timbered areas (NSW OEH, 2024). The species is known to roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges, and occasionally buildings. The species forages within densely vegetated woodlands. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls recorded on Anabat devices. It is considered moderately likely that a collision event will occur. As a non-listed species, a mortality will have a minor impact on regional populations. The species is assessed as having a low collision risk.
Nyctophilus geoffroyi Lesser Long-eared Bat	-	-	Minor	Moderately Likely	Low	The Lesser Long-eared Bat is a small microbat that is widespread across and endemic to Australia (Groves, 2015). The species commonly forages at slow speeds within woodlands or near open water. The species mostly roosts within dark caves, hollows, old trees, ceilings and hollow walls. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls recorded on Anabat devices. Based on distance of potential caves from turbines, it is considered moderately likely to collide with WTGs. Due to being listed as a non-threatened species, mortalities have the potential to lead to a minor impact on regional populations. The species is assessed as having a low collision risk.
Ozimops planiceps South-eastern Free-tailed Bat	-	-	Minor	Likely	Moderate	The South-eastern Free-tailed bat inhabits mallee, shrubland, open forest, and woodland habitats, with a particular preference for wetter environments (T. B. Reardon, 2014). The species roosts within tree hollows and artificial cavities.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Foraging typically occurs within or above the canopy (T. B. Reardon, 2014). The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls and it is considered likely that a collision event will occur. As a non-listed species, a mortality will not impact regional populations The species is assessed as having a moderate collision risk.
Ozimops ridei Ride's Free-tailed Bat	-	-	Minor	Likely	Moderate	The Ride's Free-tailed Bat typically roosts in tree hollows and primary forages along forest edges. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic and it is considered likely that a collision event will occur. As a non-listed species, a mortality will not impact regional populations The species is assessed as having a moderate collision risk.
Rhinolophus megaphyllus Eastern horseshoe Bat	-	-	Minor	Moderately Likely	Low	The Eastern horseshoe Bat typically roosts in caves, old mine shafts, and overhangs, and mostly foraging within woodlands in all strata levels, (Don E. Wilson, 2005). The species is considered 'definite' to occur within the Subject Land and is considered it is moderately likely that a collision event will occur. Due to being listed as a non-threatened species, mortalities have the potential to lead to a moderate impact on regional populations. The species is assessed as having a low collision risk.
Scotorepens balstoni Inland Broad-nosed Bat	-	-	Minor	Moderately Likely	Low	Inland Broad-nose bats typically prefer to roost in tree hollows and forages within woodlands, usually not going above the canopy, as well as at the edges of forest venturing into open areas. Commonly the species does not exceed 15 m above the ground when foraging (Don E. Wilson, 2005). The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls and is considered moderately likely that a collision event will occur.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Due to being listed as a non-threatened species, mortalities have the potential to lead to a minor impact on regional populations. The species is assessed as having a low collision risk.
Scotorepens orioni Eastern Broad-nosed Bat	-	-	Minor	Likely	Moderate	The Eastern Broad-nosed Bat commonly is found within a variety of habitats, foraging in rainforests, tall wet forests, vine forests, and low open forest. The species typically roosts within hollows trees, with nursing females found to be sharing maternal colonies. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls and is considered likely that a collision event will occur. As a non-listed species, a single mortality will not impact regional populations. The species is assessed as having a moderate collision risk.
Vespadelus darlingtoni Large Forest Bat	-	-	Minor	Moderately Likely	Low	The Large Forest Bat prefers roosting and foraging within woodlands with older and larger tree hollows, with a particular preference for older smooth-barked trees species. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls recorded on Anabat devices. It is not known to what extent the species flies at heights considered at risk of collision within the Subject Land, it is considered moderately likely that a collision event will occur. As a non-listed species, a mortality will not impact regional populations. The species is assessed as having a low collision risk.
Vespadelus regulus Eastern Forest Bat	-	-	Minor	Moderately Likely	Low	The Eastern Forest Bat commonly roosts within hollows of mature trees in intermediate to late stages of decay with largely open surrounding vegetation. Roosting habitat is often within riparian woodlands and mature forest, with colonies being up to 100 individuals. The species largely forages in wet forests and riparian zones. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						it is considered moderately likely that a collision event will occur. As a non-listed species, a mortality will not impact regional populations. The species is assessed as having a low collision risk.
Vespadelus vulturnus Little Forest Bat	-	-	Minor	Likely	Moderate	The Little Forest Bat is a very common species in south-eastern Australia and roosts within hollows within mature trees in proximity to woodlands, buildings and timber stacks. Foraging occurs within woodlands, saltmarshes, mangroves, over open water, and coastal swamp habitats. The species is considered 'definite' to occur within the Subject Land following the positive detection of acoustic calls and is considered likely that a collision event will occur. As a non-listed species, a mortality will not impact regional populations. The species is assessed as having a moderate collision risk.
Non-threatened species observed flying within the RSA						
Corvus coronoides Australian Raven	-	-	Minor	Very Likely	Moderate	The Australian raven is very widespread throughout eastern Australia and typically inhabits open country; however, is present in a diversity of habitat types (Morcombe M. , 2000). The species is known to occur and is considered locally abundant with numerous observations of individuals flying within the RSA. Due to the abundance of suitable habitat within the Project Area, it is considered very likely that a collision event will occur. As a non-listed species, a mortality is likely to lead to a minor impact on regional populations. The species is assessed as having a moderate collision risk.
Platycercus elegans Crimson Rosella	-	-	Minor	Likely	Moderate	the crimson rosella is widespread throughout south-eastern Australia and is most commonly found within tall eucalypt and wetter forests (Morcombe M. , 2000). The species is considered locally abundant with many records made within the Project Area. Maximum flight heights are not known; however, the species typically flies at lower altitudes closer to the canopy and only occasionally reaching heights considered at risk of collision.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						The species is considered likely to collide with WTG. As a non-listed species, a mortality will result in a minor impact on regional populations. The species is assessed as having a moderate collision risk.
Microcarbo melanoleucos Little Pied Cormorant	-	-	Minor	Moderately likely	Low	The little pied cormorant is widely distributed throughout Australia and utilises natural and artificial wetlands. The species is considered to be nomadic throughout its range with movements being largely influenced by rainfall and the availability of suitable wetlands (Morcombe M. , 2000). The species has been observed periodically within the Project Area with a single individual observed flying within the RSA. While agricultural dams are present, the Project Area lacks large natural wetlands and so it is considered moderately likely that a collision will occur. As a non-listed species, a mortality will result in a minor reduction in regional populations. The species is assessed as having a low collision risk.
Grallina cyanoleuca Magpie-lark	-	-	Minor	Moderately likely	Low	The magpie-lark is locally abundant and occurs throughout a diversity of habitat types where trees and water are present for the construction of mud nests (Morcombe M. , 2000). The species has been observed throughout the Project Area however flights within the RSA have been observed on only a single occasion. While suitable habitat is present throughout the Project Area, it is considered moderately likely that the species will collide with WTG based on observed behavioural traits. As a non-listed species, a mortality will have a minor impact on regional population. The species is assessed as having a low collision risk.
Manorina melanocephala Noisy Miner	-	-	Minor	Moderately Likely	Low	The magpie-lark is locally abundant and occurs throughout a diversity of habitat types where suitable open woodland is present (Morcombe M. , 2000). The species has been observed throughout the Project Area however flights within the RSA have been observed on only a single occasion.

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						While suitable habitat is present throughout the Project Area, it is considered moderately likely that the species will collide with WTG based on observed behavioural traits. As a non-listed species, a mortality will have a minor impact on regional population. The species is assessed as having a low collision risk.
Cacatua galerita Sulphur-crested Cockatoo	-	-	Minor	Very Likely	Moderate	The sulphur-crested cockatoo is present throughout a variety of habitats in eastern Australia, including woodlands, forests, cleared agricultural lands, and semi-arid and arid areas. The species is reliant on old growth forests for breeding and roosting and often flies large distances between roosting and foraging habitat (Morcombe M. , 2000). The species has been observed throughout the project area, and it is considered very likely that the species will collide with WTGs. As a non-listed species, a mortality will result in a minor reduction in regional population. The species is assessed as having a moderate collision risk.
Corvus orru Torresian Crow	-	-	Minor	Moderately Likely	Moderate	The Torresian Crow is the most common corvid of coastal towns between Forster and Brisbane. Within inland areas the species becomes more patchily distributed throughout its range. The Torresian Crow is found throughout wooded areas, taller scrublands and along timbered watercourses in dryer areas (Morcombe M. , 2000). The species has been observed flying within the RSA however has only been detected within a single season (Autumn 2022) of surveys conducted. It is considered moderately likely that the species will collide with WTG. As a non-listed species, a collision will have a minor impact on regional populations. The species is assessed as having a moderate collision risk.
Zanda funereal Yellow-tailed Black-cockatoo	-	-	Minor	Likely	Moderate	The Yellow-tailed Black-cockatoo is present in a diversity of habitat within eastern and south-eastern Australia. The species is considered nomadic throughout its range and feeds largely on the seeds of native trees but is also known to utilise exotic pine plantations regularly (Morcombe M. , 2000).

Species	Threatened Species Status		Consequence of Event	Likelihood of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						Suitable habitat is present throughout the Project Area and the species has been observed to occur in low numbers and so a collision event is considered likely. As a non-listed species, a mortality will have a minor impact on regional populations. The species is assessed as having a moderate collision risk.

Status listing per EPBC and BC Acts: CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory; LC = Least Concern; SLC = Special Least Concern.
*Species have been assessed as nomadic based on species profiles sourced form Bird Life Australia and (Morcombe M. , 2000)

7.3.6 HEAT MAPPING

Bird abundance and site utilisation is highly variable throughout the Project Area and is heavily influenced by the availability and suitability of habitat, topography, and season. Where turbines are in areas of higher site utilisation, particularly flight heights within the RSA, higher rates of collision and mortality are expected. To identify these high-risk areas, heat mapping of bird abundance has been undertaken to map areas that may represent flight paths across the Project Area.

A heat map generated from the bird utilisation data collected across all seasonal surveys is shown in **Figure 7-6**. A 1 km radius was applied to each BUS location sampled to reflect the approximate average survey area in which an accurate species identification with a high level of confidence could be obtained. Total species abundance observed at each BUS point was then applied as a gradient to identify areas of higher utilisation.

Due to the large size of the Project Area, mapping of flight paths using a heat mapping approach is limited to sampled survey locations within proximity to indicative turbine locations. Incidental observations of potentially at-risk raptors, and species observed flying at heights considered at risk of collision (within the RSA) were recorded beyond the extent of sampled BUS locations and offered important insights into site level movements for species.

7.3.6.1 TOTAL SPECIES ABUNDANCE

Mapped site utilisation in relation to abundance of all species observed is presented in **Figure 7-6**. A colour gradient has been applied to the buffered BUS location based on the total abundance of individual birds across all detected species from all survey periods.

A colour gradient has been applied ranging from <100 to >600 individuals. Although mapped woodland vegetation is present throughout the site, much of this has been significantly disturbed by agricultural land use practices. Areas of high bird abundance are located within proximity to larger and denser patches of vegetation that are likely to provide more suitable habitat for a higher diversity of species. Higher bird abundance is also present in areas of more contiguous vegetation, particularly associated with the Oxley Wild Rivers National Park, near Apsley gorge located to the Site’s east.

Although heat mapping possesses a degree of bias towards locations sampled during survey events, incidental observations of threatened species made during traversing the site show similar correlations between site utilisation and area of more contiguous vegetation. Of these species, the Dusky Woodswallow, Little Eagle, Wedge-tailed Eagle, and Glossy Black-cockatoo are of particular interest in the risk of collision with wind turbines. While these species are highly mobile, their occurrence is likely to reflect habitat suitability within the Project Area and thus greater potential for an interaction with a turbine. However, flight height is an important element to collision risk, which is further evaluated in the mathematical collision risk modelling.

ERM BUS4
BLUE MOUNTAIN ROAD
NA BUS3
NA BUS1
ERM BUS5
ERM BUS8
NA BUS5
NA BUS6
ERM BUS3
WINTERBOURNE ROAD
NA RF1
NA BUS4
ERM BUS7
ERM BUS1
ERM BUS6
ERM BUS9
NA BUS2
NA BUS7
BARK HUT ROAD
ERM BUS10
ERM BUS11
ERM BUS2
ERM BUS12
ERM BUS13
NA BUS13
THUNDERBOLTS WAY
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
NA RF2
NA BUS8
NA BUS9
NA BUS12
OXLEY HIGHWAY
ERM BUS14

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Barking Owl
- Black Falcon
- Blue-billed Duck
- Diamond Firetail
- Dusky Woodswallow
- Glossy Black-Cockatoo
- Little Eagle
- Little Lorikeet
- Flame Robin
- Scarlet Robin
- Speckled Warbler
- Varied Sitella
- White throated needletail

Abundance Count

- <100
- 100 - 200
- 201 - 300
- 301 - 400
- 401 - 500
- 501 - 600
- >600

"NA" = Nature Advisory

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 17/06/2025
Created By: VN
Drawing Size: A3
0 1 2 3km
1:110,000

F7-6 Total Bird Species Abundance Recorded at Bus Points

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7.3.6.2 SPECIES ABUNDANCE WITHIN THE RSA BY DISTANCE

Although suitable habitat for at-risk bird species is present, the distribution of such habitat is patchy and site utilisation is not constant across the Project Area.

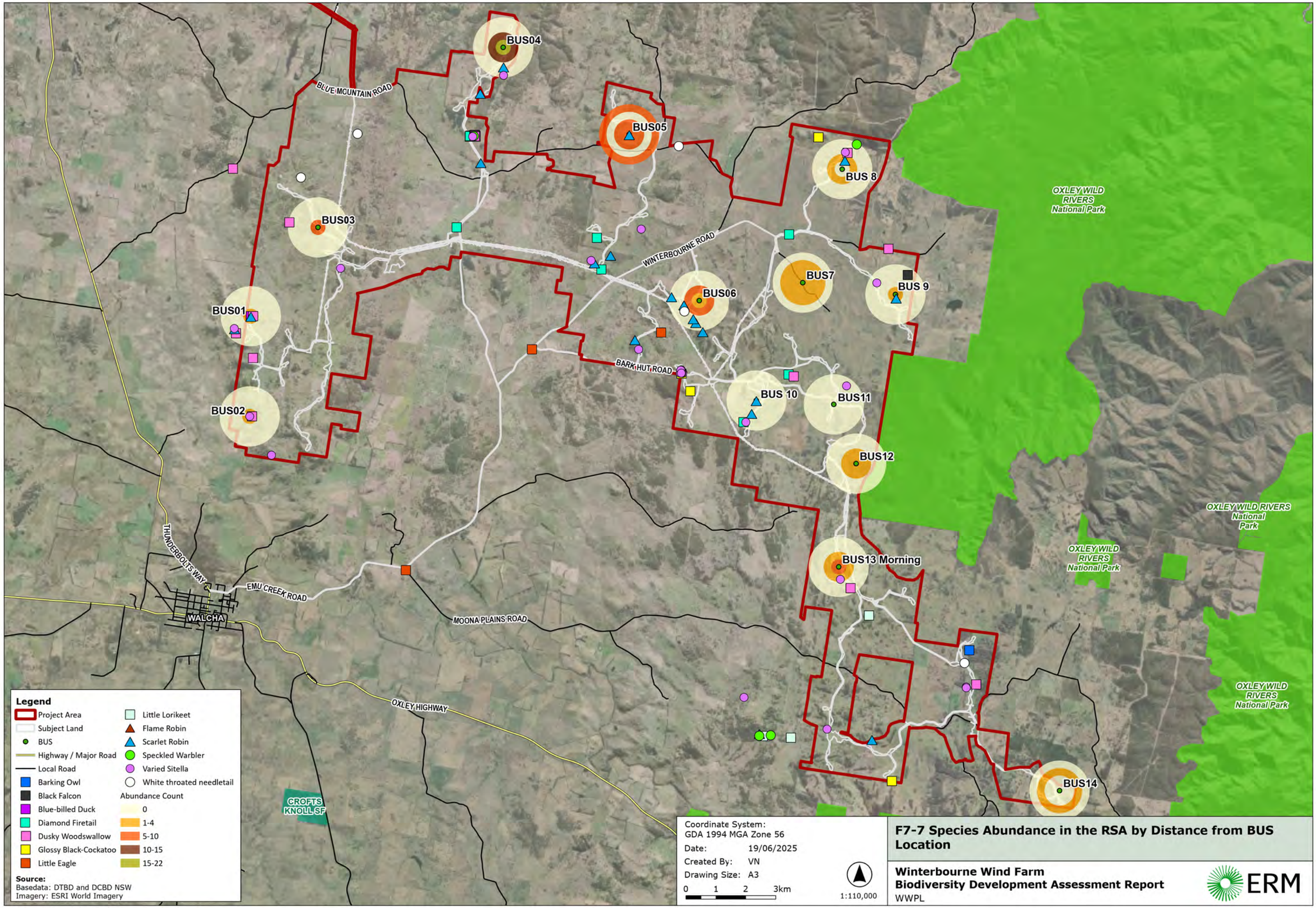
While total species abundance can provide meaningful insights into avifauna site utilisation as a whole, as shown in **Figure 7-6** abundance is heavily influenced by the presence of species that are not considered to be at risk of collision, particularly woodland species, as they do not fly in the RSA.

Figure 7-7 provides heat mapping of the total abundance of birds observed flying at heights within the RSA. Observations have been separated into distance bands of 250 m increments from the BUS location to provide further details regarding site utilisation at the local scale.

As the distance estimates of birds are unknown for those observation collected by Nature Advisory, only data collected by ERM has been used in this analysis. Flight height within the RSA was relatively low across much of the Project Area with most survey locations reporting less than four individuals flying at 70 m or higher.

Flight heights within the RSA were highest at BUS04 and BUS05 to the north of the Project Area. These areas of the site are of higher elevation and contain steep ridgelines with pockets of vegetation in gullies. These changes in topography may influence the variation in flight heights observed at these BUS locations when compared to BUS locations in flatter areas.

Although preliminary assessments of turbine risk provided in **Section 7.3.3** provides a conservative estimate of potential risk, this is based solely on the proximity of habitat in linear distances from the turbine and is not able to account for potential changes to collision risk due to several factors such as topography, level of connectivity, patch size, vegetation type and site utilisation. While birds are highly mobile, it is expected that at-risk flight behaviour will be more abundant in the north of the Project Area where conditions are favourable for raptors to forage at height and more contiguous vegetation is present.



F7-7 Species Abundance in the RSA by Distance from BUS Location

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ERM

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7.3.7 FLIGHT PATH MAPPING

Movement patterns of listed threatened and migratory species, and nomadic species (identified within **Section 7.3.4)** within the Project Area and the surrounding landscape is expected to be driven by the availability of important habitat features. To evaluate the extent of potential barrier effects and impacts to expected movement pathways for threatened avifauna and bats, predicted flight path mapping has been completed for the Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*), and those nomadic and threatened species dependent on wetlands and woodlands.

7.3.7.1 GLOSSY BLACK-COCKATOO

Glossy Black-cockatoo are known to occur within the Project Area and while movement patterns for the species are poorly understood they are likely to be driven by changes in food availability. Potential habitat for the species has been defined as vegetation supporting suitable foraging species, *Allocasuarina spp*, and/or suitable nest hollows. Suitable hollows for breeding were mapped when they met the minimum height, size and entrance requirements for the species. Foraging habitat was defined within the Subject Land using a combination of the Glossy Black-cockatoo species polygon based on associated PCTs and confirmed locations of *Allocasuarina spp.* Where tree hollows or *Allocasuarina spp* records were present within larger patches of contiguous vegetation extending beyond the Subject Land, it was assumed that the full extent of the vegetation patch has the potential to support suitable foraging and/or breeding habitat and so was included in the mapping. Potential foraging habitat beyond the extent of the Subject Land was identified using the SVTM Extant PCT Mapping sourced from SEED. Those PCTs that comprise *Allocasuarina* species have been mapped as likely to possess suitable foraging habitat.

Movement of Glossy Black-cockatoos is predicted to occur predominantly in the center and eastern half of the Project Area. Contiguous vegetation associated with the adjacent Oxley Wild Rivers National Park is expected to act as the primary movement source for the species. Observations of the species within the Project Area occur along the Project's boundary, within proximity to more contiguous vegetation that would provide potential foraging, breeding and dispersal functions for the species. While the extent of foraging and nesting habitat within these areas of the broader landscape is unknown it is likely that resident individuals will utilize habitat features within the Project Area using vegetation corridors from the east. Potential foraging and nesting habitat is patchily distributed across the Subject Land and may provide connectivity corridors and opportunistic foraging opportunities.

While turbines have the potential to establish barriers to Glossy Black-cockatoo movement, suitable foraging habitat is limited within the Project Area and so any impacts of the proposed development are unlikely to restrict species access to habitat considered critical for survival. The greatest risk of a potential barrier exists in the central east of the Project Area, where a higher density of turbines arranged in a non-parallel design may impact predicted east-west movement between the Project Area and the Oxley Wild Rivers National Park. Large distances exist between proposed turbine rows with a valley approximately 2.5 km wide providing direct pathways between the National Park and foraging habitat that is likely to allow for movement through turbine infrastructure.

While some habitat features are noted to be in close proximity to turbines, the Glossy Black-cockatoo is largely considered to be forest dependent (Cameron, 2006; Murdoch, 2012) and flight heights are likely to be restricted to just above canopy height. With predicted average canopy height of 21.3 m across the Project Area and a RSA height of 68 m, approximately 46.7m of airspace is present outside of the at-risk area and is likely to allow for permeability for the species.

7.3.7.2 THREATENED, MIGRATORY AND NOMADIC WETLAND SPECIES

Waterbodies in the Subject Land/Assessment Area are associated with agricultural farm dams with only minor creek lines present in the central north and south east. Areas of wetland vegetation are limited (i.e., PCT 766 sedgeland), which generally does not comprise open water.

While these may provide temporary habitat to wetland-dependent species, they are not considered to be critical foraging or breeding habitat and so are not likely to influence the movement pathways of nomadic and migratory avifauna. Condition and habitat value of these dams vary depending on the size, vegetation cover and water retention; however, are known to provide non-breeding habitat for listed threatened species including the Blue-billed Duck (*Oxyura australis*).

Local movement is likely to be largely consistent throughout the Project Area due to the high density of potentially suitable dams. While many dams may not provide important habitat in isolation, the proximity of dams is expected to establish a matrix of interconnected waterbodies with regular movement between these features likely to occur. A cluster of larger agricultural dams is present in the Project Area's western edge which may facilitate broader species movement.

As there are no clear movement pathways between the waterbodies within the Project Area, the identification of significant barriers to species movement is difficult to predict. In the western portion of the Project Area, barrier effects may be reduced by the linear, north-south orientation of turbines and the low density and large distances between arms of infrastructure. One potential source wetland is adjacent to a break in turbine infrastructure approximately 5 km wide and allows for free movement throughout the Project Area. In the east of the Project Area, the potential for movement barriers is greater, with access from the source wetland potentially broken by the easternmost arm of turbines. While turbine density is higher, movement between agricultural dams is likely to be low altitude flights that will likely be below the at-risk heights of the RSA and so may mitigate any potential barriers caused by the turbines.

7.3.7.3 THREATENED, MIGRATORY AND NOMADIC WOODLAND SPECIES

Important habitat for those threatened and nomadic species identified to be woodland dependent, such as the Scarlet Robin (*Petroica boodang*) and Varied Sittella (*Daphoenositta chrysoptera*), has been identified using qualitative habitat mapping informed by the SVTM and ground-truthed vegetation assessments. For the purposes of this predicted flight mapping, woodland vegetation has been mapped where canopy coverage is contiguous or of a suitable density to facilitate the presence of naturally occurring open woodlands.

Movement pathways for woodland species are expected to be in linear pathways between these mapped woodland areas.

In the western portion of the Project Area this is likely to be largely in a north-south direction with connectivity with vegetation patches beyond the Project Boundary also likely to influence broader landscape movement. In the eastern portion of the Project Area, the Oxley Wild Rivers National Park is expected to provide the source of species movement with pathways likely to radiate out through connected woodlands. Although large areas of cleared agricultural land are present, scattered trees, roadside vegetation and thin linear sections of remnant vegetation provide connectivity between mapped areas of larger woodland patches.

Although turbine infrastructure is located within and between woodland vegetation mapped as habitat in this predictive flight path mapping, threatened, migratory and nomadic species dependent on woodlands are considered unlikely to be impacted by potential barrier effects caused by operating turbines. Based on predicted mean canopy heights of confirmed PCTs, approximately 46.7 m of airspace is present between the canopy and the lowest point of the turbine blades. While occasional individuals may reach heights at risk of collision, species movements are likely to be restricted to within proximity of the canopy and so average flight heights are likely to be lower than the RSA. Movement of woodland-dependent species within the Project Area is not considered likely to be impacted by barrier effects established by operating WTGs.

NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
CROFTS KNOLL SF
OXLEY WILD RIVERS National Park
OXLEY WILD RIVERS National Park

Legend
- Project Area
- Turbine
- Flight Path
- Habitat Trees
- South-eastern glossy black-cockatoo
- South-eastern glossy black-cockatoo Species Polygon
- Highway / Major Road
- Local Road
- National Parks
- State Forest

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

F7-8 Predicted Flight Path Mapping for the Glossy Black-Cockatoo

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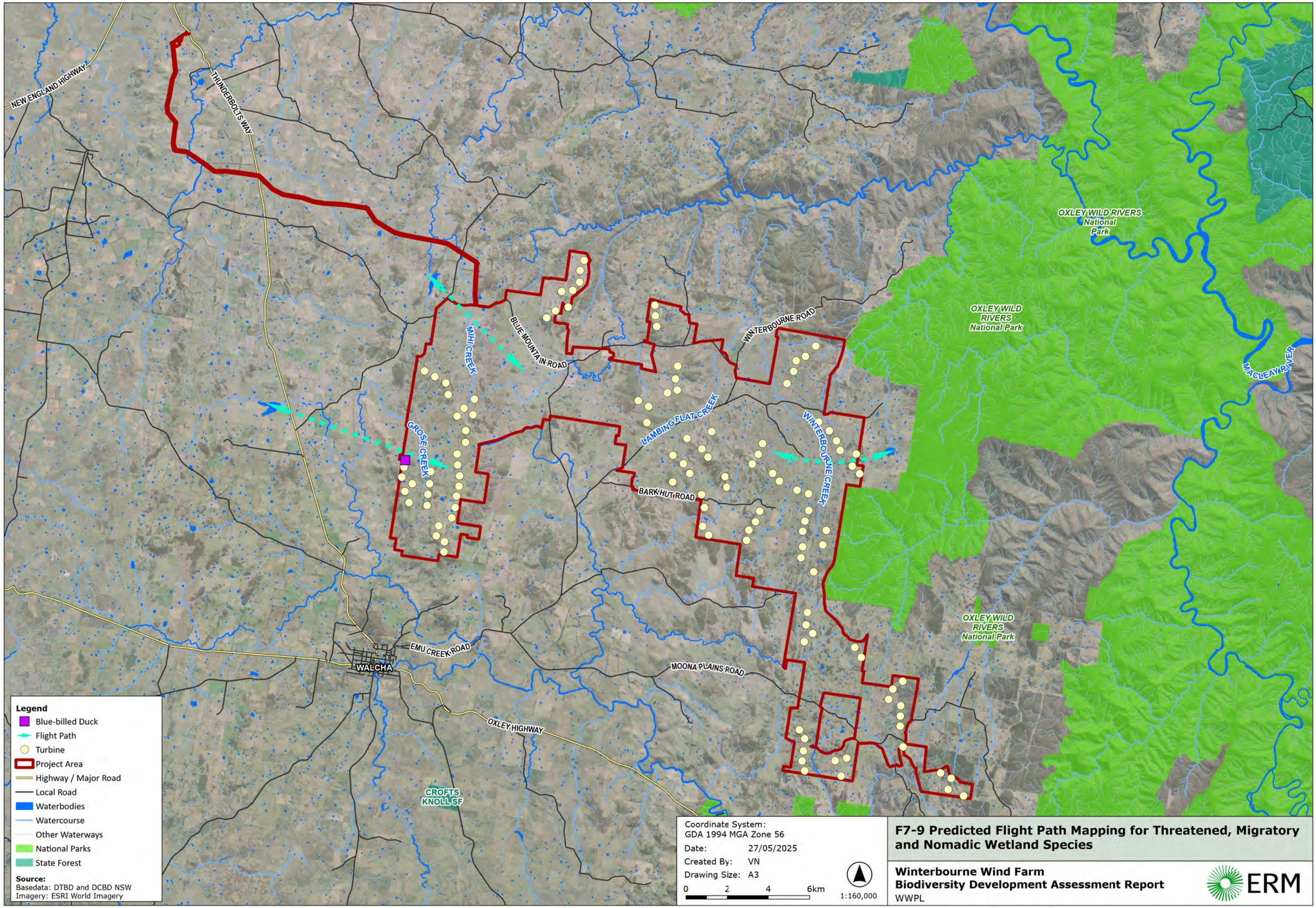

F7-9 Predicted Flight Path Mapping for Threatened, Migratory and Nomadic Wetland Species

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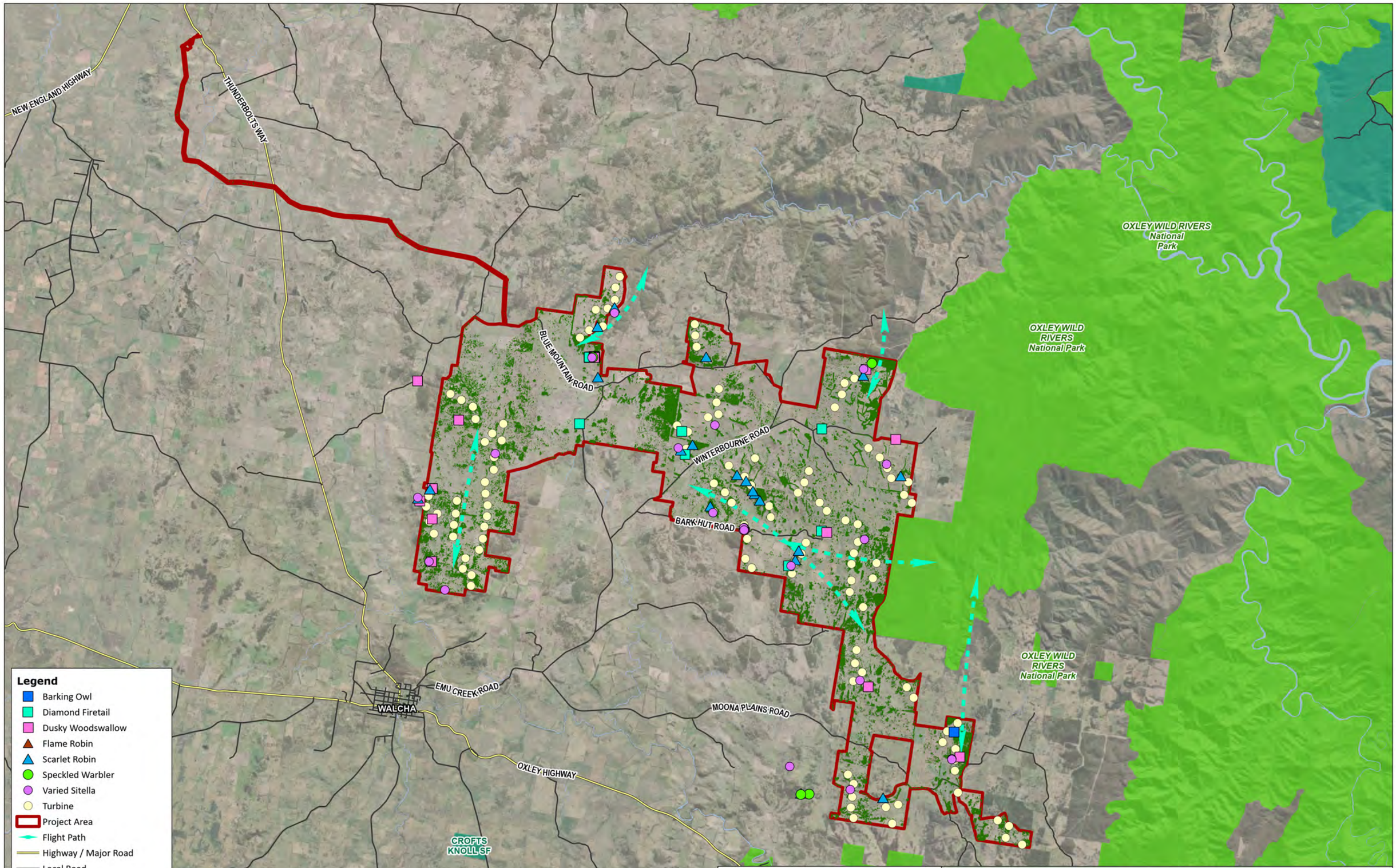

F7-10 Predicted Flight Path Mapping of Threatened, Migratory and Nomadic Woodland Dependent Species

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0526676_WWF_BDAR_E_R1.aprx

7.4 MATHEMATICAL COLLISION RISK MODELLING

The Band Collision Risk Model (Band, Madders, & Whitfield, 2007) will be used to predict the total number of bird collisions that may result from the Project. This method of CRM requires the input of parameters that describe species-specific biometrics, flight speeds and characteristics and the expected amount of flight activity as derived from field surveys in the Subject Land. It also requires the input of WTG specific information such as the blade size and pitch, hub height and rotor rotation period as well as the proportion of time the WTG will be operational (Band, Madders, & Whitfield, 2007).

The CRM should use observational BUS data to determine the flight heights, frequency of time spent in the RSA for the species known to occur within the RSA. Literature may be used to determine average flock size, but observational data must be used for presence/absence of species, as well as time spent within the RSA. This follows the process of determining:

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

Stage 1 depends on bird surveys at vantage points used to gather information about the frequency of bird and bat flights in the RSA (Band, Madders & Whitfield 2007) and has been informed from data across 6 survey periods across both relevant seasons in the Project Area. This also depends on the flock size of the species as well as the species activity during the year (e.g., whether it is diurnal or nocturnal, migratory or present all year round).

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

A CRM model has been developed based on site-specific observations and data. It includes species identified as occurring within the RSA or those identified as having a moderate, high or very high collision risk, provided there are sufficient observations to input into the model.

7.4.1 BIRD UTILISATION SURVEY GUIDELINES

The BAM guidance for wind farm turbine strike assessment and adaptive impact management has undergone changes since the commencement of seasonal surveys. As of June 2023, BUS length was required to be 30 minutes with six replicates across three time periods for each season. This survey effort was not required prior to the implementation of these updated guidelines and surveys prior to this were conducted for 20 minutes. To maintain consistency in modelling output, all survey samples are assumed to be 30 minutes in duration regardless of the guidelines in place at the time of survey. While this assumption may lead to an increased modelled annual collision estimate for each species, the output can be considered the most conservative estimate.

7.4.2 ASSUMED BIRD FLIGHT ACTIVITY

BUS provide site-specific data to inform bird utilisation; however, are limited by the short sampling period length within a single twelve-month period. For the purposes of the CRM, bird utilisation is assumed to be constant across the year regardless of the season.

Average hours of daylight (the time between dawn and dusk) have been calculated using data obtained from Geoscience Australia's Geodetic Calculator and have been used to calculate the proportion of time birds spent within the RSA per year. Although the times that birds are active at heights within the RSA are likely to vary depending on season, weather, and bird functional groups, to establish the most conservative estimate of collision risk annually, it has been assumed that birds are active for 100% of available daylight hours.

7.4.3 SPECIES MORPHOMETRICS

To calculate the total number of collisions per annum for each species, species-specific morphometric data including wing length, body length, and flight speed is required. Flight speeds are not well understood for Australian birds; therefore, where estimates of flight speeds could not be found in the scientific literature, estimates have been taken from closely related species of similar size.

For those species in which flight speeds could be sourced, only the maximum observed flight speed could be found. Birds likely to interact with wind turbines are expected to only rarely fly at maximum speeds and so collision risk may fluctuate to a degree depending on the speed at which the bird is flying.

7.4.4 COLLISION RISK MODEL INCLUSION CRITERIA

The following section details the modelling processes used for the CRM for the Subject Land.

The CRM included bird species assessed as having moderate, high and very high collision risk, as detailed in **Table 7-10**, unless there were insufficient observations to support the modelling. The species that were assessed as having a low collision risk, as determined by the risk assessment, were not considered in the CRM. This is summarised in **Table 7-11**.

TABLE 7-11 COLLISION RISK MODEL INCLUSION CRITERIA

Risk Category	Included in CRM
Low	No
Moderate	Yes (only with sightings in RSA)
High	Yes (only with sightings in RSA)
Very High	Yes (only with sightings in RSA)

It is important to note that while numerous observations of threatened birds and bats have been made during field assessments in the Subject Land, only the White-throated Needletail was observed flying within the RSA with sufficient records to effectively model collision risk. Threatened species which have been assessed as very high or high risk of collision which have not been recorded in the RSA are listed below:

<u>High collision risk</u>

- Little Eagle (*Hieraaetus morphnoides*).

<u>Moderate collision risk</u>

- Regent Honeyeater (*Anthochaera phrygia*);
- Eastern Cave Bat (*Vespadelus troughtoni*);
- Large Bent-wing Bat (*Miniopterus orianae oceanensis*);

- Little Bent-wing Bat (*Miniopterus australis*);
- Australasian Bittern (*Botaurus poiciloptilus*);
- Australian Painted Snipe (*Rostratula australis*);
- Barking Owl (*Ninox connivens*);
- Bush Stone-curlew (*Burhinus grallarius*);
- Dusky Woodswallow (*Artamus cyanopterus*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Fork-tailed Swift (*Apus pacificus*);
- Grey Falcon (*Falco hypoleucos*);
- Grey-headed Flying Fox (*Pterops poliocephalus*);
- Square-tailed Kite (*Lophoictinia isura*);
- Spotted Harrier (*Circus assimilis*);
- South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*);
- Southern Myotis (*Myotis macropus*);
- White-bellied Sea-eagle (*Haliaeetus leucogaster*); and
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*).

These species will be monitored during further bird surveys during the construction and operational phases of the Project. The CRM will be updated should a sufficient observation (n=3) becomes available.

7.4.5 WIND FARM AND WTG PARAMETERS

Table 7-12 details the parameters of the WTG for the Project relevant to the CRM. These parameters have been used in the CRM for the Project Area to calculate collision risk for detected species under different scenarios.

TABLE 7-12 WTG PARAMETERS FOR THE PROJECT

WTG Parameters	WTG Specifications
Number of WTGs	118
WTG Hub Height	149 m
WTG Rotor Diameter	162 m
RSA Height	68-230 m (lowest point and highest point)
Number of Blades	3
Chord Width of Blades	4.3 m
Average Pitch Angle of Rotor	5 degrees
Average Rotation Period of WTG	5 Seconds
Project Area	21,844 ha

7.4.6 BIRD SPECIES PARAMETERS

Table 7-13 provides morphometric parameters, known behavioural traits, and observations of site utilisation following seasonal surveys.

The parameters presented below have informed the collision risk model undertaken for each species and have been obtained through a combination of literature review and field observations. The range of flight heights and flock size of the species does not reflect the observed flight heights during survey seasons to date, but rather a maximum estimate based on known behaviours.

TABLE 7-13 SPECIES OBSERVED WITHIN THE RSA

Species Name	Wingspan (cm)	Length (cm)	Flight Speed (m/s)	Number of Modelled Sightings in the Project Area during Survey Period	Total minutes active during survey time	Total minutes active proportional to total survey time
Australian Raven	100	50	16.7	32	960	0.084
Brown Falcon	115	45	13.6	8	240	0.021
Black-shouldered Kite	90	35	17.3	4	130	0.0104
Little Pied Cormorant	46	58	14.6	3	90	0.008
Magpie-lark	18.4	27	16.7	5	150	0.013
Nankeen Kestrel	74	30	17.4	21	630	0.055
Noisy Miner	26	28	19.4	3	90	0.008
Wedge-tailed Eagle	230	110	16.7	202	6060	0.527
Whistling Kite	146	55	30	3	90	0.008
White-throated Needletail	50	20	36	717	21510	1.871

7.4.7 COLLISION RISK MODELLING RESULTS

A summary of model output for the preliminary CRM is presented in **Table 7-14**.

For the ten species included in the model, collision risk has been calculated as the number of collisions per species per annum. It is expected that birds in practice show a high level of avoidance of WTGs (Band, Madders, & Whitfield, 2007). However, avoidance rates have not been calculated for all species and research is necessary to determine species-specific avoidance rates. For this CRM, 95% 98% and 99% avoidance rates have been used to calculate collision numbers per annum for the given species. These avoidance rates are what is typically used in CRM exercises (Smales & Muir, 2005).

TABLE 7-14 MODEL CRM ESTIMATED COLLISION NUMBERS PER ANNUM

	Estimated annual number of collisions (based on RSA of 68-230m)			**Estimated collision across the operation life of the Project (30 years)**		
Species	Avoidance Scenario			Avoidance Scenario		
	95%	98%	99%	95%	98%	99%
Australian Raven	0.35	0.14	0.07	10.5	4.2	2.1
Black-shouldered Kite	0.04	0.01	0.007	1.2	0.3	0.21
Brown Falcon	0.07	0.03	0.01	2.1	0.9	0.3
Little Pied Cormorant	0.03	0.01	0.006	0.9	0.3	0.18
Magpie-lark	0.04	0.02	0.01	1.2	0.6	0.3
Nankeen Kestrel	0.037	0.036	0.036	1.11	1.08	1.08
Noisy Miner	0.02	0.01	0.004	0.6	0.3	0.12
Wedge-tailed Eagle	2.79	1.12	0.56	83.7	33.6	16.8
Whistling Kite	0.05	0.02	0.01	1.5	0.6	0.3
White-throated Needletail	5.94	2.38	1.19	178.2	71.4	35.7
Total	**9.367**	**3.776**	**1.903**	**281.01**	**113.28**	**57.09**

This CRM model indicates that between two and ten birds are expected to collide with WTGs per year. Over the operational life of the Project this equates to between 57 and 281 collisions. Based on the field investigations that have been undertaken, as well as the literature providing the maximum parameters for the species, the total annual collision numbers in the above table are considered the 'worst-case' scenario for the project. It should be noted that the observations of the little pied cormorant, magpie-lark, noisy miner, and whistling kite flying at heights within the RSA were low across the survey seasons with a sample size of less than 5 individuals included in the above modelling. As such, the reliability of mortality estimates for these species are likely to be restricted by a low sample size.

White-throated Needletail is the only listed migratory and threatened species detected within the Project Area with a sufficient sample size to allow for inclusion within the CRM following the detection of flocks of approximately 300 individuals in 2025. Between one and six individuals are expected to collide with a WTG each year resulting in between 35 and 178 expected mortalities across the operational life of the project. As a migratory species with a global distribution, potential presence within the Project Area is restricted to approximately 6 months each year (October to March) (DCCEEW, 2019) and the calculated maximum time birds can occupy the RSA has been adjusted for these seasonal movements. The outputs of this model assume that birds will be active for 100% of available daylight hours across 100% of months where the species is present in Australia.

The species is considered highly mobile and movements within Australia are widespread and heavily influenced by seasonal weather patterns (DCCEEW, 2019); and so the actual time the species is present and interacting with the Subject Land is likely to be a much smaller proportion of the total time spent within the Australian distribution. Actual mortalities following WTG collisions for the species may be lower than this model predicts; however, as large flock numbers may be present while the species is interacting with the Subject Land, the outputs above are considered suitably precautionary.

Four species, the channel-billed cuckoo (*Scythrops novaehollandiae*), crimson rosella (*Platycercus elegans*), forest raven (*Corvus tasmanicus*), and yellow-tailed black-cockatoo (*Zanda funerea*) were observed flying within the RSA with an insufficient sample size (n=<3) for inclusion in the CRM. These species may still be susceptible to impacts resulting from collision with WTG; however, impacts are to be negligible on the regional populations based on a combination of known species behavior and low observed abundance. Should a suitable sample size be reached during future monitoring surveys outlined in this draft BBAMP framework, this CRM will be updated as is necessary.

7.4.8 COLLISION RISK MODEL PEER REVIEW RECOMMENDATIONS

The peer review of the CRM was undertaken by Principal Consultant Peter Wright, with 15 years' experience and Senior Consultant Sebastian Ellis, with 4 years' experience, from the ERM Europe Business Unit. These two professionals have each worked on multiple Projects throughout the UK and Europe that require the use of CRM using the Band Model.

The peer review concluded the Band Model is an adequate model to analyse the data collected from the survey effort of the Project Area. To provide a more robust, and conservative estimate of collision risk, the peer review detailed several measures to improve the model output. **Table 7-15** details a summary of the recommendations from the peer review.

TABLE 7-15 CRM PEER REVIEW RECOMMENDATIONS AND IMPLIMENTATION

Peer Review Recommendations	Implementation into CRM
Use of hypothetical data, or data from a broader area than the windfarm Subject Land leads to a large amount of uncertainty and undermines confidence in the model. If a species is not recorded in the survey area but is expected, further survey effort would be preferable to utilisation of data from a wider area. Bird activity is typically site specific, with topography, habitat, food/prey availability and other factors all influencing bird flight activity at any one location. Although regional datasets may provide information on bird density that can be extrapolated to a proposed wind farm site, the CRM requires additional assumptions to be made around bird occupancy (e.g., number and duration of flights at potential collision risk height) or bird flux (number of regular flights through the wind farm at collision risk height). As with all models, the more assumptions made for the model inputs, the more uncertainty there is in the outputs.	On the guidance of the peer review model, as well as the literature review of models used throughout the world for CRM, hypothetical modelling is not an accurate way to understand the collision risk for a proposed development. Based on this recommendation, only birds that have been observed within the RSA for the Project Area, will be included in the CRM prepared as part of this BDAR.

Peer Review Recommendations	Implementation into CRM
Reference to WTG and bird specific parameters need to be made and justified.	The parameters for the WTGs are based upon the worst-case scenarios. Bird morphology and flight speed parameters were based on literature and observational data.
The calculation of bird occupancy across the whole site requires equal duration of survey effort across all areas of the site (e.g., if 2 hours survey is undertaken at 3 locations simultaneously to cover the whole site then this equates to 2 hours surveyed across the site rather than 6 hours in total).	The calculation for time spent surveying the Project Area was based on surveys conducted by two ecologists at one time. BUS were never conducted simultaneously but rather were conducted one after the other during the survey periods. Therefore, the total time spent surveying the Project Area was calculated based on the accumulation of all survey minutes conducted during each BUS in the Project Area, where no overlap occurred during surveying.
It is recommended that a rule of 2 km visibility per vantage point survey (BUS equivalent in the UK) be used to calculate the total area surveyed.	Implementing this recommendation would provide more accurate representation of the total area surveyed across the Project Area. For each BUS point, a visibility estimate was given to be 1 km, which provided a more conservative estimate than the 2 km recommended. This would account for areas with low visibility due to vegetation density, topography and weather.
The initial infrastructure footprint was calculated using a 100 m buffer. In the UK, a 500m buffer around the infrastructure to calculate the risk envelope is typically used.	A 500 m buffer of the disturbance footprint has been applied to ensure any impacts are not underestimated and provide a worst-case collision risk estimate.
Bird parameters used to calculate collision risk should be referenced and the input of 'flapping' bird behaviour should be applied over 'gliding' bird behaviour to give a precautionary outcome.	Bird parameters used for the CRM referenced 'flapping' bird behaviour applied.
One of the assumptions used in the model is that each flight observed lasted 30 minutes duration. No justification is provided for using this value, and best practice would be to use actual flight durations recorded from site specific surveys.	The data that was recorded was the bird presence within the RSA (68-230 m) and direction flying. The survey effort did not capture the total time that the birds sighted spent in the RSA. Each BUS lasted for 30 minutes and therefore it was concluded that if any bird was seen during that BUS within the RSA, that it was seen for the total 30 minutes within the RSA. This does not give the exact period of observation in the RSA, but instead provides the total maximum time the bird could have been sighted in the RSA. Therefore, this provides a conservative and worst-case timeframe for observations in the RSA.
Incorrect application of avoidance rates and 98% avoidance rates should be applied.	Avoidance rates have now been implemented correctly for 95%, 98% and 99% avoidance for each bird species, and given as a range.

7.4.9 COLLISION RISK MODEL LITERATURE REVIEW

Australia has been increasingly adopting renewable energy projects, with 110 operational wind farms present in the country, and that number predicted to grow in the coming years (ARENA, 2025) to meet evolving renewable energy targets.

An increase in WTGs has resulted in adverse effects on many avian species, through both direct fatalities as a result of the collision with WTG rotor blades as well as secondary impacts such as the result of habitat alteration and loss and the changes in normal flight paths as a result of WTG presence/habitat loss (Madders & Whitfield, 2006).

Collision risk is particularly important to determine for wind farms where threatened or migratory species have been detected when even a few fatalities can potentially cause a significant impact (Drewitt & Langston, 2006) (Loss, Will, & Marra, 2013). Other species that are vulnerable to collision with WTGs are high-flying, soaring birds of prey, such as raptors (Estellés-Domingo & López-López, 2024). Collision-related mortality is spread unevenly among species, i.e., few species often account for a large proportion of collisions (Madders & Whitfield, 2006). Collision risk will also vary dependent on each species, based on factors such as foraging behaviour, flight height, flock sizes, morphology and flight speed. WTG collision rates will vary based on variables such as time of day and time of year, based on the number of birds present in an RSA .

Raptors are known to utilise thermal soaring (slow circle-soaring flight on thermals) which is highly dependent on weather conditions. Under less favourable conditions for the species to gain altitude, WTG collision risk may be increased with the birds not tending to engage in active flight (May, et al., 2010) (Murgatroyd, Photopoulou, Underhill, Bouten, & Amar, 2018) (Marques, et al., 2014). This is because the bird is soaring and not actively flapping through an airspace. This may prolong the amount of time the bird is present within the risk window of a WTG. It has been studied in a wind farm that most raptors will spend little time in a defined collision risk zone but will often intersect in and out of the risk window (Linder, Lyhne, Laubek, Bruhn, & Pertoldi, 2022).

Studies identifying the important predictors of collision risk for raptors have observed that active flight can lead to a higher risk of collision with the tendency for a bird to dissect the path of multiple WTGs in an area (Linder, Lyhne, Laubek, Bruhn, & Pertoldi, 2022). Furthermore, track tortuosity (i.e., the amount the birds flight path winds) can also impact collision risk, such that less tortuosity increases collision risk. This is important as tortuous tracks can be a result of raptors utilising thermal soaring, and thus, thermal soaring may reduce collision risk. This is consistent with observations made other relevant studies (Péron, et al., 2017), (Janss, 2000)

CRM have been developed to assess the risk of impact to species as a result of wind farms. It is noted that such models are only able to assess the risk because of direct mortality from WTG hits, and not as a result of other impacts like habitat loss and flight redirection. A study by Masden and Cook (2016) reviewed 10 models that have been used broadly to assess the probability of bird species colliding with WTGs during passage through an RSA associated with a wind farm. The methods that were assessed were divided into those based on observational flight data, where flight behaviour, habitat use and flux of birds are analysed, as well as those that focus primarily on collisions based on theoretical parameters in the absence of bird data. The study by Masden and Cook (2016) explained that all collision risk models involve the following:

- To calculate the probability of a collision occurring assuming no evasive action – which requires information on bird morphometrics, flight speed and WTG rotor speed and size; and

- To measure the number of birds within a risk window each year – which is formulated based on observational data, or theoretical behavioural flight data for species in a given wind farm project area.

Table 7-16 shows a summary review of four of the main models mentioned in Masden and Cook (2016), including the Band Model. For each model, this table presents the objective of the model, inputs required as well as the limitations or main assumptions of the model.

TABLE 7-16 COMPARISON OF COLLISION RISK MODELS

Collision Risk Model	Objective and Benefits of the Model	Limitations and Assumptions of the Model
Tucker Model (Tucker, A Mathematical Model of Bird Collisions With Wind Turbine Rotors, 1996a) (Tucker, 1996b)	The model analyses the motions and dimensions of both birds and propeller-type rotor blades and predicts the probability of a collision when the bird flies through the RSA (Tucker, 1999a). This model can account for upwind and downwind flights of birds.	Does not measure a likely number of collisions as a measure of bird density; Blades are 1 or 3 dimensional which consist of length, chord and twist; Bird always considered to be gliding, and never flapping in flight behaviour; Bird dimensions are always rectangular with a wingspan that always exceeds length; Does not consider the collision with the WTG tower; and Avoidance behaviour is mainly left out of this model.
Band and Band Model (Band, Madders, & Whitfield, 2007); (Band W. , 2012)	The model was developed to take into considered the probability of a WTG blade that occupies the same space as a bird, and the time taken for the bird to pass through the rotor swept volume (RSV) of the area occupied by this WTG. It has two stages for estimating collisions per year: 1) number of birds flying through the rotor and 2) the probability of collision from a single transit of a rotor. This model accounts for avoidance or evasive behaviour by implementing an avoidance rate often between 95-99%. Bird specific parameters are included into this model such as bird length, wingspan, height and flight activity (diurnal/ nocturnal/ migratory). WTG parameters considered such as diameter, length, operational time, rotor speed, hub height. Considers bird both when flapping and gliding. Updates as part of 2012 were made to consider offshore wind farms (not applicable to the proposed development).	In this model the bird is assumed to be a cruciform shape; The thickness of the WTG blade still not included into this model; This model only assumes the bird is flying parallel to the wind, such that it is flying perpendicular to the rotation of the WTG; Assumes effects of approaching WTG at oblique angles will cancel out, although this may underestimate collision risk; and Does not consider the collision with the WTG tower. Can be observational data heavy, when normally in Projects the data can be quite limited.

Collision Risk Model	Objective and Benefits of the Model	Limitations and Assumptions of the Model
Monte Carlo Model (McAdam, 2005)	This model is based upon the original Band Model; however, includes stochastic modifications to account for variation in flight height and the effects of wind. This model calculates the probability of bird being struck given it has passed through the plane of the WTG at a given height and distance less than the rotor length from the centre. This model considers the effect of wind variation on collision variation through the variance of bird speed as well as changes in the direction of the WTG.	Includes same limitations of Band Model. This model includes oblique angles but not bird orientation relative to WTG.
Biosis Propriety Limited (Smales I. , Muir, Meredith, & Baird, 2013)	This model has been developed to provide a prediction of the number of collisions between WTGs and a local or migratory group of birds. This model acknowledges that birds won't only approach WTG at a perpendicular angle, but flights can occur from any direction. Considers the moving and stationary parts of the WTG – including the WTG tower that may be a factor to consider for bird collisions. Considers bird parameters and WTG parameters considered as in the Band Model. Considers avoidance rates of birds.	This model does not consider when the collisions will occur. Due to statistically minor numbers of collisions that are concluded from the model – it is unlikely that they will be evenly distributed in time. Can be observational data heavy, when normally in Projects the data can be quite limited.

As well as the limitations above, the following are considered limitations for all the models:

- Most models assume that avoidance behaviour is constant across all individuals within a species and this is unlikely;
- Can overestimate bird collisions;
- Data incorporated is often count data of number of individuals in the species – the same individual may be counted more than once; however, it can only be used in the model once, assuming collision equates to mortality. Distinguishing individuals of a species is difficult (Eichhorn, Johst, Seppelt, & Drechsler, 2012) and circumvents the above limitation by using an agent-based model to describe movements of individuals through a landscape and applying collision risk to each individual; and
- Species-specific behaviours, topography and wind parameters not considered for majority of the models.

There are many other models, however, the CRM that was chosen for this proposed development was the Band Model, also known as the Scottish Natural Heritage (SNH) Model. This Band Model was chosen based on its ability to calculate the estimate of collision per year for a bird species which is a pre-construction assessment of collision impacts on local and national populations (SNH, 2018b). It considers bird species and WTG model parameters, that ensure that it is specific and situation dependent.

The limitations of the Band Model as discussed in Band et al. (2007) include the following:

- Birds may be more evident and prominent in some habitats;
- Birds may be easier to identify when flying at different elevations;
- Detection rate may differ for different species;
- Plotting routes of flying birds is difficult due to parallax and can be a skill that takes time to develop; and
- For gliding species such as eagles, it can be hard to tell their correspondence to landscape; however, this can be circumvented by having knowledge of the species expected to be seen and knowledge of terrain.

It is noted that the disadvantage of the Band Model is that it does not necessarily consider the direction the bird is flying within the Project Area. Such information is important to identify higher risk areas. Nonetheless, this information is accounted for within the risk assessment and identifies areas of high bird activity that will require further surveying in future. Such limitations are all relevant to the proposed development and the CRM undertaken for the species relevant to the Project Area. All species identification parameters and detection rates are going to be the same across all CRM types as this comes down to survey effort rather than the model itself. It is noted that the 95% avoidance rate is dealt with within the Project Model through accounting for 98% and 99% avoidance rates as a result of research done by SNH (SNH, 2018b)

Modelling collision risk is an ongoing research area, especially with the expansion of renewable energy into new countries and areas, including offshore windfarms. Due to the absence of records of listed threatened species in the RSA, and the limited raptors observed in the RSA, the use of the Band Model is considered adequate to assess the collision risk of the Project on bird and bat species. Furthermore, the parameters used in this model are based on field observations as well as information from literature and therefore is a conservative estimate of the collision risk to species which does not limit the data or the outcomes.

7.4.10 MONITORING PROGRAM

It is noted that the design for the bird and bat monitoring program has been based on the desktop and field investigations conducted for the Project. The design of the monitoring program includes potential habitat that has been mapped for 'low' risk of impact species. This is also applicable to other potentially occurring species with negligible risk of impact, where habitat (or potential habitat) occurs in the Project Area. The following Sections detail the methods and locations for the bird and bat monitoring program.

7.4.10.1 OPERATION PHASE

Bird and bat surveys during the commencement of operation will target the species listed as 'known' or 'likely' to occur within the Project Area as well as those listed species with potential to occur in the Project Area. Bird surveys will occur during the first two years of commencement of operation with surveys being undertaken across each season in those years. The monitoring methods used in the initial two years of operation of the proposed development will be consistent with techniques used during previous field surveys.

The location of the operational phase bird and bat surveys has been informed by the habitat mapping prepared for the species determined as known, likely or having the potential to occur within the Project Area. The detailed surveys that will be undertaken for each species and the timing of such surveys can be found in Section 2.

The monitoring during operation will be based on two main approaches. The first is to monitor bird and bat activity and ongoing mortality searches that aim to determine impacts (collisions) occurring during the first two years of operation. The second is to inform the specific response to impact triggers that may result for bird and bat species, which will include increased monitoring surveys and carcass searches, investigation of risk behaviours and subsequent risk mitigation.

7.4.10.2 CARCASS SEARCH METHODOLOGY

As part of the monitoring program, carcass searches will be performed to determine the actual impact of the Project on birds and bats. The results of the monitoring will be used to review the risk assessment if necessary and to identify and determine if any further monitoring of bird and bat species is required and to update mitigation measures or adaptive management approaches.

The Project is to comprise of up to 118 WTGs, developed across one stage. At the commencement of operation, it is proposed that 30% of the WTGs will be randomly selected. These WTGs will be searched over a two-year period, at 6 weekly intervals from late Autumn to early Spring, and at 3 weekly intervals from early Spring to late Autumn. Increased monitoring in warmer months is warranted due to the increased potential for migratory species to occur within the Project Area.

The selected turbines will be revisited over the course of the first two years of operation. These visits and carcass searches will ensure high accuracy of data related to the mortality associated with WTG strike. The order of selected WTGs searched will be random during each monitoring event.

All carcass searches will be undertaken by suitably qualified personnel with appropriate skills in both bird and bat identification as well as in the handing of deceased species. Searches within areas and near selected WTGs will target birds and bats of medium to large size as per the Hull and Muir Model (2010), which uses the Monte Carlo simulation. The model suggests that 95% of bat carcasses should be present within 74 m of a WTG, and the carcasses for birds of medium to large sizes would be distributed to distances up to 122 m. Some species (larger birds) may be found further out from; however, 95% are expected to occur within an approximate 122 m search area from each selected turbine (Hull & Muir, 2010). This model was based upon parameters of a 72 m rotor radius and 120 m hub height.

Based on the principles adopted in Hull and Muir (2010), the following search areas have been designed for birds and bats for the Project, with its approximate rotor tip height of up to 230 m and turbine rotor diameter of up to 162 m:

- Bats and small to medium sized birds, including some large sized birds: 100 m radius around the turbine. Transects will be spaced every 6 m from the WTG; and
- Medium to large sized birds (and some larger bats): 100-150 m radius around the WTG. Transects in this search area will be 12 m apart, undertaken from the inner (100 m) to outer (150 m) sections of the search area.

It should be noted that in search areas of WTGs that are difficult to access for safety reasons, due to dense vegetation or slope considerations, exceptions may be made as to where transects will be conducted. This will include searching within access tracks and hard-stand areas only. Such exceptions will be noted for reporting purposes.

7.4.10.3 RECORDING INFORMATION AND CARCASS HANDLING PROCEDURES

The following information is to be recorded if a carcass is detected during the carcass searches:

- Position of the carcass in relation to the WTG;
- Comments on the vegetation type and area where the carcass was located, including if the species was found on an access path or on the WTG hard-stand area;
- Details on the individual found such as species, age, sex, number of individuals, the injury description as well as the estimated time of death if found deceased. If the carcass is unable to be identified, it will be taken to appropriate facilities for DNA testing;
- Photos must be taken of the area and of the individual found. Such photos will need to be sent to an appropriately qualified ecologist within two business days so they can adequately undertake identification; and
- Recording when the carcass was found, and weather conditions (wind speed, temperature, rainfall) that preceded the date when the carcass was found.

The carcass found will need to be handled in accordance with the following procedure:

1. Carcass is to be safely removed from the site with appropriate personal protective equipment (PPE) to be worn by personnel. PPE should include thick rubber gloves, long-sleeved shirt, face mask (if possible) and protective eyewear. The carcass should be placed in a plastic bag, then wrapped in newspaper and placed into a second plastic bag. The removal of the carcass from the area ensures that recounting of the same carcass does not occur later;
2. Labelling of the carcass plastic bag to ensure the species is easily identifiable later and all information is correct. This includes placing a completed datasheet with the above listed information into the outer plastic bag; and
3. The carcass bag will then be placed into an appropriate freezer compartment, likely within the Projects site office. This will keep the carcass for future examination, if required, by a suitably qualified ecologist if the original retrieval was made by an unqualified operation staff member. Frozen specimens will also be able to be used for detectability trials later.

An authority (i.e., scientific collection permit) must be obtained to remove the carcasses from the Project Area. This will need to be obtained for the monitoring program and will provide more detail about the disposal methods of the carcasses. Should any carcasses be found at the proposed development during construction, commissioning and maintenance activities, the carcass should be handled as above.

7.4.10.4 SCAVENGER RATES AND TRIALS

The scavenger trial is adopted to ascertain at what rate naturally occurring scavengers remove carcasses from the Project Area. These trials will be developed such that they are adopted twice within the first year following operation commencement, with each trial undertaken across 30 days. This will ensure that the difference in vegetation conditions is accounted for; that is wet season with long grass and dry season with short grass. Such periods are also going to be associated with different stocking levels across seasons.

Scavenger trials will be undertaken in the inner search area of the turbines selected for carcass search trials (100 m radius from the turbine).

Carcasses will be distributed sufficiently with lower than ten carcasses per trial to avoid biasing the results through scavenger swamping. (Smallwood, 2010).

Two different categories of carcasses will be used for the scavenger trials. Such carcasses will be those that are found during mortality trials. Additionally, small mice can be used in place of micro-bats if these carcasses are not able to be found. The two different categories will help to ascertain the different scavenger rates in the search area.

The two categories and the number of replicates that will be used for each trial are:

- Micro-bats and small birds: seven replicates per trial; and
- Medium sized birds: six replicates per trial.

At each of the randomly selected turbines used for the carcass searches, carcasses will be randomly placed under the turbines. The carcasses will be checked as follows:

- Each day for the first five days;
- Every two days from day six to 10;
- Every three days from day 11 to 19; then
- Every four days from day 20 until they disappear or until the end of the 30-day trial period.

The proposed development operation staff will be trained over a five-day period to undertake the scavenger trials following trial establishment by a suitably qualified ecologist.

If a trigger point criteria is approached or met through general monitoring, additional targeted species monitoring may be required in response where additional information is needed.

Additional procedures to follow for scavenger trials are detailed below:

- Timing of searches has been based on the detailed experience and regulatory approval of other windfarms where scavenger trials have been undertaken that show almost all carcasses have been scavenged within a period of 5-10 days. Additionally, GPS coordinates will be taken for all carcasses placed during the scavenger trials, so as not to confuse these with any naturally occurring carcasses in the search areas;
- A mix of carcass sizes of bird and bats (small, medium to very large) will be obtained to use in scavenger trials from prior searches of the Project Area. If a carcass of species at risk or of concern cannot be located for the trial, a substitute of the same colour and size will be used in its place;
- Thick latex gloves must be always worn when handling the bird and bat carcasses. This will ensure that safety of personnel but also that human scent will not replace the scent of the carcass which may alter scavenger behaviour and find rates;
- One carcass at minimum will be placed randomly within the 100 m search area at each trial site. This carcass will be thrown in the air to recreate the natural landing of a carcass from impact with a wind turbine, such that feathers or fur may become dislodged or ruffled from the impact of the simulated fall;
- Detailed observations will be taken at the search areas where carcasses have been scavenged, including the composition of the carcass and weather any types of scavenging behaviour have been present (feathers, bones dispersed, pecking, tearing, partial removal of carcasses, as well as scats and tracks of potential predators); and
- The final state of the carcass will be recorded at the end of the survey period.

The outcome focused objectives for the scavenger trials are detailed below:

- Ascertain at what rate naturally occurring scavengers remove carcasses from the Project Area to determine removal rate of carcasses that cannot be found due to scavenger removal; and
- Use removal rates to enable more accurate estimations of fatality rates of turbine strikes, to determine if mortality rates reach or exceed an ecologically significant proportion of a population.

Scavenger trials will be conducted across seasons to account for different rates of scavenging that has been observed across seasons (Catling, 1988), (Molsher & Gifford, 2000). Depending on results of the scavenger trials, requirements and procedures (including replicate numbers) will be reassessed to determine if changes to the procedures are warranted.

Alternatively, and subject to detailed design, motion sensor cameras may be installed to monitor scavenger activity. The viability of using motion sensor cameras will be assessed prior to finalizing the survey methods.

7.4.10.5 DETECTABILITY TRIAL

Detectability trials will be conducted at the same time as scavenger trials, during the first day of placing carcasses. These detectability trials will be conducted to test the efficiency of searchers in finding the carcasses for the Project Area. Detectability trials will be conducted annually with four seasonal repeats (Summer, Autumn, Winter, Spring) to represent the greatest change in vegetation cover, and seasonal bird movements. Such detectability trials will also be conducted for handlers and dogs, if they are to be used for the proposed development. The detectability trials will be conducted by personnel who have been involved in the monthly carcass searches.

The detection efficiency that is determined from the detectability trials will be incorporated into mortality rates and analyses to account for the error associated with human detection of carcasses. This detectability analysis will be documented in the report at the end of the first two-year monitoring period in accordance with this BBAMP.

Carcasses will be randomly placed in the inner search area of a turbine (100 m zone) and their location noted by the suitably qualified ecologist. The efficiency will be recorded as the number of successful finds by a searcher against the actual carcasses placed by the suitably qualified ecologist.

The categories, number of carcasses and replicates to be used in the detectability trials across the wet and dry season is presented in **Table 7-17**.

TABLE 7-17 NUMBER OF REPLICATES OF BIRD AND BAT CARCASSES FOR DETECTABILITY TRIALS

Season	Micro-bat - Small birds	Medium sized birds	Large raptor sized birds
Summer	7	7	3
Autumn	7	7	2
Winter	7	7	2
Spring	7	7	3

7.4.10.6 RESULTS ANALYSIS AND PRESENTATION

As required under the *Wind Farms – turbine strike assessment and adaptive impact management. Biodiversity Assessment Method Guide* (2024), results of annual carcass searches undertaken will be analysed and reported in future updates to this draft BBAMP framework. Annual compliance reports will include an assessment of the monitoring programs and whether any trigger limits have been met. Ongoing monitoring will be assessed following risk assessments as a component of the described adaptive management framework.

Data that will be analysed and documented in the reports will include information about carcass identification and timing, and the results of the trials (scavenger and detectability) so that factors influencing mortality can be determined. Mortality rates should be expressed as the number of carcasses discovered per turbine per year and any spatiotemporal variation across the Project Area and seasons should be presented and discussed.

Data analysis will estimate mortality rates of birds and bats within the Project Area, taking into account standard error and variation. Appropriate software packages will be used to inform variables needed to be determined during the carcass, detectability and scavenger trials which will subsequently inform the survey design.

At this stage prior to construction the following software packages and statistical principles are proposed for the Project, with specific variables to be measured and data input requirements (and associated assumptions) considered in the final monitoring design:

- Logistical regression (general linear modelling) to be used to determine searcher efficiency. This will account for significance;
- The proportion of the area searched to be estimated using the Monte-Carlo Simulation method as described in Hull and Muir (2010);
- Mortality will be estimated using the Hortvitz-Thompson style estimator from Huso (2011);
- Survival analysis (survival regression to account for interval censoring) to be calculated using Generalised Estimator (GenEst) (or similar). GenEst is used to estimate the total number of individuals that are present within an area in each time period, when their detection probability may not be known. This program is used as counts of carcasses alone and is not an accurate way to measure the true number of fatalities in an area due to those that may be missed in the process. This method also allows for comparisons across locations and years taking into account the rate of detection:
    - GenEst includes tools for estimating searcher efficiency, carcass persistence, and other detection probability parameters from experimental field trials. GenEst is not evidence of absence-type estimator and is not going to be used in circumstances where few carcasses are found. This is where the EoA program will be adopted; and
    - Evidence of Absence (EoA). This program can be used to help determine potential fatalities which may have occurred, with respect to the survey effort, even in the absence of a carcass being located.

Statistical analyses will assist in determining potential significant differences across size categories of species, vegetation composition or across seasons.

Results will inform adaptive management on whether additional mitigation measures are necessary and whether specific turbines in the Project Area pose higher risks to birds and bats than others. Such adaptive management will occur in consultation with DCCEEW.

7.4.10.7 BBAMP PERSONNEL AND ASSOCIATED TRAINING REQUIREMENTS

All personnel involved in the implementation of the BBAMP will be familiar with this BBAMP, relevant Project policies and procedures, and other important administrative matters such as health and safety documents. The Applicant will be responsible for ensuring that suitably qualified and trained people are engaged to supervise and implement the formal monitoring program as defined in this BBAMP. Beyond the formal period of monitoring, the Applicant will be responsible for ensuring ongoing reporting of incidental finds and the engagement of relevant specialists as per the BBAMP.

Training will be provided for all personnel that will be undertaking carcass searches, species identification and handling. Such training will be delivered by suitably qualified ecologists who are specialists in the field of bird and bat carcass retrievals. The training will include trial establishment, transect search techniques, selection of specific turbines for monitoring, species identification, carcass handling practices and PPE management.

The qualified ecologist will be involved in the initial search program of the turbines to oversee and assist with the carcass search, handling and identification. So that the BBAMP is being implemented and monitoring routinely performed to standard, the suitably qualified ecologist will undertake an audit after the first 6 months of the commencement of the implementation of this BBAMP.

The suitably qualified ecologist will be available to identify any carcasses that Project personnel are unable to identify, either from frozen specimens or from photographs taken at the search area.

Training will be provided for assigned operational personnel regarding how to properly prepare and handle carcasses and how to randomise the placement of carcasses in trial areas.

Scavenger trials will be developed by a suitably qualified ecologist, who will supervise the searches undertaken by trained operational personnel.

The suitably qualified ecologist will undertake data analysis and prepare the 12-month interim and two-year final monitoring reports.

Training will be provided by the suitably qualified ecologist to operational personnel involved in the monitoring program and trials, with refresher training available if requested or deemed necessary during the two-year implementation period of the BBAMP.

7.4.11 HANDLING PROTOCOL AND TRAINING: INJURED AND DECEASED SPECIES

Operational personnel involved in the search for wildlife will be appropriately trained in handling and assisting with injured or deceased wildlife. All injured or deceased wildlife found during the first two years of operation will be reported to the Responsible Officer. Once reported, it will be the responsibility of the Responsible Officer to organise for the retrieval and/or treatment of the individual. Such a protocol will involve defining the correct handling procedures, personal protective equipment, transportation and wildlife hospital treatment arrangements.

Bats can carry many forms of diseases including Hendra virus and Australian Bat Lyssavirus. Extra precautions and care will need to be taken when handling bat species.

In this circumstance, professionals should be called to handle injured bat species (e.g., WIRES; 1300 094 737). Appropriate and contemporary advice on the best practice for the movement of individuals will be provided by these organisations.

7.4.12 TRIGGER ACTION RESPONSE PLAN

This section outlines the impact triggers and the process for assessing if an impact exceeds a significant residual impact to that species associated with interactions with turbines, including the decision-making framework and adaptive management where a response is required.

Impact triggers and response requirements will be different for both listed and non-listed species. For listed threatened and migratory species, two levels of assessment are considered in this BBAMP:

1. An impact trigger, defined as a single mortality event to a listed species that triggers an ecological investigation into the cause and significance of the event, with recommendations for adaptive management to avoid, minimise and manage the impact; and
2. Assessment of the significance of the impact, with a method for estimating if the impact exceeds a significant residual impact, as defined by Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DEWHA, 2013) or the "test of significance" under Section 7.3 of the BC Act) to identify if additional offsets are required to compensate for the significant residual impact.

The Applicant will be responsible for ensuring implementation of this BBAMP and the adaptive management approach. A suitably qualified ecologist will support decision-making elements and provide advice in relation to the impact significance and where Regulator consultation (State and Commonwealth) is required.

7.4.12.1 THREATENED AND MIGRATORY SPECIES IMPACT TRIGGER REQUIREMENTS

Where a single listed threatened and/or migratory bird or bat species are found dead within the search area of a turbine (proximity that can be attributed to turbine collision) during implementation of this BBAMP, or via an incidental find, then the impact trigger methodology as described below applies. Additionally, if a breeding area for these species is located within 200 m of a turbine, then an impact trigger will occur. There are currently no known breeding places for species identified as medium or high risk in this BBAMP framework.

Where a single carcass of a listed threatened and/or migratory species is detected within the Project Area, a decision-making framework will be implemented. This includes additional surveys being undertaken within two weeks of the carcass being found by a suitably qualified ecologist, and where data is available, a population viability analysis (PVA) will be undertaken. A report will be prepared by a suitably qualified ecologist and presented to DCCEEW and/or NSW DPHI/CPHR outlining the next steps of mitigation and management. Additionally, the existing collision risk model will be updated following any suspected turbine collision. It is noted that documents that will be assessed in determining impact triggers will include:

- Significant Impact Guidelines 1.1 - Matters of National Environmental Significance per the EPBC Act (DEWHA, 2013);
- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015);

- Species-specific management plans and Conservation Advice from SPRAT profiles; and
- Test of significance" under Section 7.3 of the BC Act.

Additionally, any threatened species are identified throughout the monitoring program would trigger additional mitigation actions, including:

- Species-specific monitoring;
- Flight path mapping; and
- Additional targeted surveys.

7.4.12.2 DECISION MAKING FRAMEWORK

If the impact trigger requirements are met for the proposed development the following decision-making framework will be followed:

1. The bird or bat carcass must be immediately reported to the proposed development's Responsible Officer, including information such as the species type, the area where the species was found and any other contributing factors that appear appropriate. Photos must be taken of the carcass or injured species so that correct identification can be carried out;
2. A suitably qualified ecologist, engaged by the Applicant (and managed by the Responsible Officer), will undertake an analysis to determine the presence of the impact trigger either in person or through analysis of the carcass and/or photographic evidence. The ecologist will assess whether the death/injury can be directly attributed to a WTG strike. Where there is conclusive evidence the death/ injury is not related to WTG strike, no further action is required;
3. If the impact trigger has been confirmed by the ecologist, the proposed development's Responsible Officer will report the trigger to CPHR and/or DCCEEW within two business days;
4. The suitably qualified ecologist will undertake a detailed investigation to determine the events that caused the death or injury of the listed species. This investigation will include a PVA where data is available for the species. Once this investigation is concluded and if it is deemed that WTG collision or interference with the WTG has caused the death/injury, other factors like species behaviour will also be considered;
5. If the evaluation undertaken by the suitably qualified ecologist (including a PVA) reveals the impact trigger has the potential to contribute a significant impact to the species, species-specific monitoring will likely be recommended and implemented. This monitoring will be informed by the ecologist, with a minimum six-week period of fortnightly monitoring. These monitoring exercises will need to be supervised and reported by the suitably qualified ecologist, who will include in the report any recommendations for additional mitigation measures to manage or reduce the impact to the species, in accordance with the adaptive management measures. CPHR and/or DCCEEW will be consulted on the next steps to close-out the response;

6. If the evaluation undertaken by the suitably qualified ecologist can demonstrate that a significant impact is unlikely and no further action will be required. This significant impact will be determined through following the relevant guidelines including but not limited to the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance per the EPBC Act (DEWHA, 2013), and the process to be outlined in the BBAMP. Species-specific guidelines will be applied as well as current knowledge of the species populations and ranges; and
7. If the evaluation undertaken by the suitably qualified ecologist cannot determine the cause of the impact trigger beyond reasonable doubt, further monitoring (fortnightly for six-weeks) may be proposed to determine re-occurrences/extent of the impact. As with the previous steps, if the additional monitoring confirms a one-off occurrence to the species, then no further action except advising the relevant authority is required.

If the impact trigger is assessed as having the potential to contribute to a significant impact, adaptive management will be designed to reduce and mitigate impact to the species. Further monitoring of the effect of these additional mitigation measures and their impact would be undertaken by suitably qualified ecologist to determine and report on their effectiveness. The BBAMP will be updated to include any additional or adjusted mitigation measures. As part of the adaptive management strategy, several mitigation measures may be considered, such as:

- Acoustics to discourage foraging birds at selected locations;
- Encourage species into alternative low-risk areas using social attraction techniques (decoys and audio playback systems); and
- Investigate alternative stocking arrangements.

All evaluations and decisions regarding mitigation measures for the impacted species will be reported to CPHR and/or DCCEEW, with consultation to ensure the best course of action is applied for the Project and species affected. Outcomes will also be reported in the monitoring reports that are prepared by the ecologist to the Applicant.

Offsets may be required where the significant residual impact to the species cannot be effectively mitigated by other measures. Offsets may be in the form of financial offsets or research-based offsets where an appropriate institution can undertake species-specific research. Offsets will need to be considered and developed in accordance with *EPBC Act Environmental Offsets Policy* (DSEWPC, 2012). Any offset consultations will need to be undertaken with DCCEEW. Additionally, if a trigger is assessed to have occurred, surveys will be undertaken to review the area, and discussions with DCCEEW will occur, which may include turbine curtailing if assessed as appropriate for species management.

7.4.12.3 NON-THREATENED (PROTECTED AND LOCALLY ABUNDANT SPECIES) IMPACT TRIGGER REQUIREMENTS

The impact trigger for the non-listed threatened species in this BBAMP will be a total of five or more bat or bird carcasses of the same species that are recorded at the same WTG during a 12-month period.

The definition of a significant impact to a non-listed threatened species is an impact that is likely to reduce the viability of the population of the species within that bioregion. Sometimes the population numbers for a species are not known or reported.

In the case where such information is not publicly available, a suitably qualified ecologist will undertake an assessment of the potential impact to a species in the bioregion to determine whether the impact will exceed indicative significant impact thresholds.

7.4.12.4 DECISION MAKING FRAMEWORK

If the impact trigger requirements are met for the proposed development, the following decision-making framework will be followed:

1. DCCEEW and or CPHR will be notified of the trigger (including species, time and area) within seven days of the trigger event;
2. A suitably qualified ecologist will undertake an analysis to determine if the impact trigger will exceed the indicative significant impact threshold. This assessment will take into account factors like the distribution of the species, known population size and habitat requirements, as well as any literature on specific threats to the species within the bioregion;
3. A report on the findings of the analysis will be prepared by the suitably qualified ecologist and presented to the proposed development's Responsible Officer and subsequently then presented to DCCEEW and/or CPHR within three weeks of the impact triggering event (this date may be subject to change upon consultation with regulators);
4. If the evaluation undertaken by the suitably qualified ecologist reveals the impact trigger to be a one-off event and unlikely to occur again, no further action will be required;
5. If the evaluation undertaken by the suitably qualified ecologist reveals the impact trigger may lead to the indicative significant impact thresholds being exceeded, species-specific monitoring will likely be recommended and implemented. These monitoring exercises (fortnightly for six-weeks) will need to be observed and reported on by the suitably qualified ecologist, who will then determine if any additional mitigation measures are necessary to manage or reduce the significant impact upon the species. Such measures will be decided upon through adaptive management approach; and
6. The investigations and mitigation measures recommended in the case of a significant impact will need to be included in the monitoring reports, in accordance with this BBAMP.

7.4.12.5 ADAPTIVE MANAGEMENT

In the event of an impact trigger to a listed threatened bird or bat species, adaptive management principles will be applied. Application of adaptive management will be upon written recommendation (from the reporting requirement of the impact trigger response) by a suitably qualified ecologist, in accordance with this BBAMP.

Adaptive management will take into consideration the species impacted, the area of impact and other factors such as population dynamics, to determine the most appropriate solution.

Additional mitigation and monitoring measures, should they be required, and potential effects will be monitored and documented within the monitoring reports, in accordance with this BBAMP, and presented to the DCCEEW for consultation on the next steps for management and mitigation to be implemented.

7.4.13 MITIGATION MEASURES

To minimise potential impacts to bird and bat species associated with operation of the WTGs within the vicinity of the Project Area this BBAMP framework intends to enable (in line with the *Onshore Wind Farms – interim guidance on bird and bat management (2021*)), the implementation of a long-term approach to the mitigation and management of potential impacts to listed threatened and migratory species. Monitoring will also identify any potential changes to the species' utilisation of the project site and the surrounding landscape.

This BBAMP framework has defined environmental objectives for the proposed development that will enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory species. Monitoring will also identify any potential changes to the species' utilisation of the project site and the surrounding landscape. The environmental outcomes are:

- An improved understanding of the risk of turbine collision and barotrauma impacts on listed bird and bat species;
- An improved understanding of whether and how project site usage changes as a result of wind farm construction and operation;
- An improved monitoring approach for the timely identification of turbine collisions and collection and analysis of data;
- An improved approach to the timely and regular validation and update to the CRM using monitoring data, and a robust adaptive management approach; and
- Development of management and corrective actions to minimise risk of turbine collision and other impacts on threatened bird and bat species.

This section details the mitigation measures that will be implemented for potential significant impacts to listed threatened species arising out of the operation of the Project. Impact triggers act as a measure to determine when additional mitigation measures should be implemented. Mitigation measures will be reviewed throughout the monitoring period, and at the end of every two-year monitoring period, a suitably qualified ecologist will oversee and determine whether any adjustments should be made. The required monitoring frequency over the lifetime of the project will be reviewed by a suitably qualified ecologist in consultation with DCCEEW to establish an appropriate frequency based on results and changes in collision risk following monitoring completed to date.

The adaptive management approach will monitor impact triggers and apply corrective actions, as outlined in the BBAMP framework. The measures in **Table 7** have been designed so that species (locally abundant, least concern and listed species) are not significantly impacted by the Project. If changes to the mitigation measures are likely to result in a new or increased impact to any EPBC Act listed species (i.e., beyond minor variations or updates to the BBAMP), impacts may need to be referred to the Minister in accordance with Section 143A of the EPBC Act, following a self-assessment.

The main potential causes of impact to listed species for the Project are considered as:

- Collision of birds and bats with blades of operating WTGs;
- Injury and mortality of birds and bats caused by exposure to rapid air pressure reduction due to proximity to turbine blades, causing barotrauma; and

- Removal or reduction of critical foraging, dispersal and breeding habitat following construction of WTGs and associated infrastructure.

Factors that can increase potential impacts to listed species for the Project are considered as:

- Promotion of water and foraging resources that result in attracting birds and bats into the vicinity of the WTGs. This could result in higher rates of collision and injury/death. Nesting may occur close to WTGs; and
- Lighting on WTGs and buildings causing an increase in bird and bat prey. This may result in increased bird and bat abundance in the vicinity of the WTGs and increase collision risk.

An adaptive management process has been established by this BBAMP, which includes the following broad elements:

- Baseline monitoring surveys – prior to the commencement of operation of the proposed development;
- Operational monitoring surveys – to be undertaken at selected WTGs throughout the operation of the proposed development, to estimate mortality of bird and bat species as well as record species within the Project Area;
- Reporting – to be undertaken in the first and second year of operation and agreed upon timeframes thereafter with DCCEEW and CPHR. Such reports will include mortality estimates, incident findings, mitigation measure effectiveness or inefficiencies; and
- Development of mitigation measures based on monitoring surveys and reporting results to manage risks such as minimising mortality.

Table 7-18 details the management objectives, mitigation measures and controls and subsequent timing of such controls for this BBAMP. It also details the measures of success for these controls, as well as corrective actions that will be implemented if the controls do not meet such criteria.

Specifically, the management actions aim to minimise the impact of mortality associated with collisions with WTGs. The success of management actions will be measured through performance indicators related to impact triggers, monitoring and assessment outputs. Despite these measures, a residual risk remains. The success of the proposed management actions will be measured through monitoring documentation and reporting, including DCCEEW and DPHI compliance reporting requirements.

TABLE 7-18 PROPOSED MITIGATION MEASURES, TIMING, PERFORMANCE CRITERIA AND CORRECTIVE ACTIONS

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
Baseline surveys	An additional 12 months (4 seasons) of baseline bird and bat data to be obtained through BUS, bat acoustic detection, bat trapping, and owl passive acoustic detection surveys.	Develop a deeper understanding of bird and bat utilisation of the Subject Land prior to any development.	Seasonally in spring, summer, autumn and winter.	BUS will be completed using the same methodology and in the same locations as the BUS considered in this draft BBAMP framework. Bat acoustic detection will continue on the met mast and be analysed seasonally. Bat acoustic detection should also be undertaken near existing BUS locations. Bat trapping surveys should be undertaken in areas identified as containing suitable habitat. Forest owl acoustic detection should be undertaken in areas identified as containing suitable habitat.	Bird and bat surveys are undertaken using recommended guidelines, including: 'Species credit' threatened bats and their habitats - NSW survey guide for the Biodiversity Assessment Method (NSW DPIE, 2021) Wind Farms - turbine strike assessment and adaptive impact management. Biodiversity Assessment Method Guide (working draft) (NSW DCCEEW, 2024e).

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
Operational phase mortality monitoring	All turbines to be searched in the inner (120 m radius from the WTG) and outer search area (120 – 170 m from the WTG) each month for 2 years. Avian mortality estimates to be made for each WTG for all avian species. Mortality estimates should consider factors such as detector efficiency and scavenger trials. Ongoing operational phase monitoring is recommended every 2 years, subject to consultation with NSW DCCEEW.	Quantify avian mortalities due to direct impact with WTG.	Operational phase – monthly searches for the first two years. After the first two years, the frequency of monitoring will be determined based on the previous monitoring results but every two years is recommended, subject to consultation with NSW DCCEEW.	Mortality surveys will be undertaken at all turbines identified as High risk, and 33% of the turbines identified as Moderate or Low risk as identified in Figure 7-5 The locations of mortality surveys after two years will be reviewed based on the previous monitoring results. Mortality survey result analysis will consider the effects of topography and operational activities (such as maintenance). Scavenger and carcass detectability trials will be undertaken in accordance with the methods described in this BBAMP. Mortality estimates will be undertaken and analysed as per the methods described in this	If operational phase surveys do not occur due to unforeseen circumstances, they will be reorganised for as soon as reasonably possible. The same action applies to the reporting of mortality estimates and responses to impact triggers. Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4).

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
				BBAMP. Such estimates will be included in annual monitoring reports. Responses to impact triggers will be reported and analysed by a suitably qualified ecologist as described in this BBAMP.	
Monitoring reporting	Preparation and submission of monitoring reports to NSW DCCEEW. Monitoring reports to include: Turbine strike reports comprising raw strike data, strike notifications, survey methodologies, results of detection / persistence trials, environmental / meteorological conditions and associated statistical analysis; mortality estimates and carcass findings / locations; mitigation measure effectiveness; incident reporting; impact triggers; recommendations for ongoing monitoring; and species occurrence records.	Evaluation of efficacy of management and mitigation measures in relation to impacts on avian species.	Annually in the first two years of operation. Every two years after the first two years of operation.	Monitoring reports will be completed within three months of completion of the year's monitoring program in the first two years of operation. Ongoing monitoring reporting will occur based on the outcomes of the two-year monitoring program, subject to consultation with NSW DCCEEW.	Where monitoring reports are not prepared as per the planned schedule due to unforeseen circumstances, the report and supporting information will be prepared and presented to NSW DCCEEW as soon as reasonably possible.

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
Removal of water and foraging resources that result in attracting avian species into the vicinity of the wind turbines.	Subject to agreement with landowners, the following actions are recommended: Grain feeders to be placed at least 200 m away from WTGs. Remove avian carcasses as soon as practicable. Carcass removal to be undertaken by suitably qualified personnel, following stipulated protocols and reporting procedures. Livestock and animal carcass removal from within 200 m of WTGs by landholders, as soon as practicable. Monthly searches for carcasses in the first two years of operation, and regularly thereafter. Livestock watering points to be placed / moved at least 200 m from WTGs.	Reduce the likelihood of avian collision with WTG by reducing potential foraging resources.	During operational phase.	Carcasses / carrion removal will be undertaken as soon as possible and reported. Incident reporting provides recommended mitigation measures to reduce future risk. Decreases in avian mortality over operation of the Project due to mitigation measures being implemented.	Where mortality of avian species due to the presence of foraging resources occurs, actions will be undertaken immediately to rectify the problem. Regular communication and agreement with landholders is necessary. Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4).
Removal and / or adjustment of lighting on turbines and other Project infrastructure causing an increase in avian prey.	Lighting is required for the safety of operational personnel and landholders at the entrance to each WTG, office building and substation. To reduce impacts, lights can be switched off when not required.	Reduce the likelihood of avian prey species being attracted to WTGs.	During operational phase.	Bird and bat mortality will be lower at unlit turbines / infrastructure.	Type and placement of lights will be reviewed in response to avian mortality rates. Light placement will be investigated to determine the most appropriate location placement.

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
	Lighting faults should be fixed quickly. Any necessary flashing of lights should be synchronised.				Regular communication and agreement with landholders is necessary. Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4).
Wind turbine speed curtailment (Florent & Bennett, 2024)	In the event that an impact trigger is met, speed on high risk turbines identified by a suitably qualified ecologist will be reduced to 7 m / second (s) during periods where collision risk is expected to be highest for impacted species. This includes: dusk, dawn and high seasonal bat activity (October to March) Immediately preceding a storm event between October to March Confirmation of breeding of a threatened raptor species within 200 m of a WTG.	Reduce bat collisions with WTGs. Bird collisions should also be reduced.	During operational phase	Bat mortality rates will be lower than recorded historically at other wind farms without speed curtailment.	If bat mortality rates are higher than expected, WTG speeds should be reduced. Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4).

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
	The duration of the reduced wind speed requirements will be defined based on the advice from the ecologist to appropriately mitigate the potential impacts.				
Pulse Survey	Where an impact trigger of a known listed threatened and/or migratory flocking species is detected an immediate pulse survey will occur. A pulse survey is a one-off additional mortality monitoring event whereby: All surrounding turbines within a 2km radius of the turbine at which the carcass was detected are surveyed; Where carcasses are found at neighbouring turbines, searches will extend to turbines within 2km of newly detected carcasses until the extent of impact range is confirmed; Occurs within five days of the carcass detection; The mortality monitoring methods follow the same protocols that are established in Section 7.4. For this draft BBAMP framework, flocking species include, but are not limited to: White-throated Needletail Large Bent-wing Bat Fork-tailed Swift	More effectively detect and assess impacts of WTGs to flocking species and implement appropriate mitigation measures	Upon detection of an impact trigger anytime throughout operation	Pulse carcass searches are implemented within 5 days of the detection Severity of impacts to flocking species are more effectively detected following an impact trigger being met	Should an impact trigger for a listed threatened species be met then an ecological investigation will be undertaken and turbine curtailment, and/or raising of cut in speeds will be considered following consultation with BCS and/or DCCEEW. Should an ecological investigation identify that impacts constitute an ecologically significant proportion, additional offsetting and compensatory measures may be required in line with consultation with BCS and/or DCCEEW (See Section 7.4).

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
Lifting speeds at which wind turbine commences operation	Where an impact trigger of a known listed threatened and/or migratory species is detected, the cut-in speed for wind turbines to commence operation should be lifted from 3 m/s to 5 m/s where appropriate.	Reduce avian collisions with WTGs.	During operational phase	Avian mortality rates will be lower than recorded historically at other wind farms without speed curtailment.	If avian mortality rates are higher than expected, WTG operational commencement speeds should be raised. Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4)
Acoustic deterrents	Broadcast sound to deter avian and microbat species from approaching WTGs	Reduce avian and microbat collisions with WTGs	During operational phase	Bird and bat mortality will be lower at turbines with acoustic deterrents.	Acoustic deterrents should be trialed to determine the best placement of the acoustic deterrent device(s). Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4).
Bird detection systems/Automated Curtailment (McClure, et al., 2022)	Where appropriate, WTG design will include avian detection systems (e.g. IdentiFlight®, Robin Radar Systems). Identification systems should be located	Reduce avian collisions with WTGs	During operational phase	No significant bird mortality numbers caused by the operational wind turbines.	Detectors should be trialed to identify the optimal locations for deployment.

Mitigation measure	Action	Outcome	Timing	Performance Criteria	Corrective Action
	strategically to ensure all WTGs identified to be high and very high risk are within the operational radius.			No species significant impact threshold reached.	Impact trigger response framework initiated in the event of multiple strikes of non-threatened at-risk species and / or one strike of threatened or migratory species (refer to Section 7.4).

7.4.14 TURBINE STRIKE NOTIFICATION

7.4.14.1 ASSESSMENT OF SIGNIFICANT RESIDUAL IMPACTS

When an impact trigger of a threatened or non-threatened avian species is detected, the significance of impact will be assessed by a suitably qualified ecologist. To determine whether an impact trigger has exceeded an indicative significant impact threshold, the number of mortalities of each species based on the carcass search results will be quantified and assessed as to whether the number has reached or exceeded an ecologically significant proportion of a population over a defined time period (referred to as a 'significant impact threshold') (DoE, 2013).

An ecologically significant proportion of a population is defined as being 0.1% of the estimated national population size for a species (DoE, 2015). Where this is exceeded for threatened species, additional offsets may be required for the significant residual impact. For those non-listed threatened species, other than the wedge-tailed eagle, identified as Medium, High or Very High, significant impact thresholds will relate to the number of mortalities recorded at a single turbine across a 12-month period rather than cumulatively across the entirety of the proposed development.

A high-level review of species population ecology has been used to establish indicative significant impact estimates which consider the number of mortality events within specific timeframes for species considered at medium, high and very high risk of collision and / or barotrauma as a result of the Project. Generational time, defined as the average interval between the birth of an individual and the birth of its offspring, is approximately ten years for most species identified as very high or high risk of collision and / or barotrauma in this BBAMP. Generational times can be used as an indication of the time required for a population to replace individuals lost due to WTG impacts. The species' range and population size have also been considered. If a species occupies a range larger than NSW, the NSW population size (if known) has been used to identify the threshold for significant impact.

Table 7 provides indicative significant impact thresholds for the six species considered at high risk of WTG impacts and 10 species considered at medium risk of WTG impacts (**Section 7.3.4**). Due to unknown population estimates for some species, a conservative approach has been applied. If population estimates for a species become available, the significant impact thresholds proposed by this BBAMP will be updated accordingly.

TABLE 7-19 WTG SIGNIFICANT IMPACT THRESHOLD FOR SPECIES AT HIGH AND MODERATE COLLISION RISK

Common Name	Scientific Name	Australian Population Estimate	Indicative Significant Impact Threshold (0.1% of population) for life of wind farm
High collision risk			
Little Eagle	*Hieraaetus morphnoides*	Unknown	WTG mortality or injury to 1 individual
Wedge-tailed Eagle	*Aquila audax*	Unknown	5 mortalities in a 12-month period over entire Subject Land

Common Name	Scientific Name	Australian Population Estimate	Indicative Significant Impact Threshold (0.1% of population) for life of wind farm
White-throated Needletail	*Hirundapus caudacutus*	41,000 (Garnett & Baker, 2020)	WTG mortality or injury to 41 individuals
Brown Falcon	*Falco berigora*	Unknown	5 mortalities in a 12-month period over entire Subject Land
Nankeen Kestrel	*Falco cenchroides*	Unknown	5 mortalities in a 12-month period over entire Subject Land
Moderate collision risk			
Australasian Bittern	*Botaurus poiciloptilus*	1,300 (Garnett & Baker, 2020)	WTG mortality or injury to 1 individual
Australian Painted Snipe	*Rostratula australis*	340	WTG mortality or injury to 1 individual
Barking Owl	*Ninox connivens*	Unknown	WTG mortality or injury to 1 individual
Bush Stone-curlew	*Burhinus grallarius*	2000 (Fraser, 2021)	WTG mortality or injury to 2 individuals
Regent Honeyeater	*Anthochaera phrygia*	250 (Garnett & Baker, 2020)	WTG mortality or injury to 1 individual
Fork-tailed Swift	*Apus pacificus*	50, 000*	WTG mortality or injury to 50 individuals
Spotted Harrier	*Circus assimilis*	Unknown	WTG mortality or injury to 1 individual
Grey Falcon	*Falco hypoleucos*	1,000 (Garnett & Baker, 2020)	WTG mortality or injury to 1 individual
White-bellied Sea-eagle	*Haliaeetus leucogaster*	1,600 (NSW)	WTG mortality or injury to 1 individual
South-eastern Glossy Black-cockatoo	*Calyptorhynchus lathami lathami*	7,500 (BirdLife International, 2025)	WTG mortality or injury to 8 individual
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	200,000 (NSW) (NSW Scientific Committee, 2016)	WTG mortality or injury to 10 individuals
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Unknown	WTG mortality or injury to 1 individual
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*	Unknown	WTG mortality or injury to 1 individual
Grey-headed Flying Fox	*Pteropus poliocephalus*	400,000 (Westcott, Heersink, McKeown, & Caley, 2015)	WTG mortality or injury to 10 individuals

**Population is unknown for Australia. Estimate based on largest NSW flock size recorded* (Anon, 1972)

Due to unknown population estimates for some species, a conservative approach has been taken to proposed impact thresholds that are likely to be a greater proportion of the population than is applied to the remaining species. In these instances, a significant impact threshold of one mortality has been proposed. If population estimates for a species become available, the significant impact thresholds proposed will be updated accordingly. Where a species is listed as threatened under the BC Act but not listed as threatened under the EPBC Act, known population estimates specific to NSW have been used to calculate mortality thresholds.

These significant impact thresholds are indicative only, and the actual significant impact assessment and associated advice will be provided by a qualified ecologist aligned with the investigation process. These indicative thresholds may exhibit fluctuations through time as updated species population estimates become available and it is expected that contemporary information be used during an investigation, as required throughout the life of the BBAMP.

7.4.14.2 SPECIFIC MANAGEMENT OBJECTIVES, ACTIVITIES, TIMING AND PERFORMANCE CRITERIA

Table 7-20 summarises management objectives, activities, timing and responsible parties for the implementation of the BBAMP. This table should be referred to for reporting and monitoring purposes throughout the two-year monitoring period. It is noted that adaptive management may require an adjustment to the requirements in **Table 7-20** under the direction of a suitably qualified ecologist.

TABLE 7-20 MANAGEMENT ACTIONS

Stage	Management Actions	Responsibility	Timing
Pre-Construction	Pre-clearing surveys shall be undertaken prior to clearing efforts within the marked boundaries. These pre-clearance surveys will form part of the micro-siting process, which will closely analyse potential infrastructure locations. If potential habitat for bats, such as riparian areas and dense woodlands, occur in such locations, development layout will be adjusted. Control areas to be selected as part of BACI designed bird surveys. Surveys will then be undertaken in the control and impact areas prior to construction beginning. These surveys will include BUS such as point, waterbody and bird of prey surveys, to determine species presence in the RSA and bat surveys will be conducted via the use of echolocation call detectors and harp trapping	EPC Contractor	Prior to Construction
	Targeted surveys to identify important habitat features of value to birds and bats in the Project Area including raptor nesting sites so that turbine location can be adjusted as part of micro-siting requirements to minimise collision risk	EPC Contractor	Prior to Construction
Construction	All clearing shall be within clearly marked boundaries and in accordance with the Development Permit	EPC Contractor	At all times
	Where trenching and excavations are created which may entrap fauna, suitable escape measures are put in place, and excavation are checked for fauna before backfilling	EPC Contractor	At all times
	Include toolbox talks for site specific bird and bat information during the proposed development	EPC Contractor	Daily
	Ensure appropriate waste management (lidded bins), including food scraps, to reduce potential for feral species to become established on-site	EPC Contractor	At all times
	BACI surveys conducted at impact and control areas during construction to determine bird and bat composition, abundance and density at control and development areas. This includes BUS and use of bat survey techniques	EPC Contractor	Bi-annually to Quarterly
Monitoring	Daily inspections by spotter / catcher during clearing, specifically hollow trees, roosting sites, and rocky outcrops and caves for birds and bats	EPC Contractor	Daily
	Weekly site inspections to review flora and fauna control measures during clearing and construction	EPC Contractor	Weekly
	Annual auditing of Construction Environmental Management Plan (CEMP) during construction	EPC Contractor	Quarterly

Stage	Management Actions	Responsibility	Timing
	BACI surveys to be conducted in the operation phase at control and impacts areas, to determine the 'after' development effect on bird and bat composition, abundance and density.	EPC Contractor	Bi-annually to Quarterly
	Mortality monitoring: at approximately 30% of turbines (approximately 8 WTGs) monthly for two years. Any extension to monitoring is considered under Section 7.4 of this document.	Ecologist and trained personnel	Monthly
	Scavenger and detectability trials: two of each, undertaken within the first year of monitoring, approximately 6 months apart.	Ecologist and trained personnel	Detectability = biannually Scavenger = biannually
	Adaptive management and inclusion of additional mitigation measures as a result of impact triggers as a result of recommendations from a suitably qualified ecologist	Applicant	As required
	Low wind speed curtailment required when wind speeds are below the manufacturer's cut in speed of 3 m/s (i.e., feathered to prevent turning or other mechanism)	Applicant	At all times
Reporting	Sightings and incidents reported in daily Pre-starts	EPC Contractor	Daily
	Fauna spotter-catcher will keep an inventory of any bird and bat species encountered with details of species, capture and release condition and capture and release GPS co-ordinates during construction. This also includes carcass reporting and notification	Spotter Catcher	Daily
	Injured native fauna to be reported to Health, Safety, Environment and Quality (HSEQ) Manager	Site Manager	Within 24 hours
	Preparation of monitoring BBMP reports: one within three months of the first year of monitoring, and one within three months of the second year of monitoring	Ecologist	Year 1 and Year 2 then as required.
	Monitoring report after two years: estimates of mortality for bird and bat species across the monitoring period. Taking into account detectability and scavenger trial results	Ecologist	As required
Corrective Action	All near misses and incidents will be investigated to establish root cause. Where necessary corrective actions will be developed to improve existing processes	All Personnel	As required

7.4.15 BBAMP REVIEW

The BBAMP monitoring regime will be used to evaluate its success at minimising impacts on at-risk bird and bats. Annual review processes will investigate the success of specific mitigation measures across the construction and operational phases of the Project. Monitoring and reviewing the management systems will allow failures in the processes documented in this BBAMP to be addressed and corrected, with the outcome being best-practice adaptive management.

Evaluation practices will include:

- Annual reporting to include a review of the BBAMP; updates to CRM to be undertaken based on survey results;
- Annual review and updates to the risk assessment outcomes for each turbine, justification and data for any proposed changes should be provided in reports;
- Annual review and updates to species' risk assessment based on the results of surveys; justification and data for any proposed changes should be provided in reports;
- Review and suitable adjustment of significant impact thresholds based on updated species' population estimates;
- Annual analysis and reporting of turbine strikes and success of carcass search methods;
- Identification and implementation of adaptive management actions, including technological improvements, for monitoring and mitigating turbine strikes; and
- Any matter requested by the decision-maker, either pre-operational or throughout the operational lifespan of the Project.

7.4.16 OFFSETTING AND COMPENSATORY MEASURES RELATING TO PRESCRIBED UNAVOIDABLE TURBINE STRIKES

Offsets required for impacts to habitat for threatened species are identified and outlined in Section 9 of this BDAR. While these offsets are critical to ensure a no-net loss of biodiversity values because of direct and indirect impacts caused by the Project, prescribed impacts, such as impacts caused by collision with turbines and / or barotrauma, may require further offsetting.

Proposed offsetting measures include:

- Payment into the Biodiversity Conservation Fund
- Securing and retiring additional biodiversity credits
- Funding conservation actions which improve biodiversity values for at-risk species (due to Project operation)
- Funding academic research into the impacts of wind farms on avian species.

Consultation will be undertaken with NSW DCCEEW to determine appropriate offset and compensatory measures.

8. IMPACT ASSESSMENT

8.1 DIRECT IMPACTS

Stage 2 of the BAM requires the assessment of vegetation integrity for the map of vegetation zones on the Subject Land (Section 4.3.3 of the BAM). This includes the assessment of construction and operational impacts on existing mapped biodiversity values cannot be avoided (i.e., direct impacts). The Subject Land boundary defines the extent of direct impacts and includes two impact types, being 'total' and 'partial'. These impact types are further explained below as the BAM-C evaluates the future VIS based on these impact types.

8.1.1 TOTAL IMPACT

A total impact is defined as the complete removal of native vegetation and habitat necessary for the construction of the Project. While some rehabilitation works may occur in areas not required for operational purposes (e.g., batters and areas of cut), the loss of biodiversity values from these areas is included in the assessment of total loss. Rehabilitation works are separate to the assessment of loss and are not considered.

8.1.2 PARTIAL IMPACT

In this assessment, a partial impact is proposed on the tree canopy where it occurs within a transmission line easement and is within a specified distance of the transmission lines (i.e., conductor). A partial impact is proposed as a means of minimizing the Projects impacts on biodiversity values.

The extent of vegetation clearing for this purpose was determined in consultation with Transgrid, the future operator of the transmission line easements. Diagrammatically, an example of how the transmission line easement is to be established is shown in **Figure 8-1**.

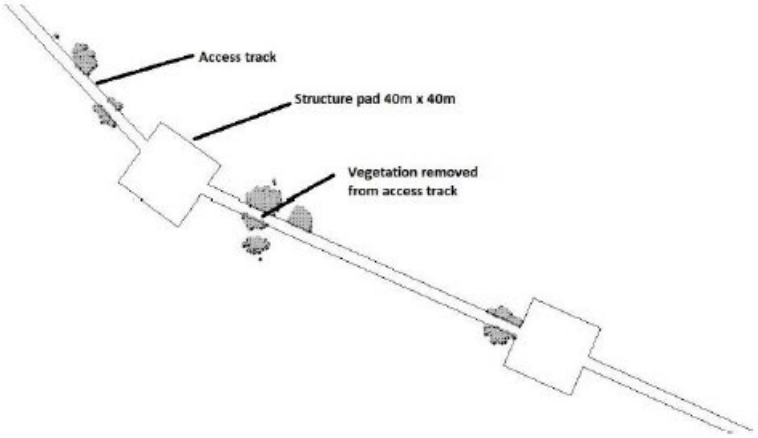


FIGURE 8-1 EXAMPLE OF VEGETATION REMOVAL IN TRANSMISSION LINE EASEMENTS

A plan and section view showing how the vegetation required to be cleared was determined is shown in **Figure 8-2**.

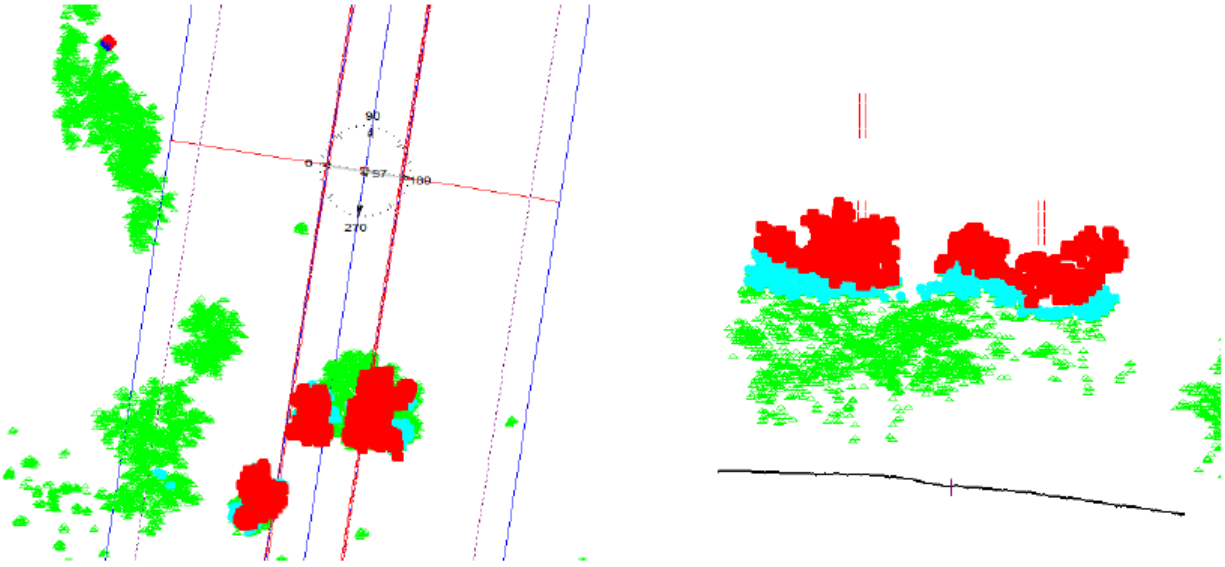


FIGURE 8-2 PLAN AND SECTION VIEW SHOWING EXAMPLE OF PARTIAL IMPACT

Native vegetation is required to be cleared to achieve a 4.5 m clearance from the conductor, as shown by the red and blue polygons in the **Figure 8-2** example provided. LiDAR was used to determine the extent of this clearing envelope, which has taken into consideration ground elevation, height of tree canopy and proximity of conductors.

The residual volume of affected trees is shown in green and represents the part of the tree canopy that does not require clearing. This is to be retained in the Project's operational phase. However, this part of the retained tree canopy may, on a case-by-case basis, be required to be cleared (e.g., if deemed required by an arborist for tree health/safety reasons). Thus, while it is the intent to leave part of the tree canopy intact for the operational period of the Project, the vegetation clearing may include the vegetation assumed to be retained. Thus, the partial loss assessed in the Updated BDAR assumes the total removal of the tree canopy associated with the green and blue impacts in **Figure 8-2.**

Quantitatively, the calculation of partial loss in the BAM-C requires the adjustment of VIS attributes 'Composition', 'Structure' and 'Function' to reflect the partiality of this impact. This has been performed as follows in this assessment:

- Composition: No species in the tree growth form group is to remain in vegetation zones identified as having a partial impact. All shrub, grass, forb, fern and other species to be retained post development. This is a worst-case scenario and assumes total loss of trees;
- Structure: No vegetation cover in the tree growth is to remain in vegetation zones identified as having a partial impact. Percent cover of all shrubs, grass, forb, fern and other species to be retained post development. This is a worst-case scenario and assumes total loss of trees; and

- Function: No trees or hollows to be retained in the zone. Maximum 15% leaf litter and existing log length is to be retained in the zone. Felled trees/limbs are likely to be placed on the ground in situ, which is likely to result in an improved outcome for ground habitat (i.e., fallen logs).

8.1.3 IMPACTS ON ASSESSABLE NATIVE VEGETATION AND THREATENED SPECIES HABITAT

The direct impacts of the development include:

- Assessable native vegetation (outlined in **Table 8-1**); and
- Threatened species and threatened species habitat (outlined in **Table 8-2**).

TABLE 8-1 SUMMARY OF IMPACTS ON ASSESSABLE NATIVE VEGETATION

VZ	PCT	Condition	TEC	SAII entity	Impact type[34]	Extent (ha)
1	510	VZ1_DC_woodland	Yes	Yes	Total Partial	2.55 1.39
2	510	VZ2_DC_openwoodland	Yes	Yes	Total	0.38
3	510	VZ3_DC_grassland	Yes	Yes	Total	8.72
4	510	VZ4_RC_grassland	Yes	Yes	Total	2.40
5	510	VZ5_low_grassland	Yes	Yes	Total	14.23
6	510	VZ6_RC_woodland	Yes	Yes	Total	0.96
7	533	VZ7_DC_openwoodland	Yes	Yes	Total Partial	0.06 0.08
8	533	VZ8_DC_grassland	Yes	Yes	Total	0.52
9	534	VZ9_DC_woodland	Yes	Yes	Total Partial	1.40 1.09
10	534	VZ10_DC_openwoodland	Yes	Yes	Total	0.58
11	534	VZ11_mod_grassland	Yes	Yes	Total	12.88
12	534	VZ12_low_grassland	Yes	Yes	Total	31.88
13	534	VZ13_RC_woodland	Yes	Yes	Total	3.26
14	565	VZ14_DC_woodland	No	No	Total Partial	4.96 0.17
15	565	VZ15_DC_openwoodland	No	No	Total	0.17
16	565	VZ16_DC_grassland	No	No	Total	11.94
17	567	VZ17_DC_woodland	No	No	Total Partial	1.07 15.51
18	567	VZ18_mod_grassland	No	No	Total	29.63
19	567	VZ19_RC_woodland	No	No	Total	0.34
20	568	VZ20_DC_openforest	No	No	Total	4.48

[34] Two management zones have been generated for vegetation zones with 'total' and 'partial' impact types

VZ	PCT	Condition	TEC	SAII entity	Impact type[34]	Extent (ha)
21	568	VZ21_DC_woodland	No	No	Total Partial	25.72 2.75
22	568	VZ22_DC_openwoodland	No	No	Total	1.30
23	568	VZ23_DC_grassland	No	No	Total	50.29
24	571	VZ24_DC_openforest	No	No	Total	14.12
25	571	VZ25_RC_woodland	No	No	Total	1.36
26	766	VZ26_DC_sedgeland	Yes	No	Total	1.18
27	766	VZ27_RC_sedgeland	Yes	No	Total	0.40
28	965	VZ28_openforest	No	No	Total Partial	1.98 1.10
29	965	VZ29_woodland	No	No	Total	12.21
30	965	VZ30_DC_shrubland	No	No	Total	0.95
31	965	VZ31_low_grassland	No	No	Total	26.13
32	501	VZ32_DC_woodland	No	No	Total	2.65
33	1512	VZ33_DC_woodland	No	No	Total	0.66
34	970	VZ34_DC_openforest	No	No	Total	4.60
35	970	VZ35_DC_woodland	No	No	Total Partial	7.50 0.94
36	970	VZ36_DC_grassland	No	No	Total	42.67
37	970	VZ37_RC_woodland	No	No	Total	0.23
38	1192	VZ38_RC_grassland	Yes	No	Total	1.22
39	1192	VZ39_DC_grassland	Yes	No	Total	18.02
40	1192	VZ40_DC_woodland	Yes	No	Total	2.82
41	1194	VZ41_DC_woodland	Yes	No	Total	0.93
42	501	VZ42_low_grassland	No	No	Total	6.35
43	568	VZ43_low_grassland	No	No	Total	58.68
44	571	VZ44_low_grassland	No	No	Total	26.71

TABLE 8-2 SUMMARY OF RESIDUAL IMPACTS TO THREATENED SPECIES AND THREATENED SPECIES HABITAT

Species Credit Species	BC Act	EPBC Act	SAII entity	Impact
Barking Owl	V	-	No	1.24 ha
Bluegrass	V	V	No	4.22 ha
Leafless Tongue Orchid	V	V	No	1.56 ha
Koala	E	E	No	119.31 ha
Narrow-leaved Black Peppermint	V	V	No	136 individuals

Species Credit Species	BC Act	EPBC Act	SAII entity	Impact
South-eastern Glossy Black-cockatoo	V	V	No	7.49 ha
Southern Greater Glider	E	E	No	91.00 ha
Southern Myotis	V	-	No	11.88 ha
Squirrel Glider	V	-	No	119.15 ha
Austral Toadflax	V	V	No	0.06 ha
Eastern Cave Bat	V	-	No[35]	9.38 ha

8.1.4 CHANGE IN VEGETATION INTEGRITY SCORE

Table 8-3 details the change in vegetation integrity score for each vegetation zone. The direct impact of the Project involves all vegetation zones. Total impacts are to affect 44 VZs with eight having partial impacts (i.e., tree canopy only).

[35] Impact not on breeding habitat

TABLE 8-3 IMPACTS TO VEGETATION INTEGRITY

VZ	PCT ID	Vegetation zone	Area (ha)	Before development			Current VIS	After development			Future VIS	Comment
				Comp	Struct	Func		Comp	Struct	Func		
1	510	VZ1_DC_woodland	2.55 1.39	54.1	68	53	58	0 49.0	0 56.3	0 27.0	0 42.1	Total impact requiring offset Partial impact requiring offset
2	510	VZ2_DC_openwoodland	0.38	27.3	56.6	26.9	34.6	0	0	0	0	Total impact requiring offset
3	510	VZ3_DC_grassland	8.72	33.8	51.1	23.9	34.5	0	0	0	0	Total impact requiring offset
4	510	VZ4_RC_grassland	2.4	41	57.2	10.2	28.8	0	0	0	0	Total impact requiring offset
5	510	VZ5_low_grassland	14.23	29.3	61.1	0.2	12.1	0	0	0	0	VIS <15 no offset
6	510	VZ6_RC_woodland	0.96	74.7	84.4	84.8	81.2	0	0	0	0	Total impact requiring offset
7	533	VZ7_DC_openwoodland	0.06 0.08	52	59	34.2	47.2	0 50.5	0 53.4	0 4.3	0 22.6	Total impact requiring offset Partial impact requiring offset
8	533	VZ8_DC_grassland	0.52	40.7	51.1	6.5	23.8	0	0	0	0	Total impact requiring offset
9	534	VZ9_DC_woodland	1.40 1.09	66.5	67.1	54.3	62.3	0 63.8	0 54.1	0 12.2	0 34.8	Total impact requiring offset Partial impact requiring offset
10	534	VZ10_DC_openwoodland	0.58	38.8	41.3	45.5	41.8	0	0	0	0	Total impact requiring offset
11	534	VZ11_mod_grassland	12.88	38.5	67.6	11.3	30.9	0	0	0	0	Total impact requiring offset
12	534	VZ12_low_grassland	31.88	24	47.8	1.8	12.7	0	0	0	0	VIS <15 no offset
13	534	VZ13_RC_woodland	3.26	63.7	74.6	80.2	72.5	0	0	0	0	Total impact requiring offset
14	565	VZ14_DC_woodland	4.96 0.17	61	68.9	62.5	64.1	0 57.4	0 49.4	0 16.2	0 35.8	Total impact requiring offset Partial impact requiring offset
15	565	VZ15_DC_openwoodland	0.17	6.7	46.5	23.1	19.3	0	0	0	0	Total impact requiring offset
16	565	VZ16_DC_grassland	11.94	30.8	50.4	4.7	19.4	0	0	0	0	Total impact requiring offset
17	567	VZ17_DC_woodland	15.51 1.07	59.1	72.7	68.1	66.4	0 53.1	0 52.7	0 28.9	0 43.2	Total impact requiring offset Partial impact requiring offset

VZ	PCT ID	Vegetation zone	Area (ha)	Before development			Current VIS	After development			Future VIS	Comment
				Comp	Struct	Func		Comp	Struct	Func		
18	567	VZ18_mod_grassland	29.63	44.4	58	6.6	25.8	0	0	0	0	Total impact requiring offset
19	567	VZ19_RC_woodland	0.34	80.7	71.1	43.5	63	0	0	0	0	Total impact requiring offset
20	568	VZ20_DC_openforest	4.48	70.2	61.3	60.6	63.9	0	0	0	0	Total impact requiring offset
21	568	VZ21_DC_woodland	25.72 2.75	42.2	64	76.5	59.1	0 39.1	0 43.4	0 23.2	0 34.0	Total impact requiring offset Partial impact requiring offset
22	568	VZ22_DC_openwoodland	1.3	8.4	47.6	3.6	11.3	0	0	0	0	VIS <17 no offset
23	568	VZ23_DC_grassland	50.29	42.3	53.5	3.7	20.3	0	0	0	0	Total impact requiring offset
24	571	VZ24_DC_openforest	14.12	65.2	63.1	53.5	60.4	0	0	0	0	Total impact requiring offset
25	571	VZ25_RC_woodland	1.36	63.9	58.2	95.4	70.8	0	0	0	0	Total impact requiring offset
26	766	VZ26_DC_sedgeland	1.18	65.2	88.6	...	76	0	0	0	0	Total impact requiring offset
27	766	VZ27_RC_sedgeland	0.4	49.5	16.4	...	28.5	0	0	0	0	Total impact requiring offset
28	965	VZ28_openforest	1.98 1.10	35.8	65.3	67.5	54	0 29.2	0 47.1	0 22.7	0 31.5	Total impact requiring offset Partial impact requiring offset
29	965	VZ29_woodland	12.21	22.4	52.7	10.5	23.2	0	0	0	0	Total impact requiring offset
30	965	VZ30_DC_shrubland	0.95	19.2	41.8	0	9.3	0	0	0	0	VIS <17 no offset
31	965	VZ31_low_grassland	26.13	31.6	49.6	0.1	11.6	0	0	0	0	VIS <17 no offset
32	501	VZ32_DC_woodland	2.65	66	66.8	76.1	69.5	0	0	...	0	Total impact requiring offset
33	1512	VZ33_DC_woodland	0.66	81.5	60.2	41.1	58.6	0	0	...	0	Total impact requiring offset
34	970	VZ34_DC_openforest	4.6	59.4	75.7	92.5	74.6	0	0	0	0	Total impact requiring offset
35	970	VZ35_DC_woodland	7.50 0.94	38.1	79.8	82.3	63	0 33.6	0 49.3	0 20.8	0 32.5	Total impact requiring offset Partial impact requiring offset
36	970	VZ36_DC_grassland	42.67	52.3	49.3	0.8	13.7	0	0	0	0	VIS <17 no offset

VZ	PCT ID	Vegetation zone	Area (ha)	Before development			Current VIS	After development			Future VIS	Comment
				Comp	Struct	Func		Comp	Struct	Func		
37	970	VZ37_RC_woodland	0.23	22.3	50.6	57.5	40.2	0	0	0	0	Total impact requiring offset
38	1192	VZ38_RC_grassland	1.22	36	71.1	13.7	32.7	0	0	0	0	Total impact requiring offset
39	1192	VZ39_DC_grassland	18.02	38.1	64.7	1.7	16.1	0	0	0	0	Total impact requiring offset
40	1192	VZ40_DC_woodland	2.82	40.8	49.9	17.2	32.7	0	0	0	0	Total impact requiring offset
41	1194	VZ41_DC_woodland	0.93	58.8	64.2	91.9	70.3	0	0	0	0	Total impact requiring offset
42	501	VZ42_low_grassland	6.35	24.1	60.1	2.5	15.3	0	0	0	0	VIS <17 no offset
43	568	VZ43_low_grassland	58.68	35.5	44.7	0.2	11.7	0	0	0	0	VIS <17 no offset
44	571	VZ44_low_grassland	26.71	41.9	53.3	1.5	15	0	0	0	0	VIS <17 no offset

8.2 INDIRECT IMPACTS

The BAM (Section 8.2.2) identifies 16 potential indirect impacts that, as a minimum, must be considered as a part of a BDAR. Residual indirect impacts of the Project on native vegetation, threatened entities and their habitat beyond the Development Footprint have been considered in accordance with the BAM in **Table 8-4**. Impacts to the neighbouring area of Gondwana Rainforest of Australia, which is listed as a World Heritage Place on the National Heritage list, are addressed in this section, as required by the SEARs.

Despite the propensity for indirect impacts, it is considered that the mitigation measures proposed are reliable and capable of remedying the effects of these impacts without causing harm to the adjoining environment. No residual indirect impacts are expected. See **Section 8.4** for recommended mitigation measures.

TABLE 8-4 SUMMARY OF RESIDUAL INDIRECT IMPACTS

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
Impacts of the proposal on TECs/PCTs and/or threatened species and their habitat beyond the construction area, with additional consideration to MNES, including but not limited to:			
(a) Inadvertent impacts on adjacent habitat or vegetation	PCTs occurring adjacent to the Subject Land TECs: New England Peppermint Grassy Woodland Box-Gum Grassy Woodland Carex Sedgeland New England Grassy Gum Woodland Threatened species habitat: Bluegrass Narrow-leaved Black Peppermint MNES: Gondwana Rainforests of Australia	Construction	There are potential impacts to retained and adjacent vegetation resulting from incidental trampling by site vehicles, and overstepping clearing and disturbance boundaries throughout the construction period. These impacts are likely to be limited to groundcover vegetation and the majority of adjacent vegetation present is comprised of Category 1- Exempt Land and low conservation grasslands. Bluegrass and juvenile Narrow-leaved Black Peppermint occur adjacent to the Subject Land with potential to be trampled. Risks will be mitigated through environmental management measures and controls via the preparation and implementation of a CEMP and CTMP. These management plans will utilise tools such as speed limits and traffic signs to reduce the likelihood of vehicles impacting adjacent vegetation. Clear boundaries are to be created using fencing, tape, etc. to ensure that no retained vegetation adjacent to the Oxley Wild Rivers National Park (NP) is incidentally impacted. A buffer of at least 500 m is to occur between the Project and the nearby conservation reserve network containing the Gondwana Rainforest of Australia world heritage area. No measurable adverse impact is expected on the values of the Gondwana Rainforest or vegetation and habitat adjacent to the Subject Land.
(b) Reduced viability of adjacent habitat due to edge effects	PCTs occurring adjacent to the Subject Land TECs: New England Peppermint Grassy Woodland Box-Gum Grassy Woodland Carex Sedgeland New England Grassy Gum Woodland Threatened species habitat: Bluegrass Narrow-leaved Black Peppermint Leafless Tongue Orchid Austral Toadflax	Operation	Impacts to viability of adjacent habitat due to edge effects is considered low due to current land use and condition (livestock grazing and weed incursions) of the Subject Land and disconnected nature of the landscape. Changes to abiotic factors of the landscape because of the Project is unlikely, however, shadows cast from the WTGs may impact light sources available to threatened flora species. To minimise edge effects because of the Project, mitigation measures will be incorporated into the CEMP and the SWMP to manage impacts to soil quality, hydrology regimes and habitat degradation. Clear boundaries are to be created using fencing, tape, etc. to ensure that no retained vegetation adjacent to the Oxley Wild Rivers NP is impacted by edge effects. A buffer of at least 500 m is to occur between the Project and the nearby conservation reserve network containing the Gondwana Rainforest of Australia world heritage area. No measurable adverse impact is expected on the values of the Gondwana Rainforest or vegetation and habitat adjacent to the Subject Land.

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
(c) Reduced viability of adjacent habitat due to noise, dust or light spill	Threatened species habitat: Greater Glider Squirrel Glider Koala Southern Myotis Barking Owl Spotted-tail Quoll MNES: • Gondwana Rainforests of Australia • White-throated Needletail • Fork-tailed Swift	Construction and operation	There are potential impacts to the viability of adjacent habitat due to artificial light, runoff, noise and dust during construction of the Project. The CTMP will work to mitigate these impacts from vehicular movement, while the CEMP will work to mitigate these impacts occurring from construction. The CEMP and CTMP will specify how artificial lighting is to be directed away from the neighbouring Oxley Wild Rivers NP and the nearby conservation reserve network containing the Gondwana Rainforest of Australia through potential use of barriers to further minimise noise and dust disturbance. Designated construction hours will minimise noise and light after dark when species are most vulnerable to these disturbances. Minimal residual indirect impacts to the viability of adjacent habitat due to noise, dust or light spill may occur to sensitive species such as nocturnal mammals and birds.
(d) Transportation of weeds and pathogens from the subject site to adjacent vegetation	PCTs occurring adjacent to the Subject Land TECs: New England Peppermint Grassy Woodland Box-Gum Grassy Woodland Carex Sedgeland New England Grassy Gum Woodland Threatened species habitat: Leafless Tongue Orchid Koala MNES: Gondwana Rainforests of Australia	Construction, operation and rehabilitation	There is a potential risk of transportation of introduced weeds and pathogens during construction and operation to adjacent vegetation. This risk is already present as a result of the current land use; however, risk is increased with increased vehicular movements. Weeds and pathogens would pose a threat to adjacent areas of native vegetation, TEC, the Oxley Wild Rivers NP and conservation reserve network containing Gondwana Rainforests of Australia, threatened flora species and threatened fauna species habitat. Species of particular sensitivity include Leafless Tongue Orchid and Koala. This risk will be mitigated within the CTMP, CEMP and Pest Management Control Programs to be implemented. There is unlikely to be residual inadvertent impacts to adjacent vegetation. The areas adjacent to the Subject Land, comprising mostly of Category-1 Exempt Land and low conservation grasslands, will be utilised as areas subject to monitoring weed and pathogen incursion. Biosecurity protocols such as washdown of vehicles and equipment will be enforced as part of the management programs and are considered sufficient for the management of weeds and pathogens.
(e) Increased risk of starvation, exposure and loss of shade or shelter	Threatened fauna species: Barking Owl Koala South-eastern Glossy Black-cockatoo Southern Greater Glider Squirrel Glider Southern Myotis Long-nosed Potoroo	Construction and operation	Clearing of native vegetation for the construction of the Project will result in reduction of resources available for threatened fauna species that may result in starvation, exposure and loss of shade or shelter. The extent of clearing of native vegetation has been minimised where possible and the extent of clearing is not considered critical to the survival of any threatened species. Ongoing monitoring through the BBAMP and CEMP will identify any increase in risk to threatened species and will manage this accordingly. There is unlikely to be residual inadvertent impacts to threatened fauna species. This risk does not apply to the Oxley Wild Rivers NP.

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
(f) Loss of breeding habitat due to vegetation clearance	Threatened fauna species: Barking Owl Koala South-eastern Glossy Black-cockatoo Southern Greater Glider Squirrel Glider Spotted-tail Quoll Long-nosed potoroo	Construction	The Project will result in a reduction of breeding habitat available for a range of threatened fauna species. Habitat features known to be of importance for breeding, such as hollow bearing trees, have been avoided where possible. Ongoing monitoring through the BBAMP and CEMP will identify any increase in risk to threatened species and will manage this accordingly. There is unlikely to be residual inadvertent impacts to threatened fauna species. This risk does not apply to the Oxley Wild Rivers NP. There will no removal of vegetation associated with the Gondwana Rainforest of Australia world heritage area.
(g) Trampling of threatened flora species	Threatened flora species: Bluegrass Narrow-leaved Black Peppermint Leafless Tongue Orchid Austral Toadflax	Construction, operation and rehabilitation	Bluegrass, Leafless Tongue Orchids and juvenile Narrow-leaved Black Peppermint occur within the Project Area with potential to be trampled. These risks will be mitigated through measures and controls via the preparation and implementation of the CEMP. No-go zones are to be established to ensure no incidental trampling occurs. There is unlikely to be residual inadvertent impacts to threatened flora. This risk does not apply to the Oxley Wild Rivers NP and conservation reserve network containing Gondwana Rainforests of Australia.
(h) Inhibition of nitrogen fixation and increased soil salinity	N/A	N/A	The Project is not expected to result in the inhibition of nitrogen or increased soil salinity.
(i) Fertiliser drift	N/A	N/A	The Project is not expected to result in any fertiliser drift.
(j) Rubbish dumping due to improper management of waste	Threatened fauna species: Barking Owl Koala South-eastern Glossy Black-cockatoo Southern Greater Glider Squirrel Glider Spotted-tail Quoll	Construction and operation	Improper waste disposal can contribute to an increase in feral animal populations, which poses a significant threat to threatened fauna. The presence of food waste and rubbish attracts predators such as foxes, rats and feral cats, leading to greater predation pressure on threatened species. Mitigation measures will be implemented to minimise residual impact including the implementation of pest control management programs and education of construction workers. There is unlikely to be residual inadvertent impacts to threatened fauna.
(k) Wood collection	Threatened fauna species: Barking Owl South-eastern Glossy Black-cockatoo	Construction	Removal of dead wood and dead trees is a key threatening process in schedule 4 of the BC Act. It can result in the loss of important habitat such as hollows and decaying wood for a wide variety of species and may adversely affect threatened species.

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
	Southern Greater Glider Squirrel Glider Spotted-tail Quoll		Mitigation measures will be implemented to minimise residual impact including education of construction workers. There is unlikely to be residual inadvertent impacts to threatened fauna.
(l) Removal and disturbance of rocks, including bush rocks	N/A	N/A	The Project is not expected to result in any indirect impacts resulting in Removal and disturbance of rocks, including bush rocks.
(m) Increase in predators	Threatened fauna species: Barking Owl Koala South-eastern Glossy Black-cockatoo Southern Greater Glider Squirrel Glider Spotted-tail Quoll Long-nosed Potoroo	Operation	The Project will involve the construction and upgrading of access tracks throughout the Subject Land, resulting in the potential to increase predator activity. Species such as the Spotted-tail Quoll and Squirrel Glider are vulnerable to predation by species such as the European Fox. The Project will involve the implementation of a Pest Control Management Program that will aim to eliminate or reduce the risk of increase in predator activity. There is unlikely to be residual inadvertent impacts to threatened fauna species. This risk does not apply to the Oxley Wild Rivers NP and conservation reserve network containing Gondwana Rainforests of Australia.
(n) Increase in pest animal populations	PCTs occurring adjacent to the Subject Land TECs: New England Peppermint Grassy Woodland Box-Gum Grassy Woodland Carex Sedgeland New England Grassy Gum Woodland Threatened species habitat: Bluegrass Narrow-leaved Black Peppermint Leafless Tongue Orchid	Operation	The Project will involve the construction and upgrading of access tracks throughout the Subject Land, resulting in the potential to increase pest animal activity. Species such as the European Rabbit can be destructive to native vegetation. The Project will involve the implementation of a Pest Control Management Program that will aim to eliminate or reduce the risk of an increase in pest animal populations. There is unlikely to be residual inadvertent impacts to threatened fauna species. This risk does not apply to the Oxley Wild Rivers NP and conservation reserve network containing Gondwana Rainforests of Australia.
(o) Change in fire regimes	N/A	N/A	The Project is not expected to result in any change in fire regimes.

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
(p) Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds	N/A	N/A	The Project is not expected to result in any disturbance to specialist breeding habitat

8.3 PRESCRIBED IMPACTS

8.3.1 HABITAT CONNECTIVITY

Impacts to habitat connectivity have been identified in **Section 7.2.1** and have been minimised throughout Project design refinements and reduction of native vegetation clearing required. The BBAMP and CEMP will include ongoing monitoring of threatened fauna to further understand and mitigate impacts to habitat connectivity.

8.3.2 WIND TURBINE STRIKES

The potential risk of wind turbine strikes because of the Project are identified in **Section 7.2.2**. The BBAMP will be implemented to avoid, minimise and mitigate these impacts and has quantified the risk to species through a number of assessments including turbine risk assessments and collision risk modelling, as described in **Section 7.3** and **7.3.6**.

8.3.3 VEHICLE STRIKES

The potential increased risk of vehicle strikes because of the Project are identified in **Section 7.2.3**. With the implementation of mitigation measures the risk of vehicle collision will be substantially reduced and considered low. These measures will be addressed in the CEMP, and include examples such as on-site education, identifying and reporting hazards as they occur during construction, and setting appropriate working hours and vehicle speed limits.

8.4 MITIGATING RESIDUAL IMPACTS – MANAGEMENT MEASURES AND IMPLEMENTATION

A range of mitigation and management measures have been developed for the Project to mitigate the impacts on native vegetation, threatened species and their habitat, including from prescribed impacts. The measures presented in **Table 8-5** aim to address impacts that have been identified as low, moderate or high risk in preceding sections, and are unavoidable.

In accordance with Section 8.4 the BAM, adaptive management is to be used to address impacts that are infrequent or difficult to measure, such as indirect or prescribed impacts, or other remaining biodiversity impacts. The management plans listed below will be prepared and implemented prior to the construction phase of the Project.

- Construction Environmental Management Plan (CEMP);
- Construction Traffic Management Plan (CTMP);
- Biodiversity Management Plan (BMP);
- Erosion and Sediment Control Plan (ESCP); and
- Pest Animal Management Plan (PAMP).

There is scope to ensure that the principals of adaptive management are included in these management plans, for example, through the monitoring of operational performance and by providing flexibility to adjust management measures where required.

The CEMP will make provisions for clearing protocols, construction timing and include measures to minimise soil disturbance, run-off and sediment transfer, artificial light, noise, dust and vibrations because of the Project.

The CTMP will detail mitigation and management measures which aim to minimise the impact of construction traffic by installing suitable signage and driving protocols to reduce the risk of vehicle strikes. The BMP will make specific provisions to limit impacts on biodiversity values, such as weed control measures and the use of fauna handlers to rescue and relocate resident fauna during construction. The ESCP will detail mitigation measures to protect soil function and reduce the risks of run-off, erosion and salinity. The PAMP will be developed and implemented to minimise the impacts of introduced predators on resident fauna, particularly threatened species.

TABLE 8-5 SUMMARY OF PROPOSED MITIGATION AND MANAGEMENT MEASURES FOR RESIDUAL IMPACTS (DIRECT, INDIRECT AND PRESCRIBED)

Mitigation measure	Method	Timing	Frequency	Responsibility
Removal of native and threatened species habitat and habitat features				
Offsets	Residual impacts on habitat will be offset through the Biodiversity Offset Scheme.	Detailed design	Planning phase	Applicant
Vegetation Clearing Protocol	Where vegetation is to be removed it will be undertaken in accordance with specifications provided in a vegetation clearing protocol, detailed within the CEMP.	Pre-construction and construction phase	Throughout planning and construction phase	Construction contractor
Fencing Protocol	Plain wire perimeter fencing (opposed to barbed-wire fencing) will be used to avoid potential entrapment of fauna on fences.	Construction phase	Ongoing	Construction contractor
Chemical Protocol	'Environmental Sensitive No-Go Zones' will be established around areas of significance including threatened fauna habitat and threatened flora species locations outside the Development Footprint.	Construction phase	Ongoing	Construction contractor
Impact to native vegetation				
Delineation of clearing areas	To avoid unnecessary removal or damage to retained vegetation, the limit of clearing will be clearly demarcated and signed as 'Environmental Sensitive No-Go Zones' prior to the commencement of clearing. This will be detailed within the CEMP, including measures: ▪ Vehicles or machinery will not be permitted to park within or drive through areas of retained vegetation; ▪ Construction materials will not be stockpiled or stored within areas of retained vegetation; ▪ Ancillary facilities, such as site compounds and construction zones, will not be located beyond the limits of clearing; ▪ Temporary fencing and signage will be maintained throughout construction; ▪ Site inductions will be given by the civil contractor to all personnel and visitors to ensure all site workers and visitors are aware of any No-Go Zones; and	Pre-construction and construction phase	Throughout planning and construction phase	Construction contractor

Mitigation measure	Method	Timing	Frequency	Responsibility
	▪ Clear boundaries on the eastern side will be established to ensure no impacts to Oxley Wild Rivers National Park.			
Light/noise/dust				
Daily/seasonal timing of construction activities to reduce impact of noise and light spill	The CEMP will include measures to avoid light encroachment on adjacent habitats such as the Oxley Wild Rivers National Park by restricting construction works to daylight hours as much as possible and incorporating sensitive lighting arrays that shield the adjoining native vegetation and habitat from stray light, with low-level lighting installed for all required external lighting.	Pre-construction and construction phase	Throughout planning and construction phase	Construction contractor
Adaptive dust monitoring programs to control air quality	The Applicant will implement programs to monitor the generation of dust during construction activities. All construction activities will be undertaken with the objective of preventing visible dust emissions from construction activities.	Construction phase	Clearing phase	Construction contractor
Invasive flora/pathogens				
Pest Control Management Program - Weed Management	To minimise the spread of weeds throughout the Subject Land and surrounding patches, appropriate weed control activities will be undertaken in accordance with State and regional weed management plans. The Subject Land is subject to the *Northern Tablelands Regional Strategic Weed Management Plan 2017-2022* (LLS, 2017)and management of Weeds of National Significance. The NSW *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high-risk activities. To comply with the objectives of the *Northern Tablelands Regional Strategic Weed Management Plan 2017-2022* (LLS, 2017), the following measures will be implemented as part of the Pest Control Management Program for the Subject Land: ▪ Initial weed treatment - Including eliminating woody species and targeting infestations of exotic herbs. In particular, High Threat Exotic weed species occurring within the subject land will be managed to prevent further spread. Prior to any vegetation clearance, High Threat Exotic weeds	Construction and operations phase	Ongoing	Construction and operations contractors

Mitigation measure	Method	Timing	Frequency	Responsibility
	should be demarcated for these to be disposed of separately from native material; ▪ Containment – Follow-up monitoring and maintenance will be undertaken in areas of the development site that have received past primary weeding treatments to contain any re-emergence of weed species; and ▪ Minimisation – Minimisation of weed species that cannot be effectively controlled on the site, such as exotic grasses, will be prevented from further spread through construction and operational phase site hygiene procedures.			
Pest Control Management Program - Pathogen Management	A pathogen management protocol will be implemented. Infection of native plants by *Phytophthora cinnamomic* is listed as a key threatening process under the BC Act and EPBC Act. The risk of spreading pathogens and the mitigation measures required on site will be regularly communicated to staff and contractors during inductions and toolbox talks.	Construction and operations	Ongoing	Construction and operations contractors
Increased pest species presence				
Pest Control Management Program - Pest Species Management	Feral pest management programs will be developed and implemented for the Project, with focus on Feral Cats and European Foxes. All control methods will be completed in accordance with relevant legislation / standard operating procedures, including but not limited to the following: ▪ Northern Tablelands Regional Strategic Pest Animal Management Plan 2018 - 2023 (LLS, 2018); ▪ NSW Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Cats (NSW DPI, 2022) ; and ▪ NSW Threat Abatement Plan: Predation by the Red Fox (Vulpes vulpes) (NSW OEH, 2010).	Construction and operations	Ongoing	Construction and operations contractors
Erosion and sediment				
Soil and Water Management Plan - Erosion and Sediment Control Plan	A site-specific Erosion and Sediment Control Plan will be developed and implemented to minimise erosion and sediment control risks.	Construction phase	Ongoing	Construction contractors

Mitigation measure	Method	Timing	Frequency	Responsibility
	The Plan will include arrangements for managing wet weather events, and working with high surface water levels, including monitoring of potential high-risk events and specific controls and follow-up measures to be applied in the event of wet weather to avoid adverse impacts to hydrological processes, wetlands and ephemeral creek lines.			
Turbine Strike				
Bird and Bat Adaptive Management Plan	The final BBAMP will be prepared in consultation with BCS following approval of the Project.	Pre-construction, construction and operations	ongoing	Environmental consultant contractors

8.5 ADAPTIVE MANAGEMENT FOR UNCERTAIN BIODIVERSITY IMPACTS

The key uncertainty in terms of the biodiversity impacts of the Project is in relation to bird and bat collision impacts. While project-specific data and analysis has been undertaken over multiple years and seasons, many Australian species are known to respond to fluctuations in resources rather than follow predictable seasonal movement patterns. For this reason, additional measures are included to specifically address this uncertainty in the form of an adaptive management framework.

The purpose of adaptive management framework is to ensure environmental outcomes are achieved. To this end, there are linkages between:

- Environmental outcomes;
- Implementation of mitigation and management measures;
- Monitoring, reporting and investigations; and
- Implementation of corrective actions to ensure environmental outcomes will be achieved.

The Project commits to collecting and analysing further data during operation, focused on the higher risk species and higher risk areas of the site.

Higher risk species include:

- Glossy Black-cockatoo;
- White-throated Needletail; and
- Wedge-tailed Eagle.

Higher risk locations include:

- Adjacent ridge lines and areas of updrafts. No turbines have been identified as high risk specifically but areas within the development site include those adjacent to connected woodland habitat such as Oxley Rivers National Park.

The work would be implemented via an adaptive Bird and Bat Adaptive Management Plan (BBAMP) to be prepared to reflect the final infrastructure layout and implemented to manage impacts. The BBAMP will include:

- A description of measures to be implemented on the project site for minimising bird and bat strike;
- Trigger levels for further investigation and mitigation measures to be implemented;
- An adaptive management plan to be implemented if the monitoring determines threatened or at-risk species are subject to adverse impacts; and
- A monitoring and reporting plan to assess the potential impacts and effectiveness of design and operational measures to mitigate bird and bat strike.

A range of mitigation strategies can be employed in response, with the most certain being ‘sector shut down’, where turbines can be programmed to be operationally limited in the higher risk periods. Buffers and monitoring are addressed in the Project’s mitigation strategies.

The BBAMP Framework incorporates adaptive management measures to be implemented where a potential significant impact to biodiversity is detected.

8.6 USE OF BIODIVERSITY CREDITS TO MITIGATE OR OFFSET INDIRECT OR PRESCRIBED IMPACTS

There is a potential for significant impacts associated with prescribed impacts related to the operation of the Project on threatened or migratory bird and bat species. Given the uncertainty associated with the significance of the impacts associate with collision risk, offsets cannot be reasonably predicted prior to commencement of operation of the Project. When an impact trigger of a threatened or non-threatened avian species is detected, the significance of impact will be assessed by a suitably qualified ecologist. To determine whether an impact trigger has exceeded an indicative significant impact threshold, the number of mortalities of each species based on the carcass search results will be quantified and assessed as to whether the number has reached or exceeded an ecologically significant proportion of a population over a defined time period (referred to as a 'significant impact threshold') (DoE, 2013).

An ecologically significant proportion of a population is defined as being 0.1% of the estimated national population size for a species (DoE, 2015). Where this is exceeded for threatened species, additional offsets may be required for the significant residual impact. The quantum of potential offsets required will depend on the significance of the impact detected through ecological investigations if an impact trigger is detected.

8.7 IMPACTS ON MNES

On 31 August 2020, a delegate of the Federal Minister for the Department of Agriculture, Water and the Environment determined that the Winterbourne Wind Farm project was a controlled action under Section 75 of the EPBC Act. The EPBC Act controlling provisions for the proposed actions are:

i. World Heritage properties (Sections 12 and 15A);

ii. National Heritage places (Sections 15B and 15C);

iii. Listed threatened species and communities (Sections 18 and 18A); and

iv. Listed migratory species (Sections 20 and 20).

In addition, consideration for the impacts from 2019-2020 bushfires on MNES entities must be considered. A check list is provided in Appendix E.

8.7.1 EPBC ACT LISTED TECS AND THREATENED/MIGRATORY SPECIES

Paragraph 14 of the supplementary SEARs requires the EIS to identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the Project. **Table 1-1** identified the MNES specified in the supplementary SEARS as requiring further assessment in this BDAR. These are:

- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community;
- Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*);
- Koala (combined populations of QLD, NSW and ACT) (*Phascolarctos cinereus*);
- Narrow-leaved Black Peppermint (*Eucalyptus nicholii*);

- Greater Glider (*Petauroides volans*);
- Beadle's Grevillea (*Grevillea beadleana*);
- Brush-tailed Rock-wallaby (*Petrogale penicillata*);
- Narrow-leaved Bertya (*Bertya ingramii*);
- Austral Toadflax (*Thesium australe*);
- White-throated Needletail (*Hirundapus caudacutus*); and
- Fork-tailed Swift (*Apus pacificus*).

This list was supplemented by the addition of the following species as they were detected within or nearby the Subject Land. These species are:

- *Calyptorhynchus lathami lathami* (south-eastern glossy-black cockatoo)
- *Dichanthium setosum* (bluegrass); and
- *Potorous tridactylus tridactylus* (long-nosed potoroo).

Paragraph 16 of the supplementary SEARs requires the consideration of various matters, which are provided in the following sections. Where appropriate, cross referencing is made to parts of the BDAR where relevant information is available and suitable to satisfy this requirement.

8.7.1.1 HABITAT DESCRIPTIONS

A description of the habitat of each MNES that may be adversely impacted by the Project is outlined in the following sections.

New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community

New England Peppermint Grassy Woodlands typically occur in high altitude areas of low relief (i.e. frost hollows and areas of cold air drainage). Soils are generally of low to medium fertility being derived mostly from sedimentary geologies. According to the final determination, New England Peppermint Grassy Woodlands are dominated by trees of *Eucalyptus nova-anglica* and occasionally with *E. dalrympleana* subsp. *heptantha*, as a co-dominant. There are few shrubs with the ground cover usually dense with *Asperula conferta*, *Poa sieberiana*, *Themeda australis*, *Juncus filicaulis*, *Dichondra repens*, *Carex inversa*, *Rumex brownii*, *Acaena ovina* and *Desmodium varians*[36] common (TSSC, 2011). Benson and Ashby identify the following as indicator species: *Eucalyptus nova-anglica*, *Carex inversa*, *Haloragis heterophylla*, *Juncus filicaulis*, *Cymbonotus lawsonianus* and *Leucopogon fraseri*.

Within the Subject Land this community is associated with PCTs 533 and 534.

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community

White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grasslands generally occurs as an open woodland with a canopy foliage cover of less than 30% consisting of *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and/or *Eucalyptus blakelyi* (Blakely's Red Gum) and in some cases the grey boxes *Eucalyptus microcarpa* and *E. moluccana* can occur as co-dominants. A shrub layer is generally absent but can include *Acacia, Bursaria, Cassinia, Hibbertia, Lissanthe* and *Templetonia* species (TSSC, 2023).

[36] Now *Grona varians*

The ground cover is dominated by tussock grasses, especially *Themeda triandra* (Kangaroo Grass) and *Poa sieberiana* (Snow Grass), along with species of *Austrostipa, Aristida, Chloris, Cymbopogon, Dichanthium, Microlaena* and *Rytidosperma*. Between the tussocks there may be bare ground or a range of forbs from genera such as *Bulbine, Chrysocephalum, Dianella, Geranium, Goodenia, Lomandra, Pimelea* and *Stackhousia* (TSSC, 2023).

Within the Subject Land this community is associated with PCT 510.

Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*)

The Spotted-tailed Quoll is generally confined within 200 km of the coast and range from the Queensland boarder to Kosciuszko National Park. The species has a preference for both wet and dry forest habitats, generally in areas with relatively high rainfall (>600 mm/yr) and predictable seasonal rainfall. The species particularly in areas where forest has been undisturbed from logging or timber harvesting. Habitat requirements for the species include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves, and large areas of relatively intact vegetation for foraging (TSSC, 2020). There is a National Recovery Plan and a Threat Abatement Plan available for the Spotted-tailed Quoll.

This species has been observed within the Subject Land. Its habitat is associated with all PCTs where functional habitat attributes are present (i.e. woody vegetation).

Koala (combined populations of QLD, NSW and ACT) (*Phascolarctos cinereus*)

Koalas can be found in habitats ranging from relatively open Eucalyptus forests and woodlands, and in climates ranging from tropical to cool temperate. In semi-arid climates, they prefer riparian habitats, where nearby streams, creeks and drainage lines, and riparian zones and patches that are resilient to drying provide refuge during times of drought and extreme heat (DAWE, 2022). There is a National Recovery Plan and a Threat Abatement Plan for predation by feral cats 2024 available for the Koala.

This species was detected within the Subject Land. Its habitat is associated with all PCTs where functional habitat attributes are present (i.e. woody vegetation).

Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)

This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally in conservation reserves. Planted as urban trees, windbreaks and corridors. The species typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.

This species has been observed within the Subject Land. Presence is scattered throughout several PCTs.

Greater Glider (*Petauroides volans*)

The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands of eastern Australia. It is typically found in highest abundance in taller, montane, moist eucalypt forests on fertile soils, with relatively old trees and abundant hollows.

The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (DCCEEW, 2022). There is a Threat Abatement Plan for predation by feral cats 2024 available for the species. There is no Recovery Plan for this species.

This species was detected within the Subject Land. Its habitat is associated with all PCTs where functional habitat attributes are present (i.e. woody vegetation).

Beadle's Grevillea (*Grevillea beadleana*)

Known from four separate areas, all in north-east NSW: the Torrington area west of Tenterfield, Oxley Wild Rivers National Park, Guy Fawkes River National Park and at Chambigne Nature Reserve south-west of Grafton. Historical records suggest it was also once found near Walcha. It typically grows in open eucalypt forest and woodland with a shrubby understorey on granite.

This species has not been observed within the Subject Land. No known occupied habitat is to be adversely impacted by the Project.

Brush-tailed Rock-wallaby (*Petrogale penicillata*)

The Brush-tailed Rock-wallaby can be found in rugged rocky areas including rock faces, outcrops, caves and ledges during the day, and typically move from refuge habitat to foraging habitat around dusk. Foraging habitat consists of grassy forest and woodland habitats, as well as artificial clearings and pastures close to daytime refuge areas (DCCEEW, 2025). There is a National Recovery Plan and Threat Abatement Plans available for the species.

This species has not been observed within the Subject Land. No known occupied habitat is to be adversely impacted by the Project.

Narrow-leaved Bertya (*Bertya ingramii*)

This species occurs only on the New England Tablelands of NSW where it was previously known only from two small populations in the Oxley Wild Rivers National Park but was historically more widespread on the Tablelands. It is long lived species (~20 years) that typically grows among rocks or in thin soils close to cliff-edges in dry woodland with she-oaks, wattles and tea-trees.

This species has not been observed within the Subject Land. No known occupied habitat is to be adversely impacted by the Project.

Austral Toadflax (*Thesium australe*)

Austral Toadflax has a sporadic but widespread distribution, with populations occurring in the Nandewar, New England Tablelands and NSW North Coast bioregions (DoE, 2013). The species distribution overlaps with the following EPBC Act-listed TECs:

- Lowland Grassy Woodland in the South East Corner Bioregion;
- New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands;
- Natural Grasslands and the Queensland Central Highlands and the northern Fitzroy Basin;
- Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland;
- Natural Temperate Grassland of the Southern Tablelands of NSW and the ACT; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

There is a Threat Abatement Plan for competition and land degradation by rabbits available for the species. There is no Recovery Plan for this species.

A small patch of roadside vegetation (0.06 ha) comprises part of a local population of the species (i.e., occurrence of species extends into adjoining private property).

White-throated Needletail (*Hirundapus caudacutus*)

In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They have been recorded above partly cleared pastures and plantations of farmland, and remnant vegetation at the edge of paddocks (TSSC, 2019). There are no Recovery Plans or Threat Abatement Plans applicable for this species.

The species has been observed flying over the Subject Land as part of its foraging range.

Fork-tailed Swift (*Apus pacificus*)

In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs. The species is aerial, flying over open country, from semi-deserts to coast, islands; sometimes over forests and cities. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas, over cliffs, beaches and over islands and swell out to sea. They also occur over settled areas, including towns, urban areas and cities. The species sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They favour dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh (DEH, 2006). There is a Threat Abatement Plan for predation by feral cats 2024 available for the species. There is no Recovery Plan for this species.

The species has been observed flying over the Subject Land as part of its foraging range.

South-eastern glossy-black cockatoo (*Calyptorhynchus lathami lathami*)

The South-eastern Glossy Black cockatoo inhabits open forest and woodland habitats throughout the east coast of Australia from Central Qld to Victoria. The species rely on nine species of sheoaks (*Allocasuarina* spp. and *Casuarinaceae* spp.), which vary on the region. In the north-east NSW region, they show preference for forest oak (*Allocasuarina torulosa*) and black sheoak (*Allocasuarina littoralis*). Glossy black-cockatoos' nest in hollows in both living and dead mature eucalyptus trees, particularly in narrow-leaved ironbark, blue leaved ironbark and Blakely's Red Gum. Potential nest hollows are generally more than 8 metres above ground, located in branches with over 30 cm in diameter, and hollows with a minimum entrance diameter of 15 cm (DCCEEW, 2022). There is a Threat Abatement Plan for predation by feral cats 2024 available for the species. There is no Recovery Plan currently available for this species, however the decision that a Recovery Plan is required was made in July 2022.

This species was detected within the Subject Land. Its habitat is associated with all PCTs with suitable foraging resources and breeding habitat (i.e, nesting hollows in proximity to *Allocasuarina* spp.).

Bluegrass (*Dichanthium setosum*)

Bluegrass occurs mainly on the northern tablelands in the Saumarez area, west of Armidale. The species is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil, and can be found in partially disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture (DEWHA, 2008). The species distribution overlaps with the following EPBC Act-listed TECs relevant to this assessment:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland; and
- Upland Wetlands of the New England Tablelands and the Monaro Plateau.

There is a Threat Abatement Plan for competition and land degradation by rabbits available for the species. There is no Recovery Plan for this species.

Long-nosed Potoroo (*Potorous tridactylus tridactylus*)

The Long-nosed Potoroo has a broad and fragmented distribution across Southeast Queensland and NSW north coast, and are generally restricted to habitats 800 m above sea level and receiving an annual rainfall greater than 760 mm. The species occurs in a range of vegetation types from coastal scrub and heathy woodland to wet sclerophyll forest and rainforest. The optimum habitat has a dense understorey layer to provide cover, and sufficient open space beneath the sub-canopy to allow foraging.

They have been recorded in gullies and near creeks, and on highland, plateau and escarpment landscapes at over 600 m above sea level within a range of habitats from heath to sedge lands to subtropical rainforest. In low altitude and coastal habitats, the species occurs in scribbly gum woodlands with a heathy understory. The species rarely occurs in remnant vegetation patches smaller than 0.1 square kilometres (DAWE, 2022).

There is a Threat Abatement Plan for predation by feral cats 2024 and by European red fox 2008 available for the species. There is no Recovery Plan for this species.

This species has not been observed within the Subject Land. Observations of this species occur to the east of the Subject Land in larger patches of native vegetation not impacted by the Project. No known occupied habitat is to be adversely impacted by the Project.

8.7.1.2 SURVEYS

Surveys for MNES likely to be adversely impacted by the Project have been completed in accordance with relevant survey guidance outlined in BAM survey guidelines and/or survey requirements specified in the TBDC.

For threatened flora, surveys have been conducted using a combination of the survey grid and parallel transects methods described in the *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method*. Survey timing has been guided by the BAM-C. Details are provided in **Section 2.2.3**. Limitations are discussed in **Section 2.2.7**.

For threatened fauna, surveys have been conducted using published guidelines and/or survey guidance specified in the TBDC. Survey timing has been guided by the BAM-C. Details are provided in **Section 2.2.4** and **Section 2.2.5**. Weather details are specified in **Section 2.2.6** with limitations are discussed in **Section 2.2.7**.

The surveys performed for the assessment of the Projects impacts on MNES have either met or exceeded the Commonwealth requirements.

8.7.1.3 DESCRIPTION OF THE IMPACTS

As per the BAM, adverse impacts on MNES has been evaluated in terms of the Project direct (**Section 8.1**), indirect (**Section 8.2**) and prescribed impacts (**Section 8.3**). Further details on the Projects impact on MNES are provided in the Assessment of Significance provided in **Section 8.7.1.5**.

8.7.1.4 DESCRIPTION OF PROPOSED AVOIDANCE AND MITIGATION MEASURES

As per the BAM, the Project is required to demonstrate how it avoids and minimizes impacts on threatened species and ecological communities. MNES that may be adversely impacted by the Project have been considered in this manner as outlined in **Section 7.1** and **Section 7.2**. Efforts to mitigate impacts on MNES are outlined in **Section 8.4**.

8.7.1.5 IDENTIFICATION OF SIGNIFICANT RESIDUAL IMPACTS

Significant residual adverse impacts are to be identified for MNES affected by the Project (paragraph 16(v) of the supplementary SEARs).

Under the Bilateral agreement, both the NSW and Australian governments have endorsed the NSW BOS to avoid, minimize and offset biodiversity impacts on both NSW and Commonwealth listed threatened species and ecological communities to streamline outcomes. The Australian Government supports the use of the BAM as the underpinning method for calculating credit requirements (offsets).

A significant impact on MNES is defined in the Significance Assessment Guidelines for MNES as follows:

> A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance.

No specific definition exists for identifying a 'significant residual impact'. However, in considering the 'significant impact' definition above and the effect of the bilateral arrangements, it is considered that a reasonable definition of 'significant residual impact' is when both of the following are likely:

- The adverse impacts of a Project are assessed as having a significant impact; and
- The offsetting arrangements under the BOS are insufficient or inadequate to compensate for the residual impacts of the Project following consideration of the avoid, minimize and mitigation measures proposed.

Assessments of Significance have been performed to determine if the Project is likely to have a significant residual impact on MNES. A conclusion is provided, which indicates whether there is a low or high risk for a significant residual impact.

New England Peppermint Grassy Woodlands CEEC

An action is likely to have a significant impact on a Critically Endangered Ecological Community if there is a real chance or possibility that it will:
Reduce the extent of an ecological community
The estimated extent of this TEC across NSW in 2011 was 14,000 ha (woody extent), representing an 82.5% decline from a pre-European extent of 80,000 ha (TSSC, 2011). The current extent of this TEC is likely to be less than the 2011 estimates and the rate of annual loss is unknown. The Project is expected to clear 6.54 ha of the TEC in a woodland condition state and 13.40 ha of moderate condition grasslands. Relative to the 2011 estimates, this impact is estimated to be 0.05% of occurrence for woody vegetation extent. The extent of moderate condition grasslands is not known and has not been estimated. If incorporated into the woody vegetation loss, the Project would reduce the extent of this TEC by an estimated 0.14% of the extent of occurrence. The loss of low condition grasslands is estimated to be 14.27 ha and is not considered to form part of the CEEC on a condition state basis. The Project also proposed to revegetate 15 ha of New England Peppermint Grassy Woodland and Box Gum Woodland (proportion not yet defined). This allowance has the capacity to compensate for the loss of 6.54 ha of New England Peppermint Grassy Woodland being impacted that is in a woodland to open woodland condition state. On balance, the Project will not likely reduce the high condition states of this TEC within the local area.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
Most patches of the ecological community are small and are separated by treeless (cleared) lands. The degree of separation varies across the TECs extent; however, occurrence is commonly hallmarked by paddock trees and small patches with large inter tree/patch distances that often result in fragmentation outcomes (i.e., gaps greater than 30-100 m).
Adversely affect habitat critical to the survival of a species
By area, the largest impact of the Project in on low condition grasslands (31.84 ha), this being an artefact of the avoid and minimise efforts expended during design. Low condition grasslands are highly degraded and are not regarded as habitat critical to the survival of the TEC. This vegetation does not meet the condition threshold for inclusion in the TEC. While in slightly better condition, the extent of loss associated with the moderate condition grasslands (i.e., 13.40 ha) is not likely to adversely affect habitat critical to the survival of the TEC. These areas are not in a condition that would support most fauna that occupy this TEC. The removal of wooded patches of the ecological community has the potential to reduce habitat features, particularly hollows, that would adversely impact hollow-dependent species. Approximately 6.54 ha of woodland vegetation is to be removed by the Project, with a commensurate amount of revegetation works proposed as compensation for this loss. Mitigation measures to protect habitat quality of patches of the TEC adjacent to the Subject Land are proposed and little residual impact to habitat quality should occur. While an adverse impact is proposed on the TEC, it is considered that the compensatory measures proposed will result in a neutral impact locally. Offsetting residual impacts are independent of these works and are expected to achieve a no net loss outcome.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
The Project will result in the removal of small patches of TEC but will not result in the wholesale loss of landscapes that comprise factors necessary for the survival of the TEC. Local occurrences of the TEC are expected to remain unaffected by the Project.

An action is likely to have a significant impact on a Critically Endangered Ecological Community if there is a real chance or possibility that it will:
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
The community structure has been substantially modified across its extent of occurrence because of land clearing and modification in the past. Species composition has been simplified through historical land clearing, modification and introduction of alien species. The Project is not anticipated to further reduce the species composition and function of the TEC beyond the levels of disturbance currently observed, for areas not subject to clearing.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
The Project has the potential to introduce or increase occurrence of invasive, predatory and pest species as well as pathogens that may be harmful to the TEC. These risks have been identified to potentially result from increased vehicle movements and increased predatory and pest species access from clearing. These risks are to be mitigated through control measures including the implementation of a CEMP, CTMP and pest management control programs.
Interfere with the recovery an ecological community
Impacts to this TEC has been assessed for SAII in Section 9.1.2.2 of this report. The small extent of clearing required for the Project, in conjunction with the condition states of the landscape and the mitigation measures to manage residual impact to the TEC mean that the Project should not interfere with the recovery of the community.
Conclusion
The Project will have an impact on this MNES. First, there is a predicted loss of 0.04% to 0.12% of the CEEC across its range. The use of offsets is proposed to remedy this loss, which is to be done in accordance with the BAM. Compliance with the BAM means a no net loss outcome should be achieved. In addition, the Project aims to re-establish up to 15 ha of CEEC vegetation (both New England Peppermint Grassy Woodland and Box Gum Woodland). This is additional to the offsetting proposed and exceeds the loss of New England Peppermint Grassy Woodland present in a woody condition state. On balance it is considered that the Project is likely to have a neutral impact. This is premised on the outcomes of avoid, minimise and mitigate actions proposed in addition to offsetting through the BOS plus provision of local compensatory measures (i.e., re-establishment of woodlands through revegetation works). It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community

An action is likely to have a significant impact on a Critically Endangered Ecological Community if there is a real chance or possibility that it will:
Reduce the extent of an ecological community
Data limitations inhibit the calculation of an accurate aerial extent of this TEC. Vardan et al (2023) estimates NSW comprised 1,963,578 ha (in the likely category) as of 2017. Tozer and Simpson (2020) estimated of 250,729 ha to occur NSW in 2006, while Vardan et al (2023) estimated 1,817,576 ha to occur at that time. The total extent of the TEC is therefore likely to be somewhere between these two estimates. During the period 2009 – 2016 an average of 395 ha of Grassy Woodland (sensu (Keith, 2004), of which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is a major component) was lost annually across NSW to agriculture-related activities (cropping,

An action is likely to have a significant impact on a Critically Endangered Ecological Community if there is a real chance or possibility that it will:
conversion to pasture and thinning) and a further 155 ha/annum due to infrastructure developments (NSW DPIE 2019 in Tozer and Simpson 2020). The loss of woodland and open woodland vegetation relative to the total extent of the TEC in NSW is estimated to be 0.0002 to 0.0021% (i.e. 5.28 ha of 250,729 ha/1,963,578 ha). When incorporating moderate condition grasslands into this estimate (i.e., 11.12 ha), the loss is calculated to be between 0.0008 to 0.0065% of the TECs woody extent. Impacts on non-woody (grassland) low condition state are not included as these are not considered to form part of the TEC (below condition state threshold).
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
Most patches of the ecological community are small and are separated by treeless (cleared) lands. The degree of separation varies across the TECs extent; however, occurrence is commonly hallmarked by paddock trees and small patches with large inter tree/patch distances that often result in fragmentation outcomes (i.e., gaps greater than 30-100 m).
Adversely affect habitat critical to the survival of a species
By area, the largest impact of the Project in on low condition grasslands (14.27 ha), this being an artefact of the avoid and minimise efforts expended during design. Low condition grasslands are highly degraded and are not regarded as habitat critical to the survival of the TEC. This vegetation does not meet the condition threshold for inclusion in the TEC. While in slightly better condition, the extent of loss associated with the moderate condition grasslands (i.e., 11.12 ha) is not likely to adversely affect habitat critical to the survival of the TEC. These areas are not in a condition that would support most fauna that occupy this TEC. The removal of wooded patches of the ecological community has the potential to reduce habitat features, particularly hollows, that would adversely impact hollow-dependent species. Approximately 5.28 ha of woodland vegetation is to be removed by the Project, with a commensurate amount of revegetation works proposed as compensation for this loss. Mitigation measures to protect habitat quality of patches of the TEC adjacent to the Subject Land are proposed and little residual impact to habitat quality should occur. While an adverse impact is proposed on the TEC, it is considered that the compensatory measures proposed will result in a neutral impact locally. Offsetting residual impacts are independent of these works and are expected to achieve a no net loss outcome.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
The TEC largely occurs in the sheep wheat belt of NSW where widespread long-term agricultural production has resulted in modification to hydrology regimes and soil quality and therefore the Project is not anticipated to alter these abiotic factors further than the current levels of disturbance. Mitigation measures such as a SWMP will be implemented to manage impacts of the Project to the abiotic factors of the landscape.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
The community structure has been substantially modified across its extent of occurrence because of land clearing and modification in the past. Species composition has been simplified through historical land clearing, modification and introduction of alien species. The Project is not anticipated to further reduce the species composition and function of the TEC beyond the levels of disturbance currently observed, for areas not subject to clearing. No burning or flora or fauna harvesting will result from the Project.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or

An action is likely to have a significant impact on a Critically Endangered Ecological Community if there is a real chance or possibility that it will:
The Project has the potential to introduce or increase occurrence of invasive, predatory and pest species as well as pathogens that may be harmful to the TEC. These risks have been identified to potentially result from increased vehicle movements and increased predatory and pest species access from clearing. These risks are to be mitigated through control measures including the implementation of a CEMP, CTMP and pest management control programs.
Interfere with the recovery of an ecological community
Impacts to this TEC has been assessed for SAII in Section 9.1.2.1 of this report. The small extent of clearing required for the Project, in conjunction with the condition states of the landscape and the mitigation measures to manage residual impact to the TEC mean that the Project should not interfere with the recovery of the community.
Conclusion
The Project will have an impact on this MNES. First, the predicted loss of between 0.0002 to 0.0021% of the CEEC across its range. The use of offsets is proposed to remedy this loss, which is to be done in accordance with the BAM. Compliance with the BAM means a no net loss outcome should be achieved. In addition, the Project aims to re-establish up to 15 ha of CEEC vegetation (both New England Peppermint Grassy Woodland and Box Gum Woodland). This is additional to the offsetting proposed and exceeds the loss of New England Peppermint Grassy Woodland present in a woody condition state. On balance it is considered that the Project is likely to have a neutral impact. This is premised on the outcomes of avoid, minimise and mitigate actions proposed in addition to offsetting through the BOS plus provision of local compensatory measures (i.e., re-establishment of woodlands through revegetation works). It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Spotted-tail Quoll

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 Northern Tablelands region in NSW population of the *D. maculatus maculatus* prior to the 2019-20 bushfires were stable and estimated at approximately 130-150 individuals (Dawson, 2005). Due to their low densities and cryptic nature (Körtner, Holznagel, Felming, & Ballard, 2015), population estimates based on presence-only records may underrepresent their true size and distribution, complicating accurate assessment of population decline. While local declines have been observed or suspected across much of the species' range over the past few decades, in localised areas of NSW the species persisted in abundance until 2019 (Glen & Dickman, 2011). The presence of these 'strong hold' populations is likely to have bolstered the total population size for the species. Woodland habitat is situated within the Subject Land; however, areas have been avoided during refinement of the project design. It is considered unlikely that the proposed Project will lead to long-term decrease in the size of the species population. Pre-clearing surveys are to be conducted to ensure no individuals are impacted during construction.
Reduce the area of occupancy of the species
The area occupancy is estimated to be 2,512 km^2, with no extreme fluctuations in the population, extent of occurrence or area of occupancy have been recorded. Habitat loss arising from the Project is associated with small patches over a long linear length, which means that the total area of habitat loss (~120.37 ha) is not concentrated within the home range of any individual. For this reason, it is considered unlikely that the proposed Project will lead to reduction in the area of occupancy of the species population. Mitigation measures to protect the adjacent Oxley Rivers National Park from indirect impacts will ensure the area of occupancy is not reduced.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:
Fragment an existing population into two or more populations
D. maculatus maculatus populations are known to occur from camera trap monitoring sites across the Northern Tablelands within the Guy Fawkes River National Park, New England National Park, Oxley Wild Rivers National Park (Dawson, 2005). Individuals of this species are known to move through a variety of vegetation types and degraded lands, which the Project will not generate any barriers prohibiting free movement throughout the landscape. The Project is not anticipated to directly impact these populations, nor will it fragment any habitat corridors between the National Parks. Mitigation measures to protect the adjacent Oxley Rivers National Park from indirect impacts will ensure this population is not fragmented.
Adversely affect habitat critical to the survival of a species.
Critical habitat is described as large patches of forest with adequate denning and prey resources (DELWP, 2016). BioNet Atlas includes small patches, highly fragmented landscapes and paddock trees as habitat in cleared landscapes. Woody vegetation has been avoided to reduce direct impacts to the species however small patches and paddock trees will be cleared. The Project will impact many small patches of vegetation over a large linear length, thus minimizing any concentrated impact on an individual's home range. Critical habitat present in the neighbouring Oxley Wild Rivers NP is to be protected from indirect impacts resulting from the Project through mitigation measures.
Disrupt the breeding cycle of a population,
Direct impacts to the Subject Land are not anticipated to disrupt the breeding cycle of the species and indirect impacts to the neighbouring Oxley Wild Rivers NP will be mitigated to ensure no disruption occurs to this known population, including barriers to prevent light and noise spill into the NP.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape and it is unlikely to significantly reduce habitat for *D. maculatus maculatus*. The proposed locations of the Project's turbines are mostly within existing cleared areas or if not, within edge habitat or habitat that is already highly disturbed (i.e., cleared/grazed and exotic understorey). The operational impacts would also be very minimal for this species. Edge effects are to be mitigated through management plans.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.
The Project would not be responsible for the introduction of harmful invasive species to the Subject Land (such as cats, foxes etc.) (TSSC, 2020). It is considered that the proposed Project is not anticipated to involve any activities that have the potential to result in an increased potential for invasive species incursions that are harmful to the species. It is anticipated that the proposed Project will include the development and implementation of a weed and pest management plan which will have a net-positive impact on the existing level of invasive species within the locality.
Introduce disease that may cause the species to decline, or
There is currently limited evidence of diseases causing detrimental effects on the *D. maculatus maculatus* population in NSW.
Interfere with the recovery of the species.
As described in the national recovery plan for the species, to reduce the rate of decline and ensure maintenance of viable populations, a reduction in habitat loss and fragmentation, road mortalities, deliberate killings, predation and cane toad poisoning is required (DELWP, 2016). Impacts to habitat loss have been minimised will prescribed impacts such as road mortality and indirect impacts such as predation are to be managed through the implementation of pest management control programs and therefore no interference with the recovery of the species is anticipated to occur.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:
Conclusion
The Project will result in the loss of an estimated 120.37 ha of woody vegetation (habitat) in small patches across a large linear Project without adversely impacting the integrity and/or connectivity of larger vegetation patches that may be important to an individual. The Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Koala

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 population
The proposed locations of the Project's turbines are mostly within existing cleared areas, or if not, within edge habitat or highly disturbed habitat. The area of native vegetation removal required for the Project is very minor (104.81 ha) in the context of the surrounding landscape; it is unlikely to significantly reduce habitat for P. cinereus. It is considered unlikely that the Project will lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species
P. cinereus area of occupancy as stated in the species conservation advice is 19,428 km2 (DAWE, 2022). The proposed locations of the Project's turbines are mostly within existing cleared areas, or if not, within edge habitat or highly disturbed habitat. The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape; it is unlikely to significantly reduce habitat for P. cinereus. The Project is unlikely to reduce the area of occupancy of the species.
Fragment an existing population into two or more populations
The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape; it is unlikely to significantly reduce foraging habitat for P. cinereus and would not fragment or isolate any areas of habitat. The Project is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species
There is no listed habitat critical to the survival of P. cinereus. The Project is unlikely to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of a population
As detailed in the BDAR, targeted surveys for P. cinereus were undertaken by species experts; the species was not recorded, scat has been found and identified. It cannot be discounted that P. cinereus may occasionally occur in the Subject Land, but the Subject Land is unlikely to provide breeding habitat. The Project is unlikely to disrupt the breeding cycle of a population.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline
The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape; it is unlikely to significantly reduce foraging habitat for P. cinereus and would not fragment or isolate any areas of habitat. The Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:
Result in invasive species that are harmful to a vulnerable species becoming established in the critically endangered or endangered species' habitat
The Project would not be responsible for the introduction of harmful invasive species to the Subject Land (such as dogs). The Project is unlikely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
Introduce disease that may cause the species to decline
The Project is unlikely to introduce any diseases (such as Chlamydia) that may cause the species to decline.
Interfere with the recovery of the species
The DAWE (2022) recovery plan for P. cinereus has been reviewed. For the reasons already stated above, the Project is unlikely to interfere with the recovery of the species.
Conclusion
The Project will result in the loss of an estimated 104.81 ha of woody vegetation (habitat) in small patches across a large linear Project without adversely impacting the integrity and/or connectivity of larger vegetation patches that may be important to an individual. The Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Narrow-leaved Black Peppermint

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 narrow-leaved Black Peppermint is known to occur within and surrounding the Subject Land. The species inhabits grassy woodlands, usually on lower slopes in landscapes. No important populations are listed under the Conservation Advice for the species. However, it is known to occur in fewer than 40 localities (DEWHA, 2008). Based on ALA and BioNet records, there appears to be a substantial population east of Armidale, which is over 30 km north of the Subject Land. An important population is defined as necessary for a species' long-term survival and recovery (DoE, 2013). The Project would result in direct impact/removal of 136 individuals. Adjacent records are quite scattered (due to the nature of the species often occurring on private property and roadsides). It is therefore not expected that the individuals within the Subject Land would form part of an important population. Due to the available habitat utilised by the species in surrounding areas, the Project is not expected to lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population
The area of occupancy for the species has not been identified. No important populations have been listed, and, further, the species' records within and surrounding the Subject Land are scattered. Therefore, the importance of the individual impacted is expected to be minor. There would be opportunity for the species to re-establish in and around areas impacted by the Project. The Project is not expected to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations
Based on ALA and BioNet records, it appears that populations are somewhat well connected. However, the main identified threat to the species is clearing and fragmentation of habitat. As the species is known to occur commonly on private property (particularly agricultural lands) and on roadsides, the species distribution is not limited to reserves or conservation areas unlike many other threatened flora species. While the Project would further fragment known areas, the population is not expected to be important (as no important populations are listed).

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
Further, the species is known to occur within more than 30 localities. As such, the Project would be unlikely to result in the fragmentation of an existing important population.
Adversely affect habitat critical to the survival of a species
No habitat critical to the survival of the species has been listed. Due to the distribution of the species across the wider landscape, the individuals impacted by the Project are not expected result in an adverse effect to habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population
The collection of seeds for horticulture is a threat to the Narrow-leaved Black Peppermint. No further threats to the breeding cycle of the species have been outlined in the Conservation Advice. No important populations have been listed. It is unlikely that the Project's expected level of disturbance would disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project would result in direct clearing of 136 individuals and would decrease the availability of habitat. However, this impact is not to the extent that the species is expected to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Domestic stock grazing and the invasion and spread of exotic species (such as Coolatai and African Love Grass) are identified threats to the Narrow-leaved Black Peppermint. Biosecurity mitigation measures would be put in place to minimise the spread of invasive species. The residual impacts are not expected to result in a substantial establishment of invasive species.
Introduce disease that may cause the species to decline, or
The Conservation Advice for the species does not list any disease that may cause the species to decline. The Project is not expected to increase the risk of diseases that may cause the species to decline.
Interfere substantially with the recovery of the species
Threats to the species include inappropriate fire regime, livestock grazing, firewood collection, clearing and fragmentation of habitat. Protecting private property occurrences of the species is important to the survival and recovery of the species (DEWHA, 2008). The Project would impact 136 individuals known to occur on private property. These impacts are not expected to be substantial, however. There are no adopted or made Recovery Plans for the Narrow-leaved Black Peppermint. The impacts to 136 individuals identified in the Subject Land is unlikely to interfere substantially with the recovery of the Narrow-leaved Black Peppermint.
Conclusion
The Project will result in the loss of an estimated 136 individuals, with a larger quantum to be retained within the local area. The Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Greater Glider

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
It's estimated that the current population of *P. volans* ranges from 10,000 to 30,000 individuals left in the wild and is currently facing a declining trend (DCCEEW, 2022). It's unlikely that the Project will result any significant impact to the species that will lead to a long-term decline in the size of the population.

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 area of occupancy of the species
The area of occupancy is facing a declining trend, due to land clearing, with the value being an estimated value of 15,316 km^2 (DCCEEW, 2022). It's unlikely that the Project will result in any significant impact to the species that will reduce the area of occupancy of the species.
Fragment an existing population into two or more populations
It's stated that all known populations of the species are important. There's no evidence of any unknown extant population occurring within the Project Area. It's unlikely that the Project will result in any significant impact to the species that will fragment an existing population.
Adversely affect habitat critical to the survival of a species.
Habitat critical for the survival of the species include the following: Large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region. Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/ or that enable recolonisation. Cool microclimate forest/ woodland areas (e.g., protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes). Short-term, or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas. The Subject Land does not occur in a 'mapped important area' and minimal impacts to critical habitat may occur. The Project is unlikely to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of a population,
The relatively low reproductive rate of the species may render small populations in isolated remnants prone to extinction. Habitat known to occur adjacent to the Subject Land that may support breeding is to be protected from indirect impacts of the Project through mitigation measures, including controls to construction hours, noise and light spill. It's unlikely that the Project will result in any significant impact to the species that will result in a disruption the breeding cycle.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The area of native vegetation removal required for the Project is 91.0 ha across numerous small patches across a long linear project length. Also, most of the proposed locations of the turbines are within existing cleared areas (or at least highly disturbed areas) and it is considered unlikely that their presence will affect nomadic flight paths (which would be more likely to occur across the surrounding vegetated areas). The Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.
The potential for the Project to introduce pest and predatory species that may impact species habitat adjacent to the Subject Land are to be managed through mitigation measures including a pest management control program. No residual impact from invasive species should occur.
Introduce disease that may cause the species to decline, or
The Project is unlikely to introduce any diseases that may cause the species to decline.
Interfere with the recovery of the species.
In the absence of a recovery plan, assumptions can be made that recovery is dependent on factors such as reduction in habitat loss and fragmentation and predation. Impacts to habitat loss have been minimised will prescribed impacts such as road mortality and indirect impacts such as predation are to be managed through the implementation of pest management control programs and therefore no interference with the recovery of the species is anticipated to occur.

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:
Conclusion
The Project will result in the loss of an estimated 91.0 ha of woody vegetation (habitat) in small patches across a large linear Project without adversely impacting the integrity and/or connectivity of larger vegetation patches that may be important to an individual. The Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Beadle's Grevillea

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
There are four separate localities in which the Beadle's grevillea is known to occur in Northern NSW. The Project is closest to a population on the tablelands above the Macleay Gorges escarpment near Enmore (Threatened Species Scientific Committee, 2015). The closest record within the last 20 years was identified in 2022 on ALA approximately 7 km from the Project Area. Most records are an additional 9 km further north. Targeted surveys were undertaken via walking transect method in 2025 as well as via a two-phase grid approach in previous years. Despite extensive surveys in native vegetation mapped as PCT 567 following the BAM, the species was not identified. The Project is not expected to directly impact any individuals and no residual impacts to nearby populations are expected. As such, the Project is not expected to result in a decrease in the size of a population.
Reduce the area of occupancy of the species
The Project would result in the removal of 126.37 ha of PCT 567 which is associated with the species (of varying conditions). This area is unoccupied and as such the Project is unlikely to have an impact on the species' area of occupancy. The Project is not likely to reduce the extent of occurrence.
Fragment an existing population into two or more populations
No individuals were identified during surveys. Recent records of the species are all located to the north of the Project Area. As such, the Project is not expected to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species
The species is known to have a restricted and severely fragmented geographic distribution (Threatened Species Scientific Committee, 2015). The Conservation Advice for the species does not identify any habitat critical to the survival of the species. The species was not identified Land and as such no known habitat is present within the Subject Land. Therefore, it is unlikely that the Project would adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population
Inappropriate fire regimes can impact seed germination. However, the Project is not expected to result in a change to fire regimes that may impact nearby known habitat. The Project is not expected to disrupt the breeding cycle of a population of the Beadle's Grevillea.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project would result in the removal of 126.37 ha of PCT 567 which is associated with the species (of varying conditions). This vegetation was surveyed, and the Beadle's Grevillea was not identified. As such, the Project would not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

An action is likely to have a significant impact on an Endangered Species if there is a real chance or possibility that it will:
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Grazing and trampling by introduced herbivores such as horses, goats or other livestock are a threat to the species. The Project is not expected to result in an increase in invasive species being established in habitat for the Beadle's Grevillea. The Subject Land has been surveyed and no individuals were identified.
Introduce disease that may cause the species to decline, or
The Conservation Advice for the species does not list any known diseases that may cause the species to decline.
Interfere with the recovery of the species
Conservation and management priorities include fire; habitat loss disturbance and modifications; impacts of domestic species; and stakeholder management. As the species is not known to occur within the Subject Land, land disturbance is not expected to interfere with the recovery of the species. No further recovery priorities would be interfered with from the Project.
Conclusion
The Project is not likely to have an adverse impact on Beadle's Grevillea as the species has not been observed within the impact area. PCT associated habitat does occur within the Subject Land, however, microhabitats are absent. On this basis it is considered that the Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Brush-tailed Rock-wallaby

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
While there is little known about the population structure of the Brush-tailed Rock-wallaby, some known important populations have been identified (Menkhorst & Hynes, 2010). Two important populations are known in Victoria and six are known in NSW. The closest important population is the Macleay River and Clarence River gorge complexes which is within approximately 50 km of the Subject Land. This is the largest known population in Australia. Additional populations are expected to exist although haven't been recorded in South-east Queensland and NSW. Refuge habitat consists of rock faces or outcrops with large boulders, ledges and caves. The species was not identified in the Subject Land during targeted surveys, nor is there presence of suitable refuge habitat. Due to the lack of suitable refuge habitat adjacent to a known important population, the Project is not expected to lead to any decrease in the size of this important population.
Reduce the area of occupancy of an important population
The area of occupancy is estimated to be between 2,328 km^2 and 100,000 km^2 (DCCEEW, 2025). As the full range of the species is not actively surveyed these values are variable and expected to be an underestimate. The extent of occurrence was calculated to be approximately 390,000 km^2. The Subject Land is within approximately 50 km of a known important habitat (Macleay Gorges region). Native vegetation within the Subject Land would be suitable foraging habitat for the species if in association with rocky terrain, which comprises the core part of an individual's home range. The combination of these habitat features are not present within the Subject Land. As such the Project is not expected to reduce the area of occupancy of an important population.

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
Fragment an existing important population into two or more populations
During construction, connectivity between patches of potential foraging habitat for the Brush-tailed Rock-Wallaby may be reduced. However, these impacts would be largely temporary and are not expected during operation. Further, no individuals were observed during targeted surveys. The Project would not result in fragmentation of the known important population (Macleay Gorges region). This population is to the northeast of the Subject Land. Based on a review of aerial imagery, potential rocky habitat near the Project Area appears only to occur on the north and east of the Subject Land, indicating that the Project would not fragment any breeding or refuge habitat. The Project would not fragment an existing important population.
Adversely affect habitat critical to the survival of a species
No Critical Habitat as defined under section 207A of the EPBC Act has been identified (DCCEEW, 2025). However, refuge areas, foraging habitat and commuting routes could be considered habitat critical for the survival of the Brush-tailed Rock-wallaby (DCCEEW, 2025). The species' home range is approximately 15 ha. No refuge areas (rocky habitat) are within or directly adjacent to the Subject Land. Commuting routes and movement corridors are not within the Subject Land due to the lack of suitable foraging habitat directly adjacent to rocky refuge areas, and the lack of individuals identified during surveys. Native vegetation impacted by the Project may provide potential foraging habitat for the species. However, as targeted surveys did not identify any individuals, the habitat is not considered critical to the survival of the species.
Disrupt the breeding cycle of an important population
Most colonies of the species consist of less than 13 individuals (DCCEEW, 2025). Rocky refuge areas with ledges, caves and potential pathways are important for the reproductive ecology of the species. As no rocky refugees would be impacted, the Project is not expected to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project may decrease available foraging habitat within 50 km of an important population. However, no individuals were identified within the Subject Land. Further, there is suitable adjacent foraging habitat closer to rocky areas where the species is known that would not be impacted by the Project.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Weed invasion following disturbance, and habitat degradation and competition from introduced herbivores (such as rabbits, goats, horses, dear) are known threats to the Brush-tailed Rock-wallaby (DCCEEW, 2025). The conservation advice also lists feral cats and red foxes as predators of this species. Feral cats and red foxes are known to occur within the Project Area. Provided biosecurity measures are put in place to minimise the spread of weeds, the Project is not expected to result in the establishment of invasive species harmful to the species.
Introduce disease that may cause the species to decline, or
Hydatid disease caused by Echinococcus granulosis can infect the species spread via canids. The disease can cause pulmonary impairment and death and is considered an important cause of mortality in some areas of Queensland (Menkhorst & Hynes, 2010). However, prevalence is not known in the rest of the species' range.
The Project is not expected to increase the risk of diseases that may cause the species to decline.
Hydatid disease caused by *Echinococcus granulosis* can infect the species spread via canids. The disease can cause pulmonary impairment and death and is considered an important cause of mortality in some areas of Queensland. However, prevalence is not known in the rest of the species' range. The Project is not expected to increase the risk of diseases that may cause the species to decline.

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
Interfere substantially with the recovery of the species
Land clearance and clearing of native vegetation is a listed threatening process for the species (Menkhorst & Hynes, 2010). While the Project is expected to result in the clearing of native vegetation, this is not important habitat for the species as it doesn't consist of rocky habitat and the species was not observed during targeted surveys. The National Recovery Plan lists several objectives that aim to reduce impact to the species and further species knowledge.
Conclusion
The Project is not likely to have an adverse impact on the Brush-tailed Rock Wallaby as the species has not been observed within the impact area nor is there habitat likely to be occupied by the species within the impact area. On this basis it is considered that the Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

White-throated Needletail

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 area of native vegetation removal required for the Project is minor in the context of the surrounding landscape and impacts associated with the Project would be more related to wind turbine collision risk. Of note are the proposed locations of the Project's turbines being mostly within existing cleared areas, or if not, within edge habitat or highly disturbed habitat. *H. caudacutus* is more commonly recorded over wooded habitats (TSSC 2019), and the locations of the turbines in cleared areas would reduce collision risk for the species. Section 7.3.1 of the BDAR provides an assessment of the impacts from wind turbine strike. To address uncertainties, the Project proposes to develop a BBAMP, which will outline monitoring measures, key thresholds for determining permissible impacts and corrective actions that are required to achieve the BBAMP objectives (which are essentially to minimise impacts on birds and bats during the operational phase). Annual losses from turbine strike are predicted. However, it is considered that these losses represent a small percentage of the important population size and are not of a magnitude that would lead to the long-term decrease in this important population. Triggers for corrective actions are proposed to aid in the management of impacts on the species.
Reduce the area of occupancy of an important population
This species may be subject to barrier impacts as a result of the Project with the wind turbines disrupting flight paths of the aerial species. Barrier impacts are addressed in the BBAMP and mitigated where possible.
Fragment an existing important population into two or more populations
This species is a highly mobile species that migrates southwards over large areas of coastal Eastern Australia in the spring, summer, and autumn seasons (TSSC, 2019). It's unlikely to fragment an existing population into two.
Adversely affect habitat critical to the survival of a species
There is no listed habitat critical to the survival of *H. caudacutus*. The Project is unlikely to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population
This species breeds in Asia and therefore no impacts to the breeding cycle will occur from the Project.

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project's proposed wind turbine locations are mainly in existing cleared areas, which minimises vegetation removal and reduces turbine collision risk, as *H. caudacutus* prefers to fly over wooded habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Based on the Referral Guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015), invasive species that are harmful to the white-throated needletail are unknown. The Project is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat.
Introduce disease that may cause the species to decline, or
There are no known diseases that present a threat to *H. caudacutus* that may be introduced on the site.
Interfere substantially with the recovery of the species
For the reasons stated above, the Project is unlikely to interfere substantially with the recovery of the species.
Conclusion
It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Glossy-black Cockatoo

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 area of native vegetation removal required for the Project is minor in the context of the surrounding landscape. The Glossy-black Cockatoo is mostly recorded in open forest habitats where it relies on sheoaks (*Allocasuarina* spp.) for foraging and nest hollows in mature trees for breeding (DCCEEW 2022). These habitat values are largely restricted to scattered woody vegetation in the eastern half of the Subject Land, and more commonly further to the east, north and south outside agricultural areas. The Project will clear a small area of habitat that comprises low density occurrences of *Allocasuarina littoralis* and some hollow-bearing trees. Scattered observations of the Glossy-black Cockatoo in the east suggest that these resources (foraging and potentially breeding) may be periodically utilized. The predicted loss of suitable habitat to be 7.49 ha spread across several patches of vegetation. The main area of available habitat for the species in the local area is in the adjoining Oxley River National Park, which is not being impacted by the Project. Impacts associated with the Project are most likely related to wind turbine collision risk. Of note are the proposed locations of the Project's turbines being mostly within existing cleared areas, or if not, within edge habitat or highly disturbed habitat., and the locations of the turbines in cleared areas would reduce collision risk for the species. Section 7.3.1 of the BDAR provides an assessment of the impacts from wind turbine strike. To address uncertainties, the Project proposes to develop a BBAMP, which will outline monitoring measures, key thresholds for determining permissible impacts and corrective actions that are required to achieve the BBAMP objectives (which are essentially to minimise impacts on birds and bats during the operational phase). The collision risk assessed for this species is moderate with the likelihood for collision at its greatest when moving through the landscape. Again, this type of impact is likely restricted to the eastern half of the Project Area. The frequency of collisions is not known, however, is not likely to be high as the availability of foraging and breeding resources within the Project Area is limited.

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
Collisions, if they occur, are likely to be very infrequent and not result in the loss of individuals that would lead to the long-term decrease in this important population. Triggers for corrective actions are proposed to aid in the management of impacts on the species.
Reduce the area of occupancy of an important population
This species may be subject to barrier impacts as a result of the Project with the wind turbines disrupting flight paths of the aerial species. Barrier impacts are addressed in the BBAMP and mitigated where possible.
Fragment an existing important population into two or more populations
This species is a highly mobile species that migrates southwards over large areas of coastal Eastern Australia. It's unlikely to fragment an existing population into two.
Adversely affect habitat critical to the survival of a species
There is no listed habitat critical to the survival of *the* Glossy-black Cockatoo. The Project is unlikely to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population
The Project will result in an estimated loss of 7.49 ha of habitat that may be used for breeding. This loss occurs in small discrete patches across a large area that is unlikely to have an adverse impact of consequence on an individual breeding pair. The use of foraging resources within the Project Area is likely to be limited to a few individuals as there is a low quantum of available resources. Movement into and out of the Project Area may expose individuals collision risk and consequently may result in the mortality of breeding individuals. Again, the loss associated with this impact is likely to be localized and not sufficient broad to adversely impact the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project's impact on habitat is restricted to 7.49 ha over a large area. Habitat loss is spread across several patches and is not concentrated on any singular patch. This loss of habitat is not likely cause decline in the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Project is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat.
Introduce disease that may cause the species to decline, or
There are no known diseases that present a threat to the Glossy-black Cockatoo that may be introduced on the site.
Interfere substantially with the recovery of the species
For the reasons stated above, the Project is unlikely to interfere substantially with the recovery of the species.
Conclusion
It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Bluegrass

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 Project will result in the removal of low condition native vegetation nearby observed occurrences of the Bluegrass. The Project has avoided known occurrences of the Bluegrass, with the extent of survey effort demonstrating that the Project is not likely to directly impact the species. The Project is not likely to decrease the size of an important population of this species.
Reduce the area of occupancy of an important population
The Project has avoided known occurrences of the species. Most of the potential habitat occurring within the Subject Land is low to moderate condition grasslands and grassy woodland, with survey effort indicating the species is absent from these habitats. The Project is not likely to reduce the area of occupancy of an important population of this species.
Fragment an existing important population into two or more populations
Bluegrass predominantly occurs to the west and north of the Subject Land, with potential habitat ceasing to the east. No records of the species occur east of those observed within the Project Area. Further, the clearing footprint of the linear Project is of insufficient size and orientation to fragment the species. The Project is not likely to fragment an existing population into two.
Adversely affect habitat critical to the survival of a species
There is no listed habitat critical to the survival of Bluegrass. The Project is unlikely to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population
Disruption of the breeding cycle of this species at the scale of an important population would require .
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project has been designed to avoid known occurrences of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Project is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat.
Introduce disease that may cause the species to decline, or
There are no known diseases that present a threat to Bluegrass that may be introduced on the site.
Interfere substantially with the recovery of the species
For the reasons stated above, the Project is unlikely to interfere substantially with the recovery of the species.
Conclusion
It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Narrow-leaved Bertya

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 Narrow-leaved Bertya is found amongst rocks or near cliff-edges on the New England Tablelands of NSW. Surveys were conducted in vegetation communities associated with the species (PCT 567) and the species was not observed. There are no records within 10 km of the Subject Land and no suitable rocky habitat is present. The Project would not lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species
The species has not been observed within or adjacent to the Subject Land. No cliffs, escarpments or rocky areas are present within the Subject Land. The Project would not reduce the area of occupancy of the species.
Fragment an existing population into two or more populations
All populations of the Narrow-leaved Bertya are within the Oxley Wild Rivers National Park (DEWHA, 2008). Two of these populations are approximately 13 km north of the Subject Land. There is no suitable rocky habitat within the Subject Land that would be directly impacted or fragmented. Due to the distance of the Subject Land from the known populations and suitable habitat, the Project is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species
No habitat critical to the survival of the Narrow-leaved Bertya has been outlined in the Conservation Advice. The species is known to grow on rock ledges and in crevices near gorges. As the species was not observed and there was no suitable habitat within or directly adjacent to the Subject Land, the Project would not affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population
It is predicted that the introduced European Honey Bee (*Apis mellifera mellifera)* impacts the pollination of the species. There is no suitable habitat for the species in the Subject Land and no individuals were identified during targeted surveys. The Project is not expected to impact the breeding cycle of the species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The species is only found within rocky habitat. No suitable habitat is within the Subject Land. As a result, the Project would not modify, destroy, remove or isolate or decrease the availability or quality of habitat.
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 Project is located a substantial distance from known individuals. Biosecurity measures would be put in place to minimize the spread of invasive species. The Project is not expected to result in the spread or establishment of invasive species in or near habitat for the Narrow-leaved Bertya.
Introduce disease that may cause the species to decline, or
The Conservation Advice does not list any known diseases that may cause the species to decline. The Project is not located near any known individuals and as such no diseases would likely be introduced that may cause the species to decline.
Interfere with the recovery of the species
Grazing from herbivores, notably goats are expected to be the main threat to the species. The Project is not located in or near known suitable habitat for the species. The Project is not expected to interfere with the recovery of the species.

An action is likely to have a significant impact on an Endangered Species if there is a real chance or possibility that it will:
Conclusion
The Project is not likely to have an adverse impact on Narrow-leaved Bertya as the species has not been observed within the impact area. PCT associated habitat does occur within the Subject Land, however, microhabitats are absent. On this basis it is considered that the Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Austral Toadflax

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
Species density within a known population can vary from 1 plant per 1 m² to 1 plant per 100 m². Given the small number of individuals making up known populations, disturbance to any individuals within known habitat has potential to lead to a long-term decrease in the size of a population. The species is associated with several PCTs within the Subject Land which were surveyed in accordance with the BAM. During targeted surveys, the species was identified within the road reserve. Individuals were identified and would be directly impacted by the Project. However, there are several scattered records of the species in surrounding habitat outside of the Subject Land. The distribution of the species is quite large, and occurrences do not only exist within discrete, fragmented populations. The population identified within the Subject Land is: ▪ Not near the limit of the species range ▪ Unlikely to be necessary for maintaining genetic diversity ▪ Unlikely to be a key source population for dispersal As such, the population identified within the Subject Land is not expected to be an important population. While direct impacts are expected to individuals, the Project is not expected to lead to a long-term decrease in the size of an important population
Reduce the area of occupancy of an important population
The species is known to occupy a large distribution. The Area of Occupancy for the species has not been outlined in the Conservation Advice (DoE, 2013). Approximately 0.06 ha of occupied habitat is mapped within the Subject Land (road reserve), with the size of this population being unknown as individuals were observed to extend into the adjoining freehold land. The species that would be impacted by the Project are not expected to form part of an important population. Post construction, there would be opportunity for the species to re-establish in grassland habitat, especially considering the species cope well with disturbance (DCCEEW, 2025). The Project would marginally reduce the area of occupancy for the species. However, it is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations
The species is often found in small and scattered populations in grasslands or woodlands. There is suitable adjacent habitat surrounding the Subject Land. The Project would not implement barriers preventing dispersal of the species outside of the Subject Land where adjacent suitable habitat would not be impacted. Further, the population identified within the Subject Land is unlikely to be important. Therefore, the Project is unlikely to fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species
The species Conservation Advice has not defined habitat critical to the survival of this species. Suitable habitat for the species would remain available outside the Subject Land. The Project is unlikely to adversely affect habitat that is critical to the survival of the species.

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
Disrupt the breeding cycle of an important population
Little is known about the ecology and biology of this species. It is known to be semi-parasitic on roots of Kangaroo Grass (*Themeda triandra)* and other grasses. Conservatively, it is considered that any disturbance to known habitat or individuals of the species may disrupt its breeding cycle. The Project would not alter further abiotic conditions that may affect the species such as fire regimes. Disturbance is understood to allow the existence of buds to resprout and as such disturbance from construction is not expected to have a substantial impact on the breeding cycle. The individuals identified within the Subject Land are not expected to form part of an important population. Therefore, the Project is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
There is extensive vegetation mapped as PCTs which are associated with the species in surrounding areas that would not be directly impacted by the Project. It is unlikely that the Project's expected level of disturbance would decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Weed invasion is listed as one of the key threats impacting this species (DoE, 2013). While biosecurity mitigation measures would be implemented, Project construction may result in an increase of weeds in and adjacent to the Subject Land. The residual impacts are not expected to cause a substantial increase in invasive weeds within habitat for the Austral Toadflax, especially considering the species is known to cope well with disturbance.
Introduce disease that may cause the species to decline, or
No diseases are listed in the conservation advice as causing the species to decline. As such, the Project is not expected to introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species
Lack of fire or other disturbance and grazing of herbivorous species are key threats to the species. There is no recovery plan specific to the Austral Toadflax. Priority actions for the species relate to: Habitat loss, disturbance and modification Trampling, browsing and grazing ▪ Fire ▪ Conservation Information ▪ Population recruitment and translocation ▪ Invasive weeds While the Project would disturb habitat, it is not expected to interfere substantially with the recovery of the species.
Conclusion
The Project will have an adverse impact on Austral Toadflax as the species has been observed within the impact area. Presence is limited to an area of 0.06 ha. On this basis it is considered that the Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Long-nosed Potoroo

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
Important populations for the species have been identified to occur in the nearby Oxley Wild Rivers NP, Guy Fawkes River NP and New England and Cathedral Rock NPs. Direct impacts to these populations will not result from the Project. It is considered unlikely that the proposed Project will lead to a long-term decrease in the size of the species population.
Reduce the area of occupancy of an important population
The modelled area of occupancy for the subspecies is estimated to be 512 km^2 throughout NSW. The important populations occurring in the adjacent National Parks will not be directly impacted by the Project and therefore the Project should not reduce their area of occupancy. Mitigation measures to control indirect impacts to adjacent habitat will be implemented.
Fragment an existing important population into two or more populations
The important population occurring in the Oxley Wild Rivers National Park will not be fragmented as a result of the Project and connectivity between the important populations within the other surrounding National Parks will not be fragmented as a result of the Project.
Adversely affect habitat critical to the survival of a species
Habitat critical to the survival of the species has been identified as occupied or unoccupied forested habitat larger than 0.1 km^2 that may provide future habitat for expansion or translocation. Wooded areas in the Subject Land do meet this criteria, and these direct impacts have been minimised where possible. Mitigation measures to reduce indirect impacts such as edge effects to this adjacent habitat are to be implemented.
Disrupt the breeding cycle of an important population
The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape and it is unlikely to significantly reduce habitat for *P. tridactylus tridactylus*. The proposed locations of the Project's turbines are mostly within existing cleared areas or if not, within edge habitat or habitat that is already highly disturbed (i.e., cleared/grazed and exotic
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape and it is unlikely to significantly reduce habitat for *P. tridactylus tridactylus*. The proposed locations of the Project's turbines are mostly within existing cleared areas or if not, within edge habitat or habitat that is already highly disturbed (i.e., cleared/grazed and exotic understorey). The operational impacts would also be very minimal for this species. It is considered unlikely that the proposed Project will decrease in the availability of suitable habitat for the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The potential for the Project to introduce pest and predatory species that may impact species habitat adjacent to the Subject Land are to be managed through mitigation measures including a pest management control program. No residual impact from invasive species should occur.
Introduce disease that may cause the species to decline, or
The Project is unlikely to introduce any diseases, such as Toxoplasmosis that the species is vulnerable to, that may cause the species to decline.
Interfere substantially with the recovery of the species
The overall objective of the species recovery plan is: Habitat is protected to prevent further loss or fragmentation of the species.

An action is likely to have a significant impact on a Vulnerable Species if there is a real chance or possibility that it will:
It is considered unlikely that the proposed Project will interfere with the above objectives and recovery of the species.
Conclusion
The Project is not likely to have an adverse impact on the Long-nosed Potoroo as the species has not been observed within the impact area. Occurrence of the species is to the east and outside the Project Area. On this basis it is considered that the Project is not likely to have a significant impact on this MNES. It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Fork-tailed Swift

An action is likely to have a significant impact on a Migratory Species if there is a real chance or possibility that it will:
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
The area of native vegetation removal required for the Project is very minor in the context of the surrounding landscape and impacts associated with the Project would be more related to wind turbine collision risk. Section 7.3.1 of the BDAR provides an assessment of the impacts from wind turbine strike. To address these uncertainties, the Project proposes to develop a BBAMP. The BBAMP will outline monitoring measures, key thresholds for determining permissible impacts and corrective actions that are required to achieve the BBAMP objectives (which are essentially to minimise impacts on birds and bats during the operational phase). This is discussed in Section 7 of the BDAR. The Project is unlikely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for *A. pacificus*.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species
The Project is unlikely to result in the introduction of any invasive species that are harmful to A. pacificus.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species
For the reasons stated above, the Project is unlikely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of *A. pacificus*.
Conclusion
The Project is not likely to have a significant residual impact on this MNES.

8.7.1.6 DESCRIPTION OF THE OFFSETS PROPOSED

The 'no net loss' standard applies to the Project, which means that the residual impact of the Project is fully offset through the NSW BOS. As per the BAM, residual impacts are quantified for the purposes of determining the Projects biodiversity offset requirements. This is outlined in **Section 9** and **Section 10**. These offsets include ecosystem and species credit requirements. How they relate to MNES that may be adversely impacted by the Project is outlined below.

Ecosystem Credits

The acquisition and retirement of ecosystem credits for the Project, as specified in **Section 10**, will produce a 'no net loss' outcome for the following MNES:

- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community;
- Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*);
- White-throated Needletail (*Hirundapus caudacutus*); and
- Fork-tailed Swift (*Apus pacificus*).

Species Credits

The acquisition and retirement of species credits for the Project, as specified in **Section 10**, will produce a 'no net loss' outcome for the following MNES:

- Koala (combined populations of QLD, NSW and ACT) (*Phascolarctos cinereus*);
- Narrow-leaved Black Peppermint (*Eucalyptus nicholii*);
- Greater Glider (*Petauroides volans*);
- Austral Toadflax (*Thesium australe*);
- South-eastern glossy-black cockatoo (*Calyptorhynchus lathami lathami*); and
- Bluegrass (*Dichanthium setosum*).

The offsets are to be delivered on a 'like for like' basis as specified in **Section 10.2**. Because of these offsetting obligations, several other MNES will also likely benefit from the compensatory measures undertaken.

Species credits are not applicable to the following MNES as these are not likely to be adversely impacted by the Project as there is no quantifiable residual impact (i.e., not directly impacted as not identified as occurring within the impact area):

- Beadle's Grevillea (*Grevillea beadleana*);
- Brush-tailed Rock-wallaby (*Petrogale penicillata*);
- Narrow-leaved Bertya (*Bertya ingramii*); and
- Long-nosed potoroo (*Potorous tridactylus tridactylus*).

Notwithstanding, it is possible that through the delivery of ecosystem credits for the Project that some of these may end up included in an in-perpetuity conservation area, thus resulting in a conservation outcome for the species.

8.7.1.7 DETAILS OF HOW THE BAM HAS BEEN APPLIED IN ACCORDANCE WITH THE OBJECTS OF THE EPBC ACT

Among several, the relevant objects of the EBPC Act are:

- To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and
- To promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and
- To promote the conservation of biodiversity.

The Project has been assessed in accordance with the BAM, which has been endorsed by the Commonwealth Government as a method suitable for assessing and managing the impacts of Projects on MNES.

The outcome of this assessment indicates that the residual impacts can be managed appropriately through conventional compensatory measures (i.e., offsets) after first considering options for avoiding and minimizing impacts.

The conventional application of the BAM in this assessment aligns with the framework of the Bilateral Arrangement between the NSW and Commonwealth Government. Accordingly, it is considered that the objects of the EPBC Act above have been adequately met.

8.7.1.8 DETAILS OF THE OFFSET PACKAGE TO COMPENSATE FOR SIGNIFICANT RESIDUAL IMPACTS

The offset package for MNES is outlined in **Section 10.1**. This offset is to be delivered on a 'like for like' basis within the regions specified. The offset would comprise a greater extent and future condition state compared to what is impacted by the Project. According to the BAM, the delivery of this compensatory measure would achieve a 'no net loss' outcome for the MNES.

8.7.2 GONDWANA RAINFORESTS OF AUSTRALIA WORLD HERITAGE PROPERTY AND NATIONAL HERITAGE PLACE

8.7.2.1 OVERVIEW

The Gondwana Rainforests of Australia is a serial property comprising the major remaining areas of rainforest in southeast Queensland and northern New South Wales and is inscribed on the World Heritage List established under the Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention). A wide range of plant and animal lineages and communities with ancient origins in Gondwana, many of which are restricted largely or entirely to the Gondwana Rainforests, survive in this collection of reserves.

The most relevant part of the Gondwana Rainforests of Australia to the Project is contained within the 'Hastings group', which includes representations in Oxley Wild Rivers National Park (NP), Werrikimbe NP, Fenwicks Scrub Flora Reserve (FR), Banda Banda FR and Mount Seaview Nature Reserve. The Oxley Wild Rivers National Park is the closest and occurs to the east of the Project.

The Hastings Group contains the core refugia area for Antarctic Beech (*Nothofagus moorei*) cool temperate rainforest. This occurs in a mosaic of vegetation types including warm and subtropical rainforests with eucalypt forests on the plateaus. The nearest mapped occurrence of this species to the Subject Land is approximately 20 km to the northeast, with the larger core stand occurring at least 30 km to the east mainly in Werrikimbe NP. This includes the largest expanse of Antarctic Beech (*Nothofagus moorei*). **Figure 8-3** shows the distribution of this species relative to the Subject Land.

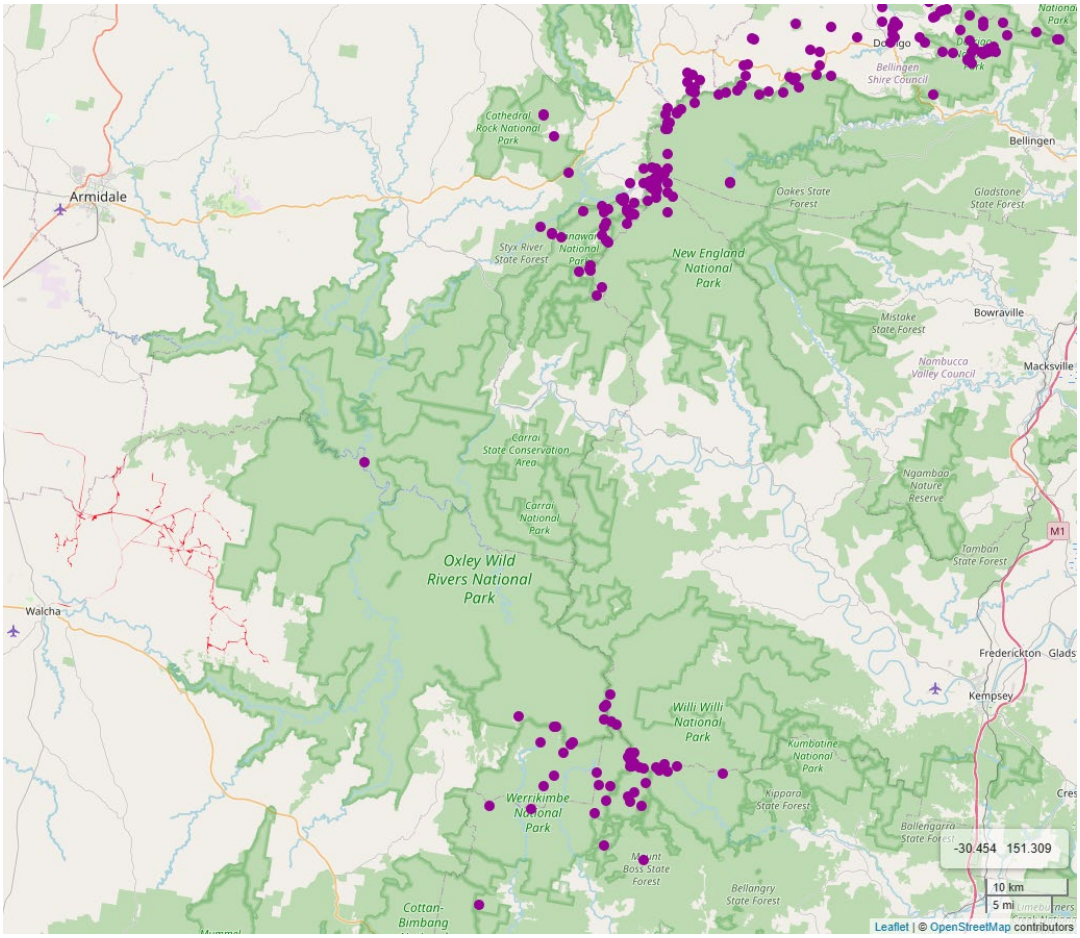


FIGURE 8-3 ANTARCTIC BEECH RECORDS RELATIVE TO THE SUBJECT LAND

The World Heritage Area comprises dry rainforest dominated by non-eucalypt canopy tress such as Wild Quince (*Alectryon subcinereus*), Shatterwood (*Backhousia sciadophora*), Brush Bloodwood (*Baloghia inophylla*), and Lacebark Tree (*Brachychiton discolor*). The understory comprises a range of shrubs (e.g., *Acalypha capillipes*), scramblers (e.g., *Aphanopetalum resinosum* [gum vine]), and forbs (e.g., orchids, ferns etc.). These vegetation communities typically inhabit the gorges of the National Park, on rocky substrates such as basalt or trachyte, or sometimes riverine alluvium.

The areas of subtropical rainforest are in the lower elevations with a small stand in Mt Seaview NR, which is approximately 40 km to the southeast of the Subject Land. This is the closest example of this kind of rainforest to the Subject Land.

Elsewhere, the warm temperate rainforest and wet eucalypt forests are relatively widespread throughout the conservation reserves that comprise the world heritage values.

Of the 42 threatened and/or rare species known to occur within this world heritage estate, nine have habitat within the Subject Land that will potentially be impacted by the project. These are:

- Glossy-black Cockatoo (*Calyptorhynchus lathami lathami*);
- Spot-tailed Quoll (*Dasyurus maculatus*);
- Great Pipistrelle (*Falsistrellus tasmaniensis*);
- Little Bent-wing Bat (*Miniopterus australis*);

- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*);
- Squirrel Glider (*Petaurus norfolcensis*);
- Brush-tailed Phascogale (*Phascogale tapoatafa*);
- Koala (*Phascolarctos cinereus*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The Long-nosed Potoroo has been recorded nearby the Subject Land but is not impacted by the Project.

8.7.2.2 PROXIMITY

While the Subject Land is approximately 600 m from the boundary of the Oxley Wild River NP, the closest the Project comes to the core values of the World Heritage Area (i.e., expanse of Antarctic Beech cool temperate rainforest) is approximately 30 km. The sections of the National Park that are declared as the World Heritage Area are approximately 1.2 km from the southern extremity of the Subject Land and 1.3 km from the northeastern extremity of the Subject Land.

8.7.2.3 ADVERSE IMPACTS

There is one category of potential impacts to the universal values for which the park was inscribed which relates to geomorphology, ecological and biological processes, and biodiversity:

1. Actions arising from the Project which have the potential to impact on World Heritage values and attributes which extend outside the World Heritage area (e.g., wildlife which forage, sometimes inhabit/nest or traverse in the vicinity of the Project Area).

Several threats to the WHA have been identified (Hunter 2004) and include:

- Inappropriate fire regimes;
- Exotic plant species;
- Exotic animals;
- Dieback;
- Disruption to gene flow;
- Decline in populations of native frogs; and
- Localised damage.

The Project is not likely to cause or exacerbate the adverse effect of these threats. However, external impacts on fauna movement pathways may have an adverse impact on gene flow.

This Updated BDAR has mapped the vegetation throughout the Disturbance Footprint. None of the vegetation communities within the Project Area conform to those that represent the core elements of the Gondwana Rainforest World Heritage Area within Oxley Wild Rivers World Heritage Area (i.e., cool, warm or subtropical rainforests). Most of the fauna and flora that rely on these rainforests generally do not occupy or use the vegetation and habitat of the Subject Land. No impact on gene flow is anticipated for these flora and fauna.

The main potential impact the Project may have on the World Heritage Area within Oxley Wild Rivers National Park is on species that may forage outside of the park, particularly bird species as they are mobile and could move through the local area.

Bird species typically associated with the rainforest vegetation community include the Pale-vented Bush-hen (*Amaurornis moluccana*), Rufous Scrubbird (*Atrichornis rufescens*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), and Albert's Lyerbird (*Menura alberti*).

These species were not observed in BUS undertaken for the Project. However, several bird species that were observed in the Project Area including the Glossy Black-cockatoo (*Calyptorrhynchus lathami lathami*) and White-throated Needletail (*Hirundapus caudactus*), and bat species including the Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Little Bent-winged Bat (*Miniopterus australis*) may also frequent the dry rainforest community.

The greatest adverse threat from a wind farm to bird and bat species is turbine strike. A detailed assessment of impacts on avian species was undertaken (**Section 7.3**). This included an assessment of turbine risk relevant to specific bird and bat habitat features, which concluded that 41 turbines presented a medium risk and 77 turbines presented a low risk. No turbines were rated high or very high risk.

The risk of turbine strike to bird and bat species that were identified in the BAM-C was then assessed and concluded that several species were at high risk of collision, including White-throated Needletail (*Hirundapus caudactus*) (see **Section 7.3.4**). Collision risk modelling (CRM) was then undertaken; however, most of the species that returned a high risk of collision were not observed within the RSA and therefore could not be input in the model.

The only species that had sufficient numbers observed in the RSA for modelling was the White-throated Needletail (*Hirundapus caudactus*). The results of the CRM for the White-throated Needletail suggest that between 1 and 6 individuals of this species may collide with a wind turbine annually; however, it is important to note that this is based on worst-case assumptions. This is discussed further in **Section 7.4.7**. Other MNES that may reside or forage within the World Heritage Area and may also frequent the wind farm that could not be included in the CRM due to lack of observations during BUS will be monitored during operation of the wind farm.

The results of the BBAMP and CRM suggest that the Project is likely to have a negligible impact on species that may reside or forage in the World Heritage Area and, therefore, the Project will not impact on the outstanding universal values for which the area was inscribed.

8.7.2.4 DOWNSTREAM IMPACTS

Climate change has been identified as they key threat to World Heritage-listed Gondwana Rainforest (CSIRO, 2019). Even small climatic changes are predicted to change the distribution patterns of many endemic species and vegetation communities. Climate projections for the broader Gondwana Rainforests region include (from DAWE, 2020; CSIRO, 2019):

- Increased average temperatures;
- More hot days, with a substantial increase in the temperature reached, the frequency of hot days, and the duration;
- A possible modest decrease in rainfall that is strongest in winter and modest increase in summer rainfall in the northern part of the region (low confidence);
- Increased severity of extreme rainfall events;
- Higher surface solar radiation (i.e., decreased overall cloud cover);
- Decreased relative humidity (although modest in winter);

- Higher evapotranspiration;
- More severe fire season, which is longer in duration; and
- Exacerbated threatening processes such as invasive species and pathogens.

Climate change will continue to induce shifts in the distribution of flora and fauna species. Adams-Hosking et al. (2011) identify that current koala distributions, based on their climate envelope, will likely contract eastwards and southwards to many regions where koala populations are declining due to additional threats of high human population densities and ongoing pressures from habitat loss, dog attacks and vehicle collisions. This trend is likely to apply to other native species which reside in the Gondwana Rainforest WHA. Over time, the southern extent of the Gondwana Rainforest WHA (i.e., Oxley Wild Rivers National Park) will have increased importance as a refuge for species that are excluded from their current range by a changing climate.

Despite the acknowledged, immediate environmental impacts of the project, broad environmental benefits will be delivered in both the short and long-term. The Project would assist in transitioning away from reliance on fossil fuels to renewable energy. Exploration, mining and combustion of fossil fuel resources produce greenhouse gases which contribute to reduced air quality, land degradation and pollution and warming of the atmosphere. Developing renewable resources for electricity generation will result in a reduction in these adverse environmental impacts arising from the use of fossil fuel.

The Project will have a net positive benefit with regard to climate change as it will:

- Contribute to the achievement of NSW and Commonwealth renewable energy and emissions reduction targets;
- Help to meet local, national and international consumer demand for climate change action;
- Facilitate the consolidation of renewable energy infrastructure in the New England renewable energy zone;
- Reduce air pollution, water use and land degradation; and
- generate clean energy.

The proposed Project would generate around 2,200 GWh per year, saving approximately 1.5 million tCO^2e/yr, and contributing to a reduction in global greenhouse gas emissions. The reduction in emissions because of renewable energy development will contribute to slowing the warming of the planet resulting in important flow on effects benefiting the environment. Slowing climate change will help to reduce ocean acidification, sea level rise and improve air quality and biodiversity for the benefit of future generations.

Considering the above, the project is an important contribution to improving future climate scenarios and is considered a positive contribution to protecting the World Heritage Areas.

8.7.2.5 BUSHFIRE IMPACTS (2019-2020)

In spring and summer of 2019-20, extensive areas of southern and eastern Australia were affected by bushfire at a scale considered unprecedented in European history. Across the Australian continent, more than 12.6 million hectares were burnt (DAWE, 2020). Australia-wide, 143 million mammals, 2.46 billion reptiles, 180 million birds and 51 million frogs Australia-wide are thought to have been killed or displaced due to the 2019/2020 bushfire (WWF, 2020).

Over 50% of the Gondwana Rainforests of Australia were affected (DPIE, 2020c), and 85% of Oxley Wild Rivers National Park (84,120ha of a total 98,906ha) was burnt at a high severity (DAWE, 2020). Previous drought conditions had defoliated trees within gully rainforests of Oxley Wild Rivers National Park, increasing susceptibility to fire.

The *Gondwana Rainforests State of Conservation Update - April 2020* report (DAWE, 2020) identifies the loss of ground cover vegetation and shrubs leads to greater surface and subsurface run-off in post-fire rain events which may exacerbate the spread of soil-borne pathogens such as Phytophthora (*Phytophthora cinnamomi*) and myrtle rust (*Austropucinia psidii*).

The fires have resulted in large areas of reduced canopy cover, bare soil, and increased soil nutrients, creating favourable conditions for weed incursion. The increased biomass contributed by weeds can also impact the extent and intensity of future fires.

There were many casualties of common and threatened fauna species residing within the Oxley Wild Rivers National Park during the 2019/2020 bushfire event. Many of the resources to support local populations have diminished or are currently under strain. Considering this, it is likely the remnant vegetation within the development footprint offers refuge and foraging resources for individuals that may have been displaced due to the fire event.

In the case of the Project, as noted above, bushfires arising from the Project which might then spread to the World Heritage Area have been considered within the Project Bushfire Assessment Report (NGH, 2022) which was developed with consultation from the NPWS with specific consideration of the Oxley Wild Rivers National Park and World Heritage Area. Commitments to mitigation measures during construction and operation are expected to keep bushfire risk to a minimum.

8.8 CUMULATIVE IMPACTS

The Project will contribute to the overall development of the New England REZ. REZs combine wind, solar, hydroelectric and energy storage, and high-voltage transmission lines, to generate and deliver clean, renewable energy. Relevant clean energy proposed, approved, under construction and operational SSDs known at the time of finalisation of this BDAR and within and in the vicinity of the New England REZ have been considered for cumulative impacts.

Potential direct, indirect and prescribed biodiversity impacts because of the Project have been assessed. Additionally, it is acknowledged the Project will contribute to cumulative impacts during construction and operation within the existing environment. Cumulative impacts occur when impacts from a project interact or overlap with impacts from other projects and can potentially result in a larger overall effect on the environment.

The assessment provided in this Updated BDAR is in accordance with the BAM involving application of the Mitigation Hierarchy (i.e., avoid, minimise, mitigate) and calculation of residual impacts, which are to be offset through the NSW Biodiversity Offset Scheme (BOS). Entities at risk of SAII have also been assessed.

Offsetting through the BOS requires the retirement of ‘like for like’ biodiversity credits from the same IBRA subregion and/or adjacent IBRA subregions within 100 km of the site. This offsetting context generally represents the regional context for evaluating cumulative impacts. The cumulative impacts of the Project are summaries as follows.

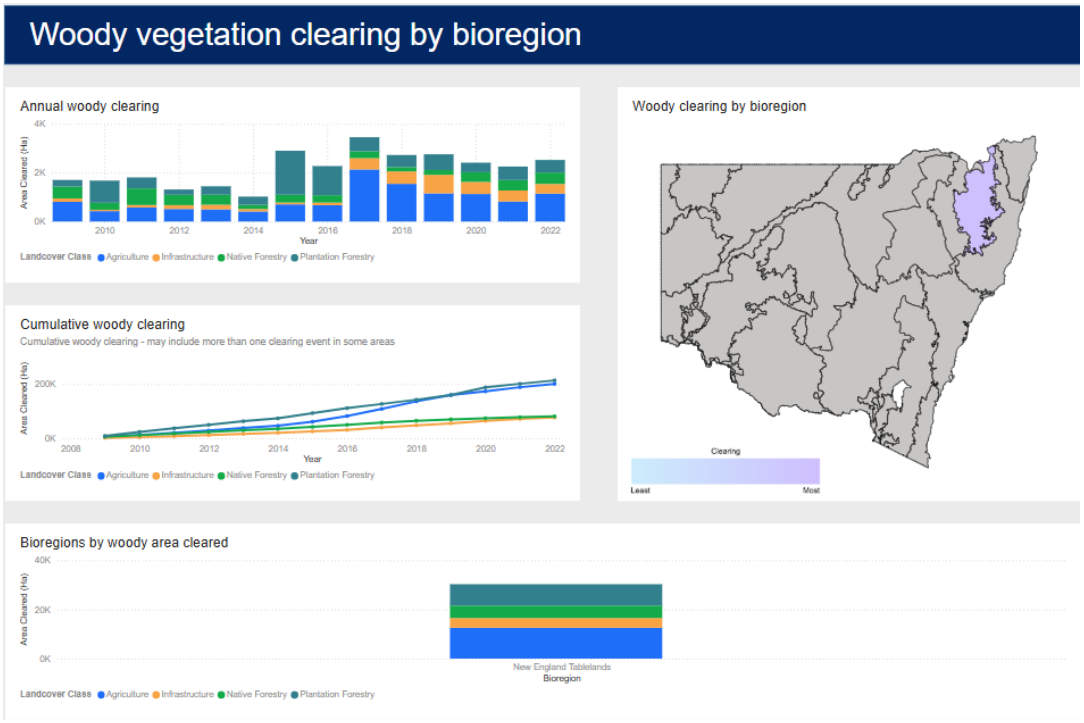
8.8.1 BIOREGIONAL CONTEXT

According to the Statewide Landcover and Tree Study (SLATS) Dashbaord (SLATS Dashboard | SEED Portal; accessed 21/5/2025), the New England Tablelands Bioregion ranks 8th out of the 18 bioregions of NSW for total woody vegetation clearing for the period between 2009 and 2022 (14 years). The annual total clearing of woody native vegetation is summarized in **Chart 8-1** below (extract from SLATS dashboard).

CHART 8-1 SLATS DASHBOARD: NSW BIOREGIONS

By area, the New England Tablelands is the 10th largest in NSW, broadly indicating a proportionally greater amount of clearing pressure for this region. A closer look at the SLATS dashboard for the New England Tablelands Bioregion is provided in **Chart 8-2**.

CHART 8-2 SLATS DASHBOARD: NEW ENGLAND TABLELANDS



This reveals several important factors in considering cumulative impacts:

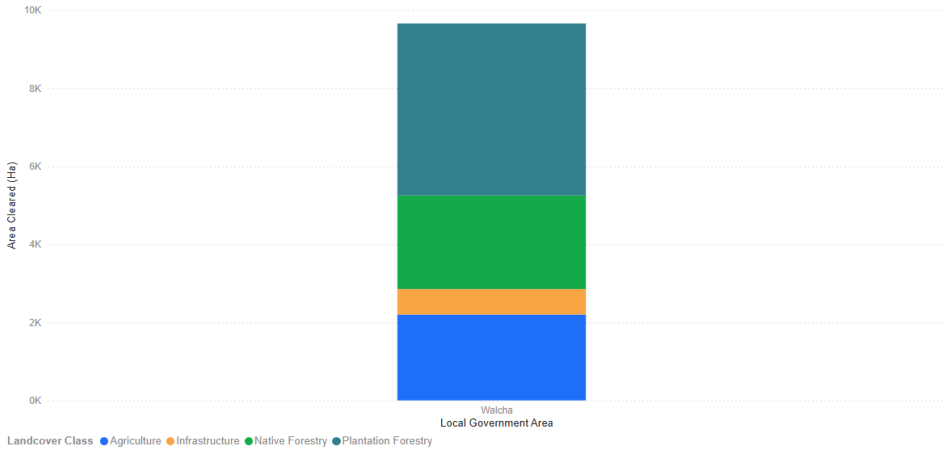
- Clearing in the Agricultural landcover class is the highest of the four reported landcover classes;
- There is considerable vegetation clearing associated with the native and plantation forestry landcover classes;
- Clearing associated with the infrastructure landcover class is roughly equivalent to the combined native and plantation forestry landcover classes from 2017 onwards;
- Clearing in the infrastructure landcover class has substantially increased in the years following 2017, which most likely relates to regulatory change (i.e., implementation of BC Act) and development activity associated with renewable energy projects; and
- A substantial (significant) increase in woody vegetation clearing was observed in both the agricultural and infrastructure landcover classes since 2017, with agriculture being three to five times greater in magnitude than infrastructure.

A total of ~30,000 ha of woody vegetation has been cleared in the New England Tablelands region for the 14 year period, with infrastructure representing approximately 10% of the overall clearing extent.

8.8.2 LOCAL GOVERNMENT AREA CONTEXT

Statistics for the Walcha local government area are also available on the SLATS dashboard. **Chart 8-3** shows nearly 10,000 ha of land has been cleared of woody vegetation for the 2009 to 2022 period, with most of that clearing associated with plantation forestry. Clearing for infrastructure is the least impactful landcover class (~500 ha), being about a quarter of the clearing associated with agriculture.

CHART 8-3 SLATS DASHBOARD: WALCHA LGA



For the life of the Project (i.e., ~30 years), a period twice that reported in SLATS (i.e., 14 years of data), it is proposed to clear 255.23 ha of native vegetation that requires an offset. The composition of this vegetation is in both woody and non-woody condition states as characterised below:

- 117.85 ha woody vegetation (open forest, woodland, open woodland and isolated trees);
- 1.18 ha sedgeland vegetation; and
- 135.62 of non-woody vegetation (moderate condition grasslands).

Independent of other vegetation clearing activity, these statistics indicate that the Project is not exceptional (i.e., the quantum of proposed woody vegetation loss [i.e., 117.85 ha] is ~25% of the cumulative loss of woody vegetation in the Walcha LGA over a 14 year period for the infrastructure landcover class (i.e., ~500 ha)). However, it is the case that woody vegetation clearing cannot continue indefinitely. For the Walcha LGA, it is noteworthy to point out that there are no approved state significant infrastructure projects requiring vegetation clearing, with the proposed New England REZ Transmission Project currently in the EIS preparation stage. If approved, this project would result in the clearing of woody vegetation in the western half of Walcha LGA.

8.8.3 AGRICULTURE

The Project Area is zoned rural and is subject to long term agricultural land uses centered on livestock grazing, with pasture improvement and cropping activity associated within this predominant use.

Historical land clearing started in the mid to late 1800's with considerable widespread pasture development and cropping emerging in the 20th century and continuing to this day. Most of the historical land clearing focused on the more arable lands (i.e., flatter more fertile soils), thus disproportionately focused on valley floors and adjacent slopes. These lands typically comprised the most threatened vegetation cover of the region, with present day incidence of native vegetation cover in these parts of the Project Area being restricted to isolated trees and small patches amid treeless lands comprising modified pastures and cropping.

Native vegetation cover predominantly occurs on the upper slopes and ridges where land clearing and pasture modification efforts have been less prominent. Consequently, grasslands in these parts of the Project Area typically comprise a greater native species component.

Chart 8-1, Chart 8-2 and Chart 8-3 all show the agricultural landcover class comprises a quarter to a third of total land clearing from 2009 to 2022. While not unexpected (i.e., the agricultural landcover class covers a large area), the rate of clearing indicated suggests the main threat to biodiversity values in the region is linked to this clearing activity.

8.8.4 INFRASTRUCTURE PROJECTS

A review of relevant clean energy proposals known at the time of finalisation of this Updated BDAR in the vicinity of the New England REZ has been undertaken and is provided in **Table 8-6**. Some of these projects are in the planning phase, and as such the level of direct impacts to native vegetation, TECs, and threatened and migratory listed species is unknown.

From these projects, Thunderbolt Wind Farm and Hills of Gold Wind Farm have been identified as the most relevant to cumulative impacts in the region. Thunderbolt Wind Farm is situated within the Eastern Nandewars subregion of the New England Tablelands IBRA Bioregion and is located approximately 26 km from the Project. The direct impact on native vegetation for Thunderbolt Wind Farm is calculated at 212.26 ha, with PCTs/species similar to the direct impact because of this Project. Hills of Gold Wind Farm occurs across several IBRA bioregions and subregions, including the Walcha Plateau subregion of the New England Tablelands bioregion, and is located approximately 88 km from the Project. The direct impact on native vegetation because of the Hills of Gold Wind Farm is calculated at 185.91 ha with some PCTs/species similar to the direct impact because of this Project.

Excluding this Project, the total area of approved or proposed native vegetation clearance that requires an offset within the New England Tablelands IBRA bioregion is estimated to be ~690 ha. Inclusive of this Project, the cumulative impact of offsetable native vegetation for infrastructure projects is estimated to be ~935 ha, which is approximately 30% of the total clearing for infrastructure projects in the New England Tablelands IBRA bioregion over a 14 year period.

TABLE 8-6 POTENTIAL CUMULATIVE IMPACTS

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
New England Tablelands IBRA Bioregion			
Hillview Wind Farm (Uralla Shire LGA)	▪ In Planning (Prepare EIS); ▪ 55 WTGs with generating capacity 200-300 MW; and ▪ Indicative development corridor of approximately 2,069 ha.	12	▪ PCT 3344 New England Ribbon Gum Grassy Forest (PCT 3344), PCT 3345 New England Snow Gum-Black Sallee Woodland (PCT 3345) and PCT 3359 New England Hills Stringybark-Box Woodland (PCT 3359) mapped within the investigations area and have associated TECs; and ▪ The extent of vegetation clearing and targeted threatened species survey results are not publicly available.
Hillview Solar Farm (Uralla Shire LGA)	▪ In Planning (Prepare EIS); ▪ 272 MW solar farm; and ▪ Indicative development corridor of approximately 961 ha.	12	▪ PCT 3344 and PCT 3359 mapped within the investigations area and have associated TECs; ▪ Austral Toadflax (*Thesium australe*) and Bluegrass (*Dichanthium setosum*) are known to occur in highly modified habitats and could occur within development corridor; and ▪ The extent of vegetation clearing and targeted threatened species survey results are not publicly available.
Eastern Hub Firming Battery	▪ In Planning (Prepare EIS); ▪ 1,000 MW / 4 hr BESS; and ▪ Estimated 40ha footprint within project investigation area of 86 ha.	12	▪ PCT 3344 mapped within the investigation area and has associated TEC; and ▪ The extent of vegetation clearing and targeted threatened species survey results are not publicly available.
Deeargee Solar Farm (Uralla Shire LGA)	▪ In Planning (Prepare EIS); ▪ 320 MW solar farm and BESS; and ▪ Indicative development footprint of 959 ha within investigation area of 1,363 ha.	25	▪ PCT 3344, PCT 3359 and PCT 3363 Western New England Red-Gum-Box Grassy Forest (PCT 3363) identified within project investigation area and potential access corridors; and ▪ The extent of vegetation clearing and targeted threatened species survey results are not publicly available.

[37] All information provided in this table has been sourced from the Major Projects Portal on 22 May 2025, based on the most recent documentation available for the nearby SSDs.

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
Thunderbolt Wind Farm (Tamworth Regional & Uralla Shire LGAs)	▪ Approved May 2024; ▪ Nominal generating capacity 192 MW; ▪ Up to 32 WTGs; ▪ Battery energy storage and ancillary infrastructure; ▪ Peak construction workforce up to 285 FTE; ▪ Operational workforce of up to 9 FTE; and ▪ Construction phase of 18 to 24 months, estimated construction date unknown (subject to project approval).	26	The project proposes to clear 212.26 ha of native vegetation, comprising of: ◦ PCT 501 – 172.48 ha; ◦ PCT 510 – 14.46 ha; ◦ PCT 542 – 4.12 ha; ◦ PCT 559 – 18.15 ha; and ◦ PCT 582 – 3.05 ha. CEEC proposed to be cleared: ◦ 7.26 ha of PCT510 Blakelys Gum – Yellow Box grassy woodland of the New England Bioregion; and ◦ 3.05 ha of PCT582 Sedgeland fens wetland of impeded drainage of the Nandewar Bioregion and New England Tableland Bioregion. The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Austral toadflax (0.8 ha, 25 species credits); and ◦ Koala (80.5 ha, 3,228 species credits). The project is within the New England Tablelands IBRA Region, and the Eastern Nandewars sub-region
Hills of Gold Wind Farm (Tamworth Regional, Liverpool Plains Shire, Upper Hunter Shire LGAs)	▪ Approved; ▪ Nominal generating capacity 390 MW; ▪ 62 WTGs; ▪ Battery energy storage and ancillary infrastructure; ▪ Peak construction workforce up to 211 FTE; ▪ Operational workforce of up to 28 FTE; and ▪ Construction phase of 18-24 months.	88	The project proposed to clear 185.91 ha of native vegetation, comprising: ◦ PCT 84 – 0.07 ha; ◦ PCT 433 – 0.02 ha; ◦ PCT 434 – 0.01 ha; ◦ PCT 486 – 4.50 ha; ◦ PCT 490 – 1.88 ha; ◦ PCT 492 – 3.15 ha; ◦ PCT 507 – 0.09 ha; ◦ PCT 526 – 0.75 ha; ◦ PCT 538 – 0.06 ha; ◦ PCT 540 – 67.46 ha; ◦ PCT 541 – 30.15 ha; ◦ PCT 586 – 2.56 ha; ◦ PCT 599 – 3.59 ha; ◦ PCT 931 – 4.45 ha;

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
			◦ PCT 934 – 24.09 ha; ◦ PCT 1194 – 41.79 ha; ◦ PCT 1604 – 0.02 ha; and ◦ PCT 1691 – 0.04 ha. CEEC proposed to be cleared: ◦ 6.77 ha of White Box Yellow Box Blakely's Red Gum Woodland and derived native grassland. The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Southern Myotis (3.97 ha, 91 species credits); ◦ Koala (44.8 ha, 1591 species credits); ◦ Squirrel Glider (15.01 ha, 540 species credits); ◦ Barking Owl (80.19 ha, 3321 species credits); and ◦ Southern Greater Glider (33.81 ha, 1162 species credits). This project is partially (14%) within the New England Tablelands IBRA Region and Walcha Plateau Sub-region
Oxley Solar Farm (Armidale Regional LGA)	▪ Approved December 2023; ▪ Approx. 215 MW solar farm; ▪ Battery energy storage and ancillary infrastructure; ▪ Peak construction workforce up to 300 FTE; ▪ Operational workforce of up to 5 FTE; and ▪ Approx 12-18 months construction duration. Estimated to commence Q1 2024.	28	The project proposed to clear 92.78 ha of native vegetation, comprising of: ◦ PCT 84 – 0.40 ha; ◦ PCT 510 – 2.67 ha; and ◦ PCT 567 – 89.71. CEEC proposed to be cleared: ◦ 92.38 ha of White Box Yellow Box Blakely's Red Gum Woodland and derived native grassland. The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Southern Myotis (24.25 ha, 299 species credits) ◦ Austral toadflax (92.38 ha, 869 species credits) The project is within the New England Tablelands IBRA Region, and the Armidale plateau sub-region

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
Bendemeer Solar Farm (Tamworth Regional LGA)	▪ In Planning (Response to Submissions); ▪ Approx. 210 MW solar farm; ▪ Battery energy storage and ancillary infrastructure; ▪ Peak construction workforce up to 250 FTE; ▪ Operational workforce of up to 10 FTE; and ▪ Approx 12-18 months estimated to commence Q2 2025.	33	The project proposed to clear 55.3 ha of native vegetation, comprising of: ◦ PCT 538 – 14.3 ha; and ◦ PCT 510 – 41 ha. Of the native vegetation to be cleared, the following is CEEC proposed to be cleared: ◦ 55.3 ha of BC Act White Box Yellow Box Blakely's Red Gum Woodland and derived native grassland; and ◦ 23.8 ha of EPBC Act White Box Yellow Box Blakely's Red Gum Woodland and derived native grassland within the same area. The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Squirrel Glider (14.3 ha, 340 species credits). The project is within the New England Tablelands IBRA Region, and the Eastern Nandewars sub-region
Bendemeer Wind Farm (Tamworth LGA)	▪ In Planning (Prepare EIS); ▪ 51 WTGs with 316 MW generating capacity; and ▪ Indicative development footprint of 366 ha within investigation corridor of approximately 1,176 ha.	47	▪ PCT 3344 and PCT 3363 mapped within the investigations area and have associated TECs; and ▪ The extent of vegetation clearing and targeted threatened species survey results are not publicly available.
Tilbuster Solar Farm (Armidale Regional LGA)	▪ Approved March 2022; ▪ Approx. 150 MW solar farm; and ▪ Battery energy storage and ancillary infrastructure.	45	The project proposed to clear 115.5 ha of native vegetation, comprising of: ◦ PCT 567 – 69.6 ha; ◦ PCT 575 – 1.1 ha; and ◦ PCT 704 – 44.7 ha. CEEC proposed to be cleared: ◦ 114.3 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Koala (15.5 ha, 299 species credits); and

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
			◦ Southern Myotis (53.3 ha, 123 species credits). The project is within the New England Tablelands IBRA Region, and the Armidale plateau sub-region
Eathorpe BESS (Armidale Régional LGA)	▪ In Planning (Prepare EIS); ▪ 150 MW BESS and ancillary infrastructure; ▪ Peak construction workforce up to 150 FTE; ▪ Operational workforce up to 1 FTE employees (BESS will be operated remotely); and ▪ Approx 12 months construction estimated to be completed in 2026.	30	The project could potentially involve the clearing of native vegetation comprising of: ◦ PCT 567 – maximum 12.57 ha; and ◦ PCT 704 – maximum 1.03. The project could potentially impact the following CEEC: ◦ White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (EPBC Act and BC Act); and ◦ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act). The project has the potential to impact on the following species which would require the acquisition of a comparable offset: ◦ Narrow-leaved Black Peppermint ◦ Koala The project is within the New England Tablelands IBRA Region, and the Armidale plateau sub-region
Armidale East BESS (Armidale Régional LGA)	▪ In Planning (Prepare EIS); ▪ 500MW BESS and ancillary infrastructure; ▪ Approx 18 months construction estimated to be completed in 2027; and ▪ Peak construction workforce not reported in Scoping Report.	35	The project could potentially involve the clearing of native vegetation comprising of: ◦ PCT 3352; and ◦ PCT 3359. The Project could potentially impact the following CEEC: ◦ White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (EPBC Act and BC Act); and ◦ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act).

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
			The project has the potential to impact on the following species which would require the acquisition of a comparable offset: ◦ Narrow-leaved Black Peppermint The project is within the New England Tablelands IBRA Region, and the Armidale plateau sub-region
New England REZ Transmission Project (various)	▪ New transmission lines between Bayswater Power Station Substation and the New England REZ, new energy hubs within the New England REZ, and ancillary infrastructure.	Varies	TECs with potential for occurrence within the Preferred Study Corridor (of relevance to this cumulative impact assessment) include: ◦ New England Peppermint Woodland on Basalts and Sediments in New England Tableland Bioregion (144 ha potentially impacted); ◦ Ribbon Gum – Mountain Gum – Snowy Gum Grassy Forest / Woodland of the New England Tableland bioregion (29 ha potentially impacted); and ◦ White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (560 ha potentially impacted). Austral Toadflax (*Thesium australe*), Narrow-leaved Peppermint (*Eucalyptus nicholii*) and Bluegrass (*Dichanthium setosum*) have been recorded during field surveys. The extent of vegetation clearing and targeted threatened species survey results are not publicly available.
Nandewar IBRA Bioregion			
Nottingham Park Solar Farm (Tamworth Regional LGA)	▪ In Planning (Prepare EIS); ▪ Development of a 250 MW solar farm - associated infrastructure and battery storage; and ▪ Potential to generate 500 jobs during construction, and approximately 10 jobs during operations.	82	The project could potentially involve the clearing of native vegetation comprising of: ◦ PCT 1383; ◦ PCT 511; ◦ PCT 516; and ◦ PCT 599. The project could potentially impact the following CEEC:

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
			◦ White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (BC Act); and ◦ White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act and BC Act) There are currently no species identified to be impacted that overlap with the Winterbourne Wind Farm. The project is within the Nandewar IBRA Region, and the Peel sub-region
Middlebrook Solar Farm (Tamworth Regional LGA)	▪ In Planning (Recommendation); ▪ Development of a 320 MW solar farm with battery storage of up to 300 MW/600 MWh (DC coupled) and associated infrastructure; ▪ Construction estimated to commence Q2 2024 (subject to project approval) for a 21 to 30 month period; and ▪ Operational workforce up to 15 FTE.	73	The project proposed to clear 4.29 ha of native vegetation, comprising of: ◦ PCT 433 – 2.16 ha; ◦ PCT 599 – 2.13 ha; and ◦ PCT 84 – 0.01 ha. CEEC proposed to be cleared: ◦ 4.29 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Squirrel Glider (2.11 ha, 40 species credits) The project is within the Nandewar IBRA Region, and the Peel sub-region
Tamworth BESS (Tamworth Regional LGA)	In Planning (Response to Submissions) 200 MW BESS and ancillary infrastructure Peak construction workforce up to 150 FTE	67	The project proposed to clear 4.2 ha of native vegetation, comprising of: ◦ PCT 589 – 4.2 ha. No CEEC proposed to be cleared There are currently no species identified to be impacted that overlap with the Winterbourne Wind Farm The project is within the Nandewar IBRA Region, and the Peel sub-region

Project	Description / Status*	Approx. distance (km) from the Project	Relevant Future Development[37]
Kingswood BESS (Tamworth Regional LGA)	In Planning (Response to Submissions) 500 MW BESS and ancillary infrastructure Peak construction workforce up to 100 FTE Minimal operational workforce (BESS will be operated remotely) Construction estimated to be up to 18 months. Construction planned to commence in Q4 of 2024 Operational workforce up to 1 FTE. 12 months construction period. Scheduling not reported in Scoping Report.	72	There is no native vegetation, PCTs, CEECs or within the project Area, except for PCT3396: Planted Native Vegetation. A total of 0.22 ha of native vegetation was identified within the subject land. No threatened flora or fauna or their habitat is proposed to be cleared as part of the Project. The project is within the Nandewar IBRA Region, and the Peel sub-region.
NSW North Coast IBRA Bioregion			
Oven Mountain Pumped Hydro Energy Storage Project (Armidale Regional LGA)	In Planning (Assessment) 600 MW pumped hydro energy storage and generation Ancillary infrastructure Peak construction workforce up to 600 FTE Operational workforce up to 30 FTE Construction estimated to be 36 to 48 months in duration.	33	The project proposed to clear 362.7 ha of native vegetation, comprising of: ◦ PCT 762 – 2.6 ha; ◦ PCT 842 – 211.3 ha; ◦ PCT 868 – 68.2 ha; ◦ PCT 979 – 7.3 ha; ◦ PCT 988 – 10.5 ha; ◦ PCT 1106 – 3.7 ha; ◦ PCT 1142 – 5.0 ha; ◦ PCT 1215 – 53.3 ha; and ◦ PCT 1268 – 1.1 ha. 9.8 ha of TEC proposed to be cleared The project is expected to have an assessable impact on the following species, which will require the acquisition of a comparable offset: ◦ Glossy Black cockatoo (10.93 ha, 349 species credits); ◦ Southern Myotis (10.39 ha, 196 species credits); ◦ Greater Glider (100.2 ha, 2661 species credits); and ◦ Squirrel Glider (232.76 ha, 6252 specie credits). The project is within the NSW North Coast IBRA Region, and the Macleay Gorges, Carrai Plateau and Macleay Hastings sub-region

8.8.5 UNALLOCATED CLEARING

The 2021 NSW Vegetation clearing report (2021 NSW Vegetation clearing report | Native vegetation | Environment and Heritage accessed 4/6/2025) documents the extent of woody and non-woody vegetation clearing across NSW using several categories including whether the clearing is authorized (or presumed authorized) or 'unallocated'.

Unallocated clearing refers to areas of vegetation clearing on rural regulated land defined by the LLS Act for which DPHI does not yet know the background or specific details of the clearing. This can include vegetation clearing for:

- Routine farm management (allowable activities);
- Land management activities under the Land Management Code 2018 that do not require certification or notification (e.g. regrowth);
- Landholder self-assessment of the level disturbance of grasslands or groundcover; or
- Other legislative exemptions.

In some instances, activities may be unlawful clearing.

Woody and non-woody vegetation clearing data throughout regulated lands of NSW (i.e., rural agricultural NSW) for the year 2021 is shown in **Chart 8-4** (extracted from the 2021 NSW Vegetation clearing report on 6/6/2025).

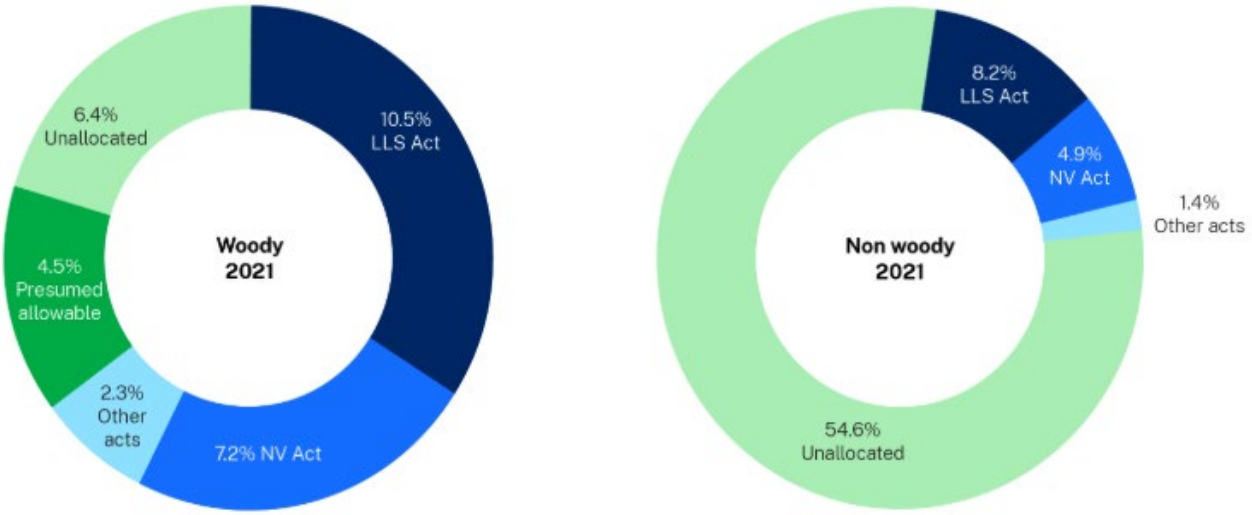


CHART 8-4 WOODY AND NON-WOODY CLEARING IN NSW FOR 2021

This shows a high proportion of native vegetation clearing is in the unallocated category, with a large proportion of this clearing associated with non-woody vegetation cover. The extent of 'unallocated' woody vegetation clearing was 4,658 ha of the total 22,318 ha cleared in NSW for 2021.

Clearing associated with 'other Acts' is likely to represent the impact from projects authorized under the EP&A Act such as infrastructure projects.

The extent of 'other Acts' woody vegetation clearing reported in 2021 was 1,656 ha for NSW. This is nearly a third of the clearing featuring in the 'unallocated' category.

8.8.6 VEGETATION AND HABITAT SENSITIVE TO CUMULATIVE IMPACTS

Vegetation and habitat most sensitive to cumulative impacts are those that have already experienced significant decline since European settlement. Clearing estimates for PCTs mapped within the Subject Land are provided in **Table 8-7** ranked in descending order of sensitivity to further clearing.

TABLE 8-7 PERCENT CLEARED STATUS OF PCTS WITHIN THE SUBJECT LAND

PCT	Pre-European Extent (ha)	Current Extent (ha)	Cleared (%)
534 (CEEC)	50,000	5,000	90
501	6,000	1,000	83
1194 (EEC)	N/A	N/A	80
1512	N/A	N/A	80
510 (CEEC)	155,000	32,000	79
571	54,000	12,000	78
766 (EEC)	N/A	N/A	75
965	N/A	N/A	75
533 (CEEC)	30,000	9,000	70
567	47,000	18,000	62
568	17,000	7,000	59
970	N/A	N/A	56
1192 (EEC)	N/A	N/A	56
565	45,000	25,000	44

These percent cleared estimates by PCT are generally consistent with regional clearing estimates, which place the Subject Land within an over cleared landscape (i.e. 70-90% cleared). For this reason, these landscapes are sensitive to ongoing vegetation and habitat clearing.

8.8.7 EFFECT OF BOS

The BOS should also be considered in a cumulative impact analysis as its effect counters the ongoing loss of woody vegetation by placing restrictive covenants on land that prevents future clearing activity. Where both factors work in tandem, an equilibrium will eventuate where no more native vegetation loss is expected for the affected region.

Infrastructure projects such as this require like for like offsetting where the native vegetation and habitat removed must be offset by the same kind of vegetation and habitat within the same IBRA subregion, adjoining IBRA subregion or any IBRA subregion within 100 km of the outer edge of the impacted site. These areas are listed below:

Same IBRA subregion

- Walcha Plateau.

Adjoining IBRA subregion

- Armidale Plateau;
- Comboyne Plateau;
- Eastern Nandewars;
- Macleay Gorges;
- Upper Manning;
- Mummel Escarpment;
- Peel; and
- Tomalla.

Within 100 km of outer edge of impacted site

- Barrington;
- Tingha Plateau;
- Bundarra Downs;
- Yarrowyck – Kentucky Downs;
- Moredun Volcanics;
- Glenn Innes – Guyra Basalts;
- Nightcap;
- Inverell Basalts;
- Wongwibinda Plateau;
- Round Mountain;
- Northeast Forest Lands;
- Guy Fawkes;
- Ebor Basalts;
- Coffs Coast and Escarpment;
- Carrai Plateau;
- Macleay Hastings; and
- Liverpool Plains.

Here, the Project will be required to find suitable offsets of approximately 700 - 800 ha, an offset area estimated by dividing the Project impact by the likely ecosystem credit hectare yield obtained from a suitable biodiversity stewardship site (i.e., 4,621 divided by ±6 credits per hectare). Cumulatively, there is an estimated 5,000+ ha of biodiversity offset requirements generated by approved and proposed major projects for the region. These offsets must be secured in the same IBRA subregion, adjoining subregion or subregion within 100 km of the outer edge of the impacted site.

8.8.8 CONCLUSION

This cumulative impact analysis shows that the main threat to biodiversity values in NSW is through unregulated land clearing. This is demonstrated by the quantifiable distinctions between authorized land clearing (i.e., allowed by legislation with associated remedies) and 'unallocated' clearing where no compensatory measures are likely to have occurred.

Of the authorised clearing, infrastructure projects represent a minor component of the total annual clearing rate with agriculture representing the largest contributor to woody vegetation loss.

The loss of offsetable native vegetation from within the Subject Land will contribute to the cumulative loss of biodiversity values from within a region that is sensitive to loss (i.e., overcleared: 70-90% cleared). When viewed from a Project lifespan perspective, the extent of the Project's proposed clearing is not exceptional as the quantum to be cleared falls within existing historical rates for the immediate local area (i.e., Walcha local government area). Combined with other Projects and at the bioregional level, the cumulative loss is approximately 935 ha, which remains within the recent historical experience for that region (i.e., ~3,000 ha for infrastructure projects over a 14 year period).

Like-for-like offsets required by this Project and others will counter the ongoing loss of native vegetation from the impacted region. There is currently sufficient capacity within the region to satisfy these offset requirements. Over time, and beyond the effect of the Project, it is anticipated that the mechanics of the BOS will render future land clearing either unacceptable or unaffordable, meaning that biodiversity values impacted by this Project and others will be protected in perpetuity without resulting in extinction events.

9. ASSESSING AND OFFSETTING IMPACTS

9.1 SERIOUS AND IRREVERSIBLE IMPACTS

A SAII entity is listed under the BC Act as an impact that is likely to contribute significantly to the risk of extinction of a threatened entity.

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct through one or more of the following principles:

1. It will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline;
2. It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size;
3. It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution; or
4. The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

The assessment of entities identified at risk of a SAII, where impacted by an SSD project, the Minister for Planning is required to:

- Take those impacts into consideration; and
- Determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted.

Potential SAII has been addressed in the following sections in accordance with Section 9.1 of the BAM (2020).

9.1.1 ASSESSMENT FOR SERIOUS AND IRREVERSIBLE IMPACTS ON BIODIVERSITY VALUES

The Project will have a direct impact on two TECs, which are listed as entities at risk of SAII. The first two principles apply to these TECs. These are:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (**Section 9.1.2.1**); and
- New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion (**Section 9.1.2.2**).

Three bat species were recorded during targeted surveys, which are listed as entities at risk of SAII. The fourth principle applies to these species. These are:

- Eastern Cave Bat (*Vespadelus troughtoni*) (**Section 9.1.3.1**);
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) (**Section 9.1.3.2**); and
- Little Bent-winged Bat (*Miniopterus australis*) (**Section 9.1.3.3**).

9.1.2 ADDITIONAL IMPACT ASSESSMENT PROVISIONS FOR TECS AT RISK OF AN SAII

The additional impact assessment provisions for TEC at risk of an SAII are assessed for each of the two TECs identified in **Section 9.1.1** as entities at risk of an SAII.

9.1.2.1 WHITE BOX - YELLOW BOX - BLAKELY'S RED GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLAND

Response to BAM Section 9.1.1 Criteria
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR).
The actions and measures proposed to avoid direct and indirect impacts are documented in Section 7 of this report. The Project is preferentially located within lands comprising low biodiversity value, notably: ▪ Category 1 – Exempt Land (~415 ha); and ▪ Low condition grasslands (~208 ha). The low condition grasslands that represent a highly degraded form of the TEC (i.e., 14.23 ha) have low biodiversity value (i.e., VIS = 12.1).
2. The assessor must consult the TBDC and/or other sources to report on the status of the TEC including: a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal) b. The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: vi. Change in community structure vii. Change in species composition viii. Disruption of ecological processes ix. Invasion and establishment of exotic species x. Degradation of habitat xi. Fragmentation of habitat c. Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the: i. extent of occurrence ii. area of occupancy iii. number of threat defined locations. d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).
The TBDC has been reviewed in relation to the information available for the TEC. A response to these criteria is as follows: a. The current extent of the TEC and the estimated reduction in the geographic extent since 1970 is not available in the TBDC. BioNet Vegetation Database

Response to BAM Section 9.1.1 Criteria

PCT 510, being the sole PCT representative of this TEC within the Subject Land, is estimated to have had a pre-European extent of 155,000 ha ±30%, with the current estimate of coverage being 32,000 ha ±30%. The percent cleared estimate for this PCT is 79% ±50%.

NSW Threatened Species Scientific Committee (Tozer & Simpson, 2020)

The average areas cleared annually attributable to either agriculture or infrastructure in the New England Tablelands in which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland occurs over the period 2009-2018 is 934 ha. Since European settlement, the estimated loss of this TEC is 93%.

Annual Loss and Reduction in Extent Since 1970

During the period 2009 – 2016 an average of 395 ha of Grassy Woodland (sensu Keith 2004, of which White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is a major component) was lost annually across NSW to agriculture-related activities (cropping, conversion to pasture and thinning) and a further 155 ha/annum due to infrastructure developments (NSW DPIE 2019 in Tozer and Simpson 2020).

Estimated Total Extent (current)

Data limitations prohibit the calculation of an accurate aerial extent of this TEC. Vardan et al (2023) estimates NSW comprised 1,963,578 ha (in the likely category) as of 2017. Tozer and Simpson (2020) estimated of 250,729 ha to occur NSW in 2006, which Vardan et al (2023) estimated 1,817,576 ha to occur at that time. The total extent of the TEC is therefore likely to be somewhere between these two estimates.

b. Tozer and Simpson (2020) report the following in relation to TEC change, disruption, degradation and fragmentation.

Change in community structure

The community structure has been substantially modified across its extent of occurrence because of land clearing and modification.

Change in species composition

Species composition has been simplified through historical land clearing, modification and introduction of alien species.

Disruption of ecological processes

The TEC largely occurs in the sheep wheat belt of NSW where widespread long-term agricultural production has resulted in the clearing and medication of this TEC. Several threats to ecological process remain active throughout the range of the TEC, which adversely affect ecological processes.

Invasion and establishment of exotic species

Exotic plant and animal species are commonly encountered in the TEC. These species directly compete with native species that characterize this ecological community, resulting in reduced abundance and extent for these species.

Degradation of habitat

Response to BAM Section 9.1.1 Criteria

The ecological community generally occurs in a degraded condition across its entire extent. Reduced patch size and associated edge effects with cleared lands has resulted in lower species diversity in remaining patches.

Fragmentation of habitat

Most patches of the ecological community are small and are separated by treeless (cleared) lands. The degree of separation varies across the TECs extent; however, occurrence is commonly hallmarked by paddock trees and small patches with large inter tree/patch distances that often result in fragmentation outcomes (i.e., gaps greater than 30-100m).

c. Principle 3 is not relevant to this TEC.

d. Principle 4 is not relevant to this TEC.

3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR

The NSW White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC is not identified as 'unknown' or 'data deficient' in the TBDC.

4. The following questions are addressed in relation to the impacts from the proposal of the TEC.
   a. The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:
      i. in hectares
      ii. as a percentage of the current geographical extent of the TEC in NSW
   b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:
      i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals
      ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:
         - distance between isolated areas of the TEC, presented as the average
         - distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and
         - estimated maximum dispersal distance for native flora species characteristic of the TEC, and
         - other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development
      iii. Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.

a. The Project will impact the TEC across the Subject Land on:

- Woody patches (i.e., woodland, open woodland, isolated trees and tree canopy); and
- Non-woody patches (i.e., moderate and low condition grasslands).

Response to BAM Section 9.1.1 Criteria

For woody patches, the impacts are as follows:

- Woodland = 3.51 ha (2.55 ha on freehold land (78 patches) and 0.96 ha in the local road reserve (72 patches))
- Open woodland = 0.36 ha (all in freehold land (42 patches))
- Isolated trees = 0.02 ha (all on freehold land – 2 trees)
- Tree canopy (transmission line) = 1.39 ha (all on freehold land (246 trees))

For non-woody patches, the impacts are as follows:

- Moderate condition grasslands = 11.12 ha (8.72 ha on freehold land (30 patches) and 2.40 ha in local road reserve (14 patches))
- Low condition grasslands = 14.28 ha (9.29 ha on freehold land (37 patches) and 4.99 ha in local road reserve (29 patches)).

Relative to the total extent of the TEC in NSW, this impact is estimated to be 0.002 to 0.012% (i.e., 30.68 ha of 250,729 ha/ 1,963,578 ha), with 47% of this impact associated with the non-woody low condition grassland with VIS < 15. Mean patch size for woodland condition state is 0.02 ha, meaning that the Project is minimizing impacts on remnant patches rather than removal of larger more intact patches.

b. i. The Project will not isolate or fragment woody patches of the TEC (i.e. separation distance of >100 m between patches). The patches impacted by the Project are small and within an existing variegated landscape (i.e., over cleared landscape mostly comprising treeless gaps between patches)

ii. The Project is expected to main connectivity between TEC patches:

- The remaining patches peripheral to the Subject Land that are within 30 m of each other will remain connected by a distance equal to or less than this separation (i.e., over 30 independent locations).
- The capacity for species to move/disperse throughout the Project Area is unlikely to be changed by the Project and its impacts. The Project would not generate a barrier to dispersal/movement.

iii. The condition of the TEC varies according to vegetation structure and tenure (i.e., freehold versus road reserve). The following VIS were calculated for each VZ:

- VZ 1 (woodland – freehold): 58.0
- VZ 2 (open woodland – freehold): 34.6
- VZ 3 (moderate condition grassland – freehold): 34.5
- VZ 4 (moderate condition grassland – road reserve): 28.8
- VZ 5 (low condition grassland): 12.1
- VZ 6 (woodland – local road reserve): 81.2

Response to BAM Section 9.1.1 Criteria
By area, the largest impact on the TEC is on low condition grasslands (14.28 ha) with VIS<15, this being an artefact of the avoid minimise efforts expended during design. Refer to Section 8.1 for details on composition, structure and function calculations by VZ.

9.1.2.2 NEW ENGLAND PEPPERMINT (*EUCALYPTUS NOVA-ANGLICA*) WOODLAND ON BASALTS AND SEDIMENTS IN THE NEW ENGLAND TABLELAND BIOREGION

Response to BAM Section 9.1.1 Criteria
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR).
The actions and measures proposed to avoid direct and indirect impacts are documented in Section 7 of this report. The Project is preferentially located within lands comprising low biodiversity value, notably: ▪ Category 1 – Exempt Land (~415 ha); and ▪ Low condition grasslands (~208 ha). The low condition grasslands that represent a highly degraded form of the TEC (i.e., 31.84 ha) have low biodiversity value (i.e., VIS = 11.3). This condition state does not incur a biodiversity offset.
2. The assessor must consult the TBDC and/or other sources to report on the status of the TEC including: a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal) b. The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: vi. Change in community structure vii. Change in species composition viii. Disruption of ecological processes ix. Invasion and establishment of exotic species x. Degradation of habitat xi. Fragmentation of habitat c. Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the: i. extent of occurrence ii. area of occupancy iii. number of threat defined locations. d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).
The TBDC has been reviewed in relation to the information available for the TEC. A response to these criteria is as follows: a. The current extent of the TEC and the estimated reduction in the geographic extent since 1970 is not available in the TBDC.

Response to BAM Section 9.1.1 Criteria

BioNet Vegetation Database

PCT 533 AND 534, being the PCTS representative of this TEC within the Subject Land, are estimated to have had a pre-European extent of 30,000 ha ±50% and 50,000 ha ±50% respectively, with the current estimate of coverage being 9,000 ha ±50% and 5,000 ha ±30% respectively. The percent cleared estimate for these PCTs is 70% ±50% and 90% ±50% respectively. From this, it is estimated that there is between 7,000 and 21,000 ha remaining of these PCTs across its natural range.

Threatened Species Scientific Committee (Commonwealth 2011)

The estimated extent of this TEC was 14,000 ha (2011), representing an 82.5% decline from a pre-European extent of 80,000 ha.

Annual Loss and Reduction in Extent Since 1970

Not known.

Estimated Total Extent (current)

The current extent of this TEC is likely to be less than the 2011 estimates.

b. TEC change, disruption, degradation and fragmentation is outlined in Threatened Species Scientific Committee listing advice (Commonwealth 2011)

Change in community structure

The community structure has been substantially modified across its extent of occurrence because of land clearing and modification.

Change in species composition

Species composition has been simplified through historical land clearing, modification and introduction of alien species.

Disruption of ecological processes

The TEC largely occurs in the sheep wheat belt of NSW where widespread long-term agricultural production has resulted in the clearing and medication of this TEC. Several threats to ecological process remain active throughout the range of the TEC, which adversely affect ecological processes. Pasture improvement has resulted in substantive soil chemistry changes that has likely permanently degraded many patches of this TEC.

Invasion and establishment of exotic species

Exotic plant and animal species are commonly encountered in the TEC. These species directly compete with native species that characterize this ecological community, resulting in reduced abundance and extent for these species.

Degradation of habitat

Response to BAM Section 9.1.1 Criteria

The ecological community generally occurs in a degraded condition across its entire extent. Reduced patch size and associated edge effects with cleared lands has resulted in lower species diversity in remaining patches.

Fragmentation of habitat

Most patches of the ecological community are small and are separated by treeless (cleared) lands. The degree of separation varies across the TECs extent; however, occurrence is commonly hallmarked by paddock trees and small patches with large inter tree/patch distances that often result in fragmentation outcomes (i.e., gaps greater than 30-100m).

c. Principle 3 is not relevant to this TEC.

d. Principle 4 is not relevant to this TEC.

3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR

The NSW New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion CEEC is not identified as 'unknown' or 'data deficient' in the TBDC.

4. The following questions are addressed in relation to the impacts from the proposal of the TEC.
   a. The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:
      i. in hectares
      ii. as a percentage of the current geographical extent of the TEC in NSW
   b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:
      i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals
      ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:
         - distance between isolated areas of the TEC, presented as the average
         - distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and
         - estimated maximum dispersal distance for native flora species characteristic of the TEC, and
         - other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development
      iii. Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.

a. The Project will impact the TEC across the Subject Land as follows:

- Woody patches (i.e., woodland, open woodland and scattered trees)
- Non-woody patches (i.e., moderate and low condition grasslands)

Response to BAM Section 9.1.1 Criteria

For woody patches, the impacts are as follows:

- Woodland = 4.35 ha (1.09 ha on freehold land (76 patches) and 3.26 ha in the local road reserve (394 patches))
- Open Woodland = 0.93 ha (0.66 ha on freehold land (56 patches) and 0.27 ha in the local road reserve (10 patches))
- Scattered trees = 0.02 ha (all on freehold land – 3 tree)
- Tree canopy (transmission line) = 1.17 ha (all on freehold land - 174 patches/trees)

For non-woody patches, the impacts are as follows:

- Moderate condition grasslands = 13.40 ha (9.80 ha on freehold land (48 patches) and 3.60 ha in local road reserve (26 patches))
- Low condition grasslands = 31.88 ha (13.43 ha on freehold land (70 patches) and 18.45 ha in local road reserve (196 patches))

This impact is estimated to be 0.37% (i.e., 51.75 ha of 14,000 ha) of the total known TEC extent in NSW, with 62% of this impact associated with the non-woody low condition grassland with VIS < 15.

A more accurate representation of regional loss is calculated by excluding the low and moderate condition grasslands, as these structural forms of the TEC have not been included in the regional mapping of this TEC (Benson and Ashby 2000). In this circumstance, the impact on the total extent of this TEC reduces to 0.05%. Mean patch size for woodland condition state is 0.01 ha, meaning that the Project is minimizing impacts on remnant patches by avoiding the removal of larger more intact patches.

b. The Project is expected to:

- Not isolate or fragment woody patches of the TEC (i.e., separation distance of >100 m).
- The remaining patches peripheral to the Subject Land that are within 100 m of each other will remain connected by a distance equal to or less than this separation (i.e., over 30 independent locations).
- The capacity for species to move/disperse throughout the Project Area is unlikely to be changed by the Project and its impacts.

c. The condition of the TEC varies according to vegetation structure and tenure (i.e., freehold versus road reserve). The following VIS were calculated by VZ:

- VZ 7 (533 woodland – freehold): 47.2
- VZ 8 (533 open woodland – freehold): 23.8
- VZ 9 (534 woodland): 62.3
- VZ 10 (534 open woodland): 41.8
- VZ 11 (534 mod condition grassland): 30.9
- VZ 12 (534 low condition grassland): 12.7

Response to BAM Section 9.1.1 Criteria

- VZ 13 (534 woodland – road reserve): 72.5

By area, the largest impact on the TEC is on low condition grasslands (31.88 ha), this being an artefact of the avoid minimise efforts expended during design. Refer to Section 8.1 for details on composition, structure and function calculations by VZ.

9.1.3 ADDITIONAL IMPACT ASSESSMENT PROVISIONS FOR THREATENED SPECIES AT RISK OF AN SAII

The additional impact assessment provisions for threatened species at risk of an SAII are assessed for each of the three bat species identified in **Section 9.1.1** as entities at risk of an SAII.

9.1.3.1 EASTERN CAVE BAT (*VESPADELUS TROUGHTONI*)

Response to BAM Section 9.1.2 Criteria

1. The action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR).

The actions and measures proposed to avoid direct and indirect impacts are documented in Section 7 of this report.

The Project design has opted for the utilisation of non-woody vegetation wherever possible and retention of existing native vegetation which avoided areas of high biodiversity value.

The Project is not directly or indirectly impacting irreplaceable roost/breeding habitat (i.e., caves, cliffs, overhangs, artificial structures).

The Project is not within 100 m of irreplaceable roost/breeding habitat (i.e., caves, cliffs, overhangs, artificial structures).

2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including:
   a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:
      i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or
      ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites

   b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:
      i. an estimate of the species' current population size in NSW, and
      ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and
      iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations

   c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:

Response to BAM Section 9.1.2 Criteria
i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).
The TBDC has been reviewed in relation to the information available for the TEC. A response to these criteria is as follows: a. Principle 1 is not relevant to this species. b. Principle 2 is not relevant to this species. c. Principle 3 is not relevant to this species. d. The TBDC provides evidence that the species is unlikely to respond to management because: i. The fecundity of the species is not well known and average offspring per year is estimated to be <1 due to high rates of miscarriage and females not giving birth every year; and ii. The species is dependent on irreplaceable habitats including rocky areas, caves, overhangs crevices, cliffs and escarpments, or old mines or tunnels, old buildings and sheds.
3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a species for a criterion listed in Section 9.1.2(2.), the assessor must record this in the BDAR
The Eastern Cave Bat (*Vespadelus troughtoni*) is not identified as 'unknown' or 'data deficient' in the TBDC.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by:

Response to BAM Section 9.1.2 Criteria
i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.

a. Principles 1 and 2 are not relevant to this species.

b. Principles 1 and 3 are not relevant to this species.

9.1.3.2 LARGE BENT-WINGED BAT (*MINIOPTERUS ORIANAE OCEANENSIS*)

Response to BAM Section 9.1.2 Criteria
1. The action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR).

The actions and measures proposed to avoid direct and indirect impacts are documented in Section 7 of this report.

The Project design has opted for the utilisation of non-woody vegetation wherever possible and retention of existing native vegetation which avoided areas of high biodiversity value.

The Project is not directly or indirectly impacting irreplaceable roost/breeding habitat (i.e., caves, cliffs, overhangs, artificial structures).

The Project is not within 100 m of irreplaceable roost/breeding habitat (i.e., caves, cliffs, overhangs, artificial structures).

2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites

Response to BAM Section 9.1.2 Criteria
b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).
The TBDC has been reviewed in relation to the information available for the TEC. A response to these criteria is as follows: a. Principle 1 is not relevant to this species. b. Principle 2 is not relevant to this species. c. Principle 3 is not relevant to this species. d. The TBDC provides evidence that the species is unlikely to respond to management because: i. Average offspring per year is estimated to be <1 due to high rates of miscarriage and females not giving birth every year; and ii. The species is dependent on irreplaceable habitats including caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding.
3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a species for a criterion listed in Section 9.1.2(2.), the assessor must record this in the BDAR
The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) is not identified as 'unknown' or 'data deficient' in the TBDC.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by:

Response to BAM Section 9.1.2 Criteria
i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.

a. Principles 1 and 2 are not relevant to this species.

b. Principles 1 and 3 are not relevant to this species.

9.1.3.3 LITTLE BENT-WINGED BAT (*MINIOPTERUS AUSTRALIS*)

Response to BAM Section 9.1.2 Criteria
1. The action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR).

The actions and measures proposed to avoid direct and indirect impacts are documented in Section 7 of this report.

The Project design has opted for the utilisation of non-woody vegetation wherever possible and retention of existing native vegetation which avoided areas of high biodiversity value.

The Project is not directly or indirectly impacting irreplaceable roost/breeding habitat (i.e., caves, cliffs, overhangs, artificial structures).

The Project is not within 100 m of irreplaceable roost/breeding habitat (i.e., caves, cliffs, overhangs, artificial structures).

Response to BAM Section 9.1.2 Criteria

2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including:
   a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:
      i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or
      ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites

   b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:
      i. an estimate of the species' current population size in NSW, and
      ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and
      iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations

   c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:
      i. extent of occurrence
      ii. area of occupancy
      iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and
      iv. whether the species' population is likely to undergo extreme fluctuations

   d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:
      i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site
      ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or
      iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).

The TBDC has been reviewed in relation to the information available for the TEC. A response to these criteria is as follows:

a. Principle 1 is not relevant to this species.

b. Principle 2 is not relevant to this species.

c. Principle 3 is not relevant to this species.

d. The TBDC provides evidence that the species is unlikely to respond to management because:

   i. Average offspring per year is estimated to be <1 due to high rates of miscarriage and females not giving birth every year; and

   ii. The species is dependent on irreplaceable habitats including caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding.

Response to BAM Section 9.1.2 Criteria
3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a species for a criterion listed in Section 9.1.2(2.), the assessor must record this in the BDAR
The Little Bent-winged Bat (*Miniopterus australis*) is not identified as 'unknown' or 'data deficient' in the TBDC.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.

a. Principles 1 and 2 are not relevant to this species.

b. Principles 1 and 3 are not relevant to this species.

9.1.4 PROPOSED ADDITIONAL MEASURES

The Applicant proposes to regenerate up to 15 ha in aggregate of the two affected SAII TECs within the local area to an extent that meets or exceeds the woody component lost through clearing for the Project. This additional measure aims to locally compensate for the loss of the woody component of vegetation associated with these PCTs (i.e., higher condition state VZs).

GIS analysis was conducted to identify potential microbat breeding habitat within a 2 km buffer of the Subject Land. None of the potential roosting/breeding habitat identified is within 100 m of the Project. Direct impacts on these SAII entities are limited to foraging habitat, with prescribed impacts potentially resulting in blade strike to individuals.

9.1.5 SAII IMPACT SUMMARY

Additional impact assessment provisions for threatened species and communities at risk of an SAII relevant to the Project have been completed for the consent authority to determine a SAII conclusion. Impacts to SAII because of the Project have been avoided, minimised and mitigated throughout the project design process. This has been supported by aligning development to areas of low condition grassland where possible, avoiding impacts to woody vegetation and minimising impacts along the transmission line by limiting associated impacts of clearing to the tree canopy only (thus retain the groundcover layer).

Additional measures aim to compensate for the loss of higher condition vegetation within the local area. This directly addresses the principles applicable to the two SAII communities to an extent that exceeds the woody vegetation loss for these two TECs. No measures to compensate for potential impacts to cave-dwelling microbats at risk of SAII as irreplaceable habitat important to these species will not be impacted by the Project.

9.2 IMPACT SUMMARY

9.2.1 IMPACTS THAT REQUIRE AN OFFSET

Impacts requiring an offset are shown in **Figure 9-1**. In accordance with **Section 9.2.1** of the BAM, these areas comprise native vegetation with vegetation integrity score of at least:

- ≥15, where the PCT is representative of an EEC or a CEEC;
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community; or
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

All PCTs mapped within the Subject Land that are to experience a permanent direct impact require offsetting as they meet the vegetation integrity score threshold above.

9.2.2 IMPACTS THAT DO NOT REQUIRE FURTHER ASSESSMENT

The Subject Land contains non-native vegetation that does not require assessment for ecosystem credits. These areas lack vegetation because of clearing for access tracks or for infrastructure such as dams, troughs, and water tanks. This land does not constitute habitat for threatened species. There are no prescribed impacts requiring offsets in areas of non-native vegetation. Impacts not requiring offset are shown in **Figure 9-2**.

Legend

- Project Area
- Subject Land
- Impacts Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
Drawing Size: A3

0 500 1,000 1,500m

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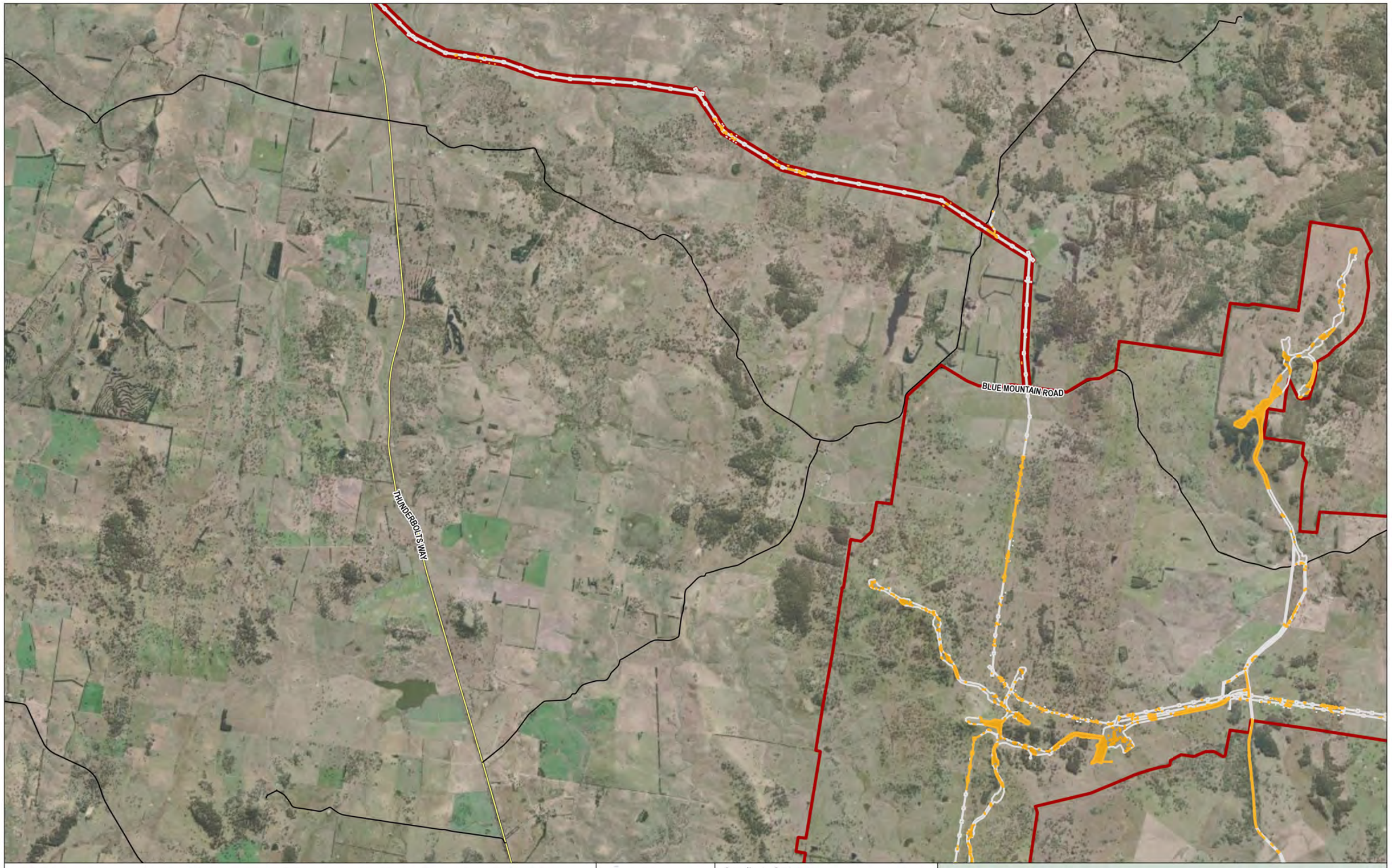
F9-1 Impacts Requiring Offset

Map 1 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx



Legend

- Project Area
- Subject Land
- Impacts Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
Drawing Size: A3

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F9-1 Impacts Requiring Offset

Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
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ERM

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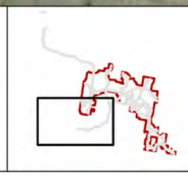
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
THUNDERBOLTS WAY
DERBY STREET
EMU CREEK ROAD
OXLEY HIGHWAY
MOONA PLAINS ROAD

Legend

- Project Area
- Subject Land
- Impacts Requiring Offset
- Highway / Major Road
- Local Road



Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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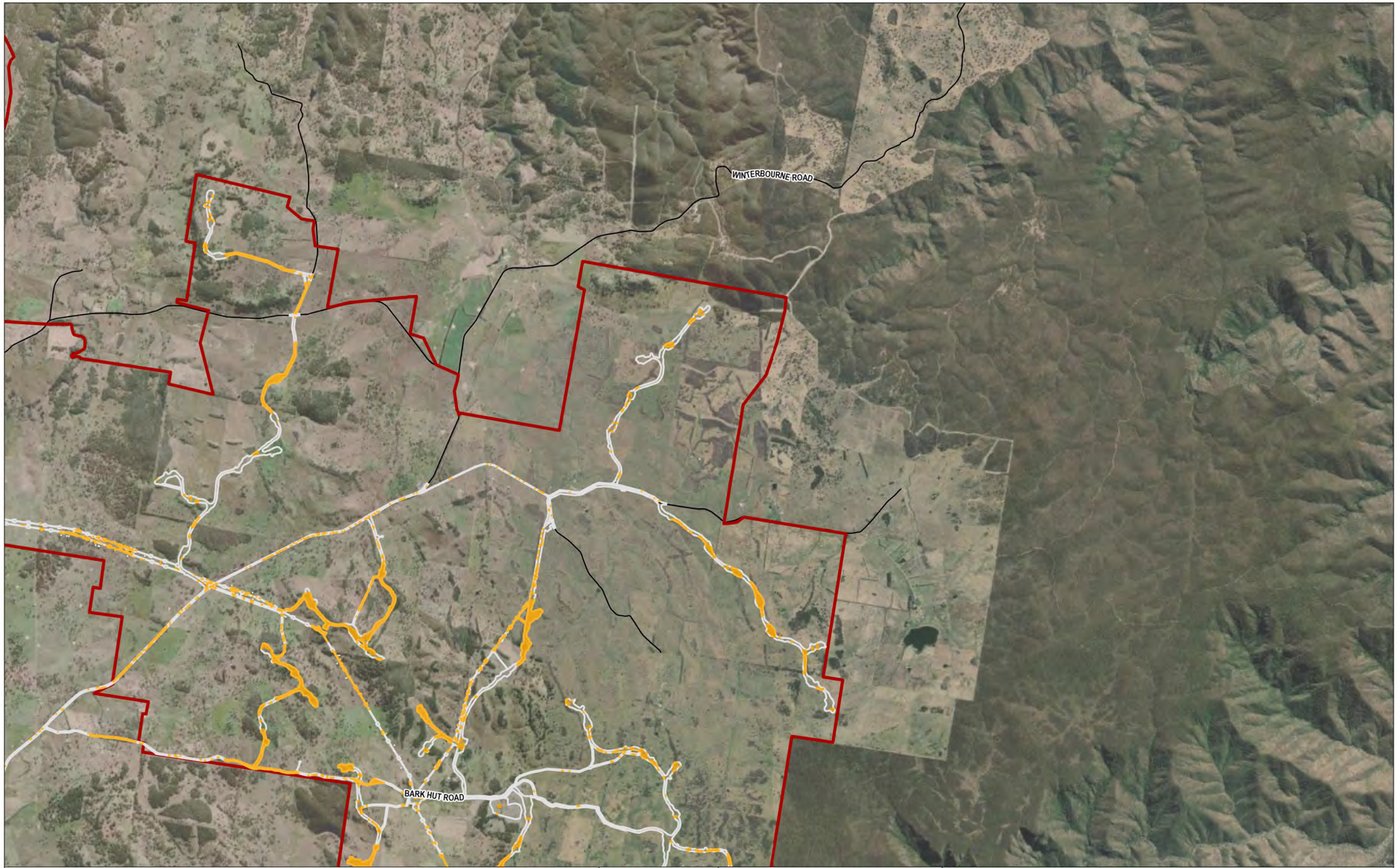
F9-1 Impacts Requiring Offset

Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx



Legend

- Project Area
- Subject Land
- Impacts Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
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F9-1 Impacts Requiring Offset

Map 4 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

MOONA PLAINS ROAD

OXLEY HIGHWAY

Legend

- Project Area
- Subject Land
- Impacts Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

Created By: VN

Drawing Size: A3

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F9-1 Impacts Requiring Offset

Map 5 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Impacts Not Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
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F9-2 Impacts not Requiring Offset

Map 1 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

Legend

- Project Area
- Subject Land
- Impacts Not Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025
Created By: VN
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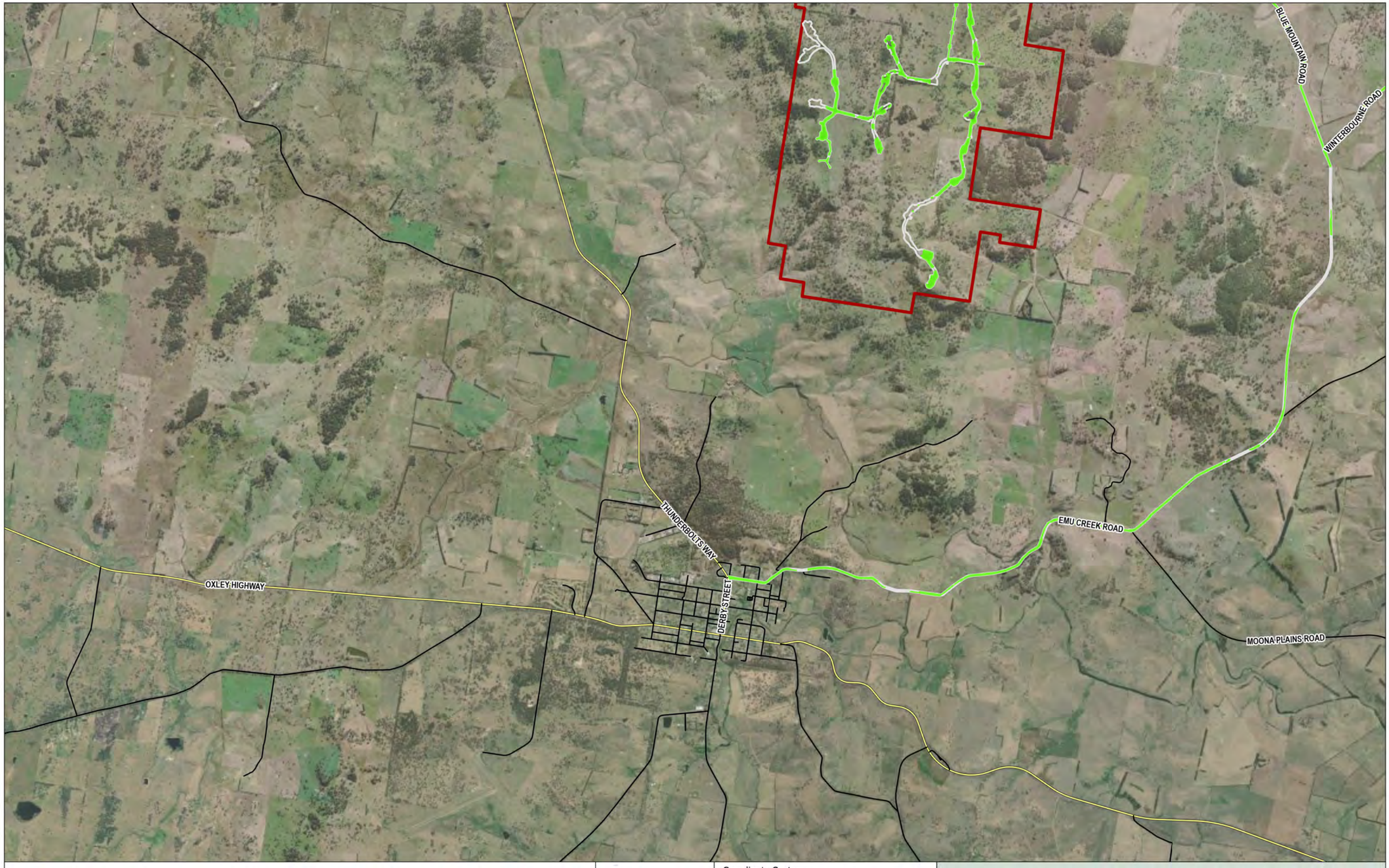
F9-2 Impacts not Requiring Offset

Map 2 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx



Legend

- Project Area
- Subject Land
- Impacts Not Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F9-2 Impacts not Requiring Offset

Map 3 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

Legend

- Project Area
- Subject Land
- Impacts Not Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 19/06/2025
Created By: VN
Drawing Size: A3
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F9-2 Impacts not Requiring Offset

Map 4 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

MOONA PLAINS ROAD

OXLEY HIGHWAY

Legend

- Project Area
- Subject Land
- Impacts Not Requiring Offset
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 19/06/2025

Created By: VN

Drawing Size: A3

0 500 1,000 1,500m

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F9-2 Impacts not Requiring Offset

Map 5 of 5

Winterbourne Wind Farm
Biodiversity Development Assessment Report
WWPL

ERM

0526676_WWF_BDAR_E_R1.aprx

10. APPLYING THE 'NO NET LOSS' STANDARD

The offset liability for the Project is calculated in the following sections. The Biodiversity Credit Report is provided in **Appendix I**.

10.1 OFFSET REQUIREMENTS FOR DIRECT IMPACTS

10.1.1 ECOSYSTEM CREDITS

Table 10-1 identifies the ecosystem credits required to offset the Project as per BAM Subsection 9.2.1(1). Vegetation zones in bold do not require offsets as per BAM Subsection 9.2.1(3.).

TABLE 10-1 IMPACTS THAT REQUIRE AN OFFSET – ECOSYSTEM CREDITS

VZ	PCT	Condition/vegetation zone name	Area (ha)	Current VIS	Future VIS	VIS Loss[38]	Credits
1	510	VZ1_DC_woodland	2.55 1.39	58	0 42.1	-58.0 -15.9	106
2	510	VZ2_DC_openwoodland	0.38	34.6	0	-34.6	8
3	510	VZ3_DC_grassland	8.72	34.5	0	-34.5	188
4	510	VZ4_RC_grassland	2.40	28.8	0	-28.8	43
5	510	VZ5_low_grassland	14.23	12.1	0	-12.1	0
6	510	VZ6_RC_woodland	0.96	81.2	0	-81.2	49
7	533	VZ7_DC_openwoodland	0.06 0.08	47.2	0 22.6	-47.2 -24.5	3
8	533	VZ8_DC_grassland	0.52	23.8	0	-23.8	8
9	534	VZ9_DC_woodland	1.40 1.09	62.3	0 34.8	-62.3 -27.5	73
10	534	VZ10_DC_openwoodland	0.58	41.8	0	-41.8	15
11	534	VZ11_mod_grassland	12.88	30.9	0	-30.9	248
12	534	VZ12_low_grassland	31.88	12.7	0	-12.7	0
13	534	VZ13_RC_woodland	3.26	72.5	0	-72.5	148
14	565	VZ14_DC_woodland	4.96 0.17	64.1	0 35.8	-64.1 -28.3	121
15	565	VZ15_DC_openwoodland	0.17	19.3	0	-19.3	1
16	565	VZ16_DC_grassland	11.94	19.4	0	-19.4	87
17	567	VZ17_DC_woodland	1.07 15.51	66.4	0 34	-66.4 -25.1	482
18	567	VZ18_mod_grassland	29.63	25.8	0	-25.8	334
19	567	VZ19_RC_woodland	0.34	63	0	-63	9
20	568	VZ20_DC_openforest	4.48	63.9	0	-63.9	125

[38] Rows emphasised in bold identify vegetation zones not requiring an offset

VZ	PCT	Condition/vegetation zone name	Area (ha)	Current VIS	Future VIS	VIS Loss[38]	Credits
21	568	VZ21_DC_woodland	25.72 2.75	59.1	0 31.5	-59.1 -25.1	695
22	568	VZ22_DC_openwoodland	1.30	11.3	0	-11.3	0
23	568	VZ23_DC_grassland	50.29	20.3	0	-20.3	447
24	571	VZ24_DC_openforest	14.12	60.4	0	-60.4	426
25	571	VZ25_RC_woodland	1.36	70.8	0	-70.8	48
26	766	VZ26_DC_sedgeland	1.18	76	0	-76	45
27	766	VZ27_RC_sedgeland	0.40	28.5	0	-28.5	6
28	965	VZ28_openforest	1.98 1.10	54	0 31.5	-54 -22.5	66
29	965	VZ29_woodland	12.21	23.2	0	-23.2	142
30	965	VZ30_DC_shrubland	0.95	9.3	0	-9.3	0
31	965	VZ31_low_grassland	26.13	11.6	0	-11.6	0
32	501	VZ32_DC_woodland	2.65	69.5	0	-69.5	92
33	1512	VZ33_DC_woodland	0.66	58.6	0	-58.6	19
34	970	VZ34_DC_openforest	4.60	74.6	0	-74.6	150
35	970	VZ35_DC_woodland	7.50 0.94	63	0 32.5	-63 -30.4	219
36	970	VZ36_DC_grassland	42.67	13.7	0	-13.7	0
37	970	VZ37_RC_woodland	0.23	40.2	0	-40.2	4
38	1192	VZ38_RC_grassland	1.22	32.7	0	-32.7	20
39	1192	VZ39_DC_grassland	18.02	16.1	0	-16.1	145
40	1192	VZ40_DC_woodland	2.82	32.7	0	-32.7	46
41	1194	VZ41_DC_woodland	0.93	70.3	0	-70.3	33
42	501	VZ42_low_grassland	6.35	15.3	0	-15.3	0
43	568	VZ43_low_grassland	58.68	11.7	0	-11.7	0
44	571	VZ44_low_grassland	26.71	15	0	-15	0

Like-for-like trading options apply to the Ecosystem credit classes as outlined in **Table 10-2**.

TABLE 10-2 ECOSYSTEM CREDIT CLASS AND MATCHING CREDIT PROFILE

PCT name	PCT vegetation class	TEC	Offset trading group	Hollow-bearing trees	Credits
501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	New England Grassy Woodlands	No	New England Grassy Woodlands - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status)	Yes	92
				No	0
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	New England Grassy Woodlands	Yes	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Yes	343
				No	51
533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	New England Grassy Woodlands	Yes	New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	Yes	3
				No	8
534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	Tableland Clay Grassy Woodlands	Yes	New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	Yes	221
				No	263
565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forests	No	New England Dry Sclerophyll Forests - < 50% cleared group (including Tier 4 or higher threat status)	Yes	209
				No	0
567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	New England Grassy Woodlands	No	New England Grassy Woodlands - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	Yes	482
				No	343
568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forests	No	New England Grassy Woodlands - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	Yes	695
				No	572
571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	New England Grassy Woodlands	No	New England Grassy Woodlands - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status)	Yes	0
				No	474

PCT name	PCT vegetation class	TEC	Offset trading group	Hollow-bearing trees	Credits
766-Carex sedgeland of the slopes and tablelands	Montane Bogs and Fens	Yes	Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	N/A	51
965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	New England Dry Sclerophyll Forests	No	New England Dry Sclerophyll Forests - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status)	Yes	208
				No	0
970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forests	No	New England Dry Sclerophyll Forests - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status)	Yes	373
				No	0
1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	Tableland Clay Grassy Woodlands	Yes	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	Yes	46
				No	165
1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	Northern Tableland Wet Sclerophyll Forests	Yes	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	Yes	33
				No	0
1512-Fuzzy Box open forest of the New England Tableland Bioregion	New England Grassy Woodlands	No	New England Grassy Woodlands - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status)	Yes	0
				No	19

10.1.2 SPECIES CREDITS

Candidate species determined to require an offset are presented in **Table 10-3**.

TABLE 10-3 IMPACTS THAT REQUIRE AN OFFSET – SPECIES CREDITS

Common name	Scientific name	BC Act	EPBC Act	Loss of habitat (ha)/ individual	Biodiversity risk weighting	Species credits
Barking Owl	*Ninox connivens*	V	-	1.24	2	42
Bluegrass	*Dichanthium setosum*	V	V	4.22	2	34
Leafless Tongue Orchid*	*Cryptostylis hunteriana*	V	V	1.56	1.5	31
Koala	*Phascolarctos cinereus*	E	E	119.33	2	3,422
Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	V	V	136 individuals	2	272
South-eastern Glossy Black-cockatoo	*Calyptorhynchus lathami lathami*	V	V	7.47	2	242
Southern Greater Glider	*Petauroides volans*	E	E	90.97	2	2,566
Southern Myotis	*Myotis macropus*	V	-	11.87	2	343
Squirrel Glider	*Petaurus norfolcensis*	V	-	119.15	2	3,417
Austral Toadflax	*Thesium australe*	V	V	0.06	1.5	1
Eastern Cave Bat	*Vespadelus troughtoni*	V	-	9.38	3	431

* Note: This area calculation is 'assumed presence'.

The area from which the Species credits can be obtained is limited to the State of NSW.

10.2 OFFSET STRATEGY

10.2.1 NSW BAM REQUIREMENTS

The No Net Loss standard involves the retirement of ecosystem and species credits for Project related direct impacts in accordance with the BOS. The BOS requires all biodiversity impacts to be calculated using the BAM-C, which provides an output determining the final Species credit and Ecosystem credit obligations for the Project. Typically, the final credit obligations are to be 'retired' prior to construction or in accordance with an approved staged approach.

The Applicant is developing a biodiversity offset strategy in parallel with the BDAR. This strategy will detail the offset approach to be undertaken to retire credit obligations and will be achieved by:

- Retiring 'like for like' credits as specified in **Sections 7.1** and **7.2** to the amount and from the regions indicated;
- Funding a biodiversity conservation action instead of, or in combination with, the retirement of species credits;
- Payment into the Biodiversity Conservation Trust (BCT) in lieu of satisfying the offset liability specified in **Section 7.1** and **7.2**; and/or
- Consideration for entering into a Strategic Offset Delivery Agreement (SODA), which is a mechanism that allows proponents of major development projects to meet their biodiversity offset obligations by entering into an agreement with the Environment Agency Head.

Like for like offsetting where the native vegetation and habitat removed must be offset by the same kind of vegetation and habitat within the same IBRA subregion, adjoining IBRA subregion or any IBRA subregion within 100 km of the outer edge of the impacted site. These areas are listed below:

Same IBRA subregion

- Walcha Plateau.

Adjoining IBRA subregion

- Armidale Plateau;
- Comboyne Plateau;
- Eastern Nandewars;
- Macleay Gorges;
- Upper Manning;
- Mummel Escarpment;
- Peel; and
- Tomalla.

Within 100 km of outer edge of impacted site

- Barrington;
- Tingha Plateau;
- Bundarra Downs;
- Yarrowyck – Kentucky Downs;
- Moredun Volcanics;
- Glenn Innes – Guyra Basalts;
- Nightcap;
- Inverell Basalts;
- Wongwibinda Plateau;
- Round Mountain;
- Northeast Forest Lands;
- Guy Fawkes;
- Ebor Basalts;
- Coffs Coast and Escarpment;

- Carrai Plateau;
- Macleay Hastings; and
- Liverpool Plains.

10.2.2 MNES REQUIREMENTS

Additional biodiversity offsets may be required for MNES matters adversely impacted by the Project where the NSW BAM has not adequately addressed residual impacts on MNES. The recently published *Guidance for Accredited Assessors on the assessment of MNES* (~September – October 2024, which was either just prior to or after the submission of the Amended BDAR) lists the following for framework for consideration:

- Whether the MNES has been offset using the BAM;
- How impacts requiring offsets correlate to MNES impacts;
- Whether ecological rehabilitation and/or biodiversity conservation actions are proposed for offsetting; and
- Whether any other offsetting approach is proposed, such as land-based offsets, retiring credits by payment into the Biodiversity Conservation Fund and/or through supplementary measures.

The Project will deliver offsets as outlined in **Section 10.1** using the strategy outlined in 10.2.1. For most of the offsets proposed, they correlate directly with MNES adversely impacted by the Project. However, a few MNES are 'ecosystem predicted species' where offset delivery is indirectly delivered through ecosystem credits. MNES affected by this are:

- Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*);
- White-throated Needletail (*Hirundapus caudacutus*); and
- Fork-tailed Swift (*Apus pacificus*).

The ecosystem credit liability comprises habitat associated with these species. Accordingly, it is reasonable to assume that the delivery of offsets through these ecosystem credits will also deliver offsets for the above species. It is considered that the BOS is sufficiently robust to provide an adequate offset outcome for these affected MNES through this mechanism.

11. CONCLUSION

11.1 BIODIVERSITY MATTERS REQUIRING ASSESSMENT

The assessable vegetation cover mapped within the Subject Land is 464.13 ha. Fourteen PCTs are mapped within the Subject Land comprising 44 vegetation zones in varying conditions states that are generically described as:

- Woody:
  - Open forests;
  - Woodland;
  - Open Woodland; and
  - Shrubland.
- Non-woody:
  - Moderate condition grasslands;
  - Low condition grasslands; and
  - Sedgeland.

Four TECs are mapped within the Subject Land these being:

- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions EEC;
- New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion CEEC;
- Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion EEC; and
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC.

11.2 AVOID, MINIMISE AND MITIGATE

The amended Project design is based on detailed assessments and in response to the identification and assessment of environmental limitations, constructability requirements, and consideration of the outcomes of agency, landowner, and community consultations. The project design has aimed to avoid areas of biodiversity values as follows:

- Remnant woodland habitat identified as having high biodiversity value for resident and nomadic fauna, and in areas comprising TECs. The mapped extent and condition of this habitat was used to affect an avoidance during Project design; and
- The Project has been designed to maximise use of existing public and internal access tracks across the Subject Land where possible, minimising vegetation clearance required and where possible preventing an increase in predator access routes and activity.

A suite of mitigation measures to avoid and further minimise direct, indirect and prescribed impacts will be implemented, such as the development and implementation of a BBAMP and BMP.

11.3 DIRECT IMPACTS ON ASSESSABLE BIODIVERSITY MATTERS

The Project will have a direct impact on native vegetation and the habitat of known and assumed candidate threatened species. Direct impacts on PCTs are unavoidable and have been subject to residual impact calculations.

Species polygons have been established for eight threatened species that cannot be avoided by the Project. None of the species are identified as SAII entities.

Three PCTs forming part of two CEECs are listed as SAII entities, these being:

- 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion;
- 533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion; and
- 534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion.

The Projects' impact on SAII entities has been reduced through design. Additional measures are proposed to locally compensate for the loss of woody vegetation associated with these PCTs (i.e., higher condition state VZs).

11.4 INDIRECT IMPACTS ON ASSESSABLE BIODIVERSITY MATTERS

Indirect and prescribed impacts are expected because of the Project and are associated with the following:

- Impacts to hydrological processes;
- Increase risk of mammal predatory species access;
- Increase risk of vehicle strike; and
- Risk of turbine strike.

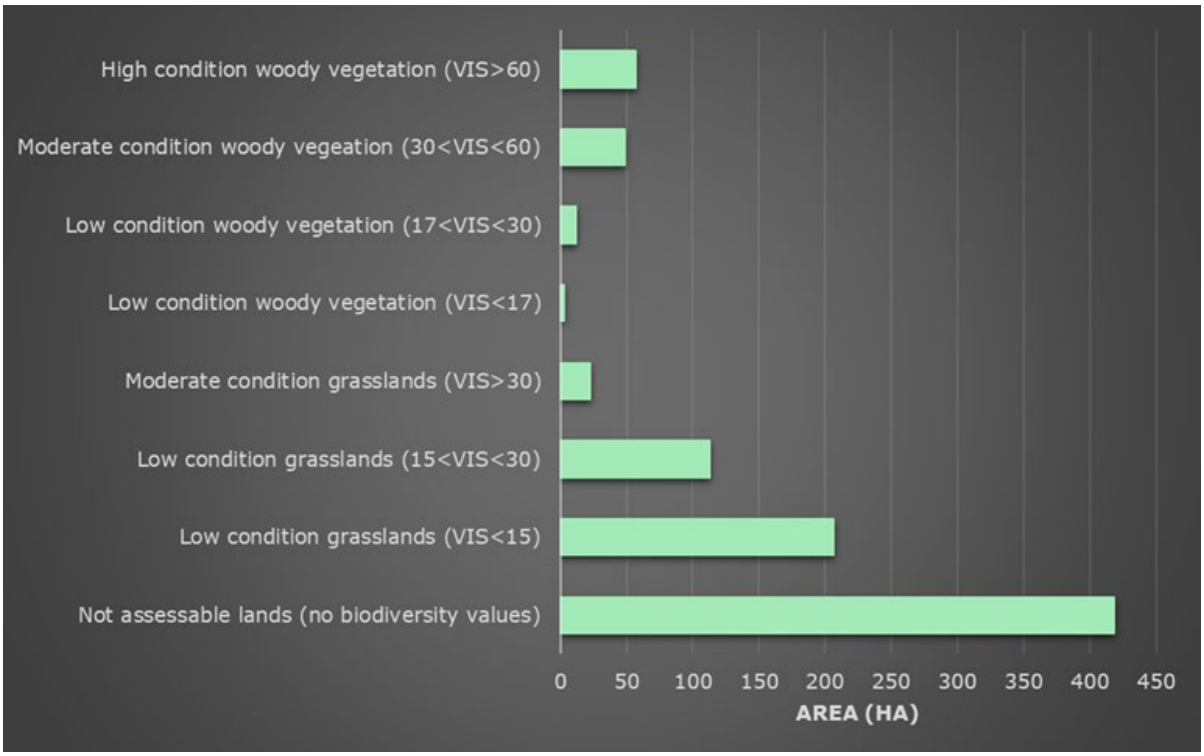
Mitigation measures will be implemented to mitigate against these indirect impacts and are inclusive of the implementation of a CEMP, BBAMP and BMP.

11.5 SUMMARY

The Project's impacts, assessed in accordance with the BAM, have demonstrated an avoid, minimize and mitigate approach to reducing the impacts on high biodiversity values. As shown in **Chart 11-1,** most of the Project's impacts are on lands that do not require assessment under the BAM (i.e., no biodiversity values) or are on assessable native vegetation and habitat with a VIS of less than 30 (i.e., low biodiversity values).

High biodiversity values impacted by the Project are restricted to areas of woody vegetation that either form part of a CEEC, EEC and/or have a VIS > 60 (i.e., ~107.77 ha or 12.2% of the Subject Land). Adequate representations of the high biodiversity values impacted by the Project will remain within the Project Area following development (i.e., a portion of the remaining ~4,200 ha of woody vegetation). The like-for-like offsetting of residual impacts through the BOS will ensure a no net loss outcome, thus maintaining compliance with the 'no net loss' standard established by the BAM.

CHART 11-1 SUMMARY OF BIODIVERSITY VALUES WITHIN THE SUBJECT LAND



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APPENDIX A LAND CATEGORISATION ASSESSMENT

Winterbourne Wind Farm

Land Categorisation Assessment Report

PREPARED FOR

WinterbourneWind Pty Ltd

DATE
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Land Category Assessment Report

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
CEEC	Critically Endangered Ecological Community
DP	Deposit Plan
DPE	(Former) Department of Planning and Environment (NSW)
EIS	Environmental Impact Statement
ERM	Environmental Resources Management Australia Pty Ltd
IGGAM	Interim Grasslands and other Groundcover Assessment Method
kV	kilovolt
LCA	Land Categorisation Assessment
LGA	Local Government Area
LLS Act	*Local Land Services Act 2013* (NSW)
LLS Regulation	*Local Land Services Regulation 2014* (NSW)
Met masts	Meteorological masts
MW	megawatt
MWh	megawatt hour
NSW	New South Wales
NSW DCCEEW	Department of Climate Change, Energy, the Environment and Water (NSW)
NV Act	*Native Vegetation Act 2003* (NSW) (repealed)
NVR map	Native Vegetation Regulatory map
O&M	Operations and Maintenance
PCT	Plant Community Type
PFC	Percentage Foliage Cover
PVP	Property Vegetation Plan
REZ	Renewable Energy Zone
SVTM	State Vegetation Type Map
TEC	Threatened Ecological Community
VIS	Vegetation Integrity Score
WTG	Wind Turbine Generator

GLOSSARY

Term	Description
Benchmark (DPIE 2020)	The quantitative measures that represent the 'best attainable' condition for each PCT, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, no high-frequency burning, and evidence of recruitment of native species.
Cleared lands	Lands deemed to be void of native vegetation (s 60J (2) of the LLS Act). These are designated as Category 1 - Exempt Land.
Evenness	The relative abundance of each species in the community
Low conservation value grasslands	Lands deemed to be low conservation value grasslands (s 60F (3) of the LLS Act). These are designated as Category 1 - Exempt Land.
Prescribed impacts	Means the prescribed impacts identified in clause 6.1 of the *Biodiversity Conservation Regulation 2017*. Prescribed impacts can be direct or indirect impacts.
Shannon-Weiner Index	The Shannon-Wiener Index is a measure of biodiversity that considers both species richness and evenness. It ranges from 0 to 5, with higher values indicating greater diversity. Values below 1.99 are considered very low, 2.0-2.49 are low, 2.50-2.99 are moderate, 3.00-3.49 are high, and 3.50 and above are very high. In most ecological studies, values typically fall between 1.5 and 3.5. (Beals, Gross and Harrell, 2000)
Species accumulation plot	Plots the cumulative species count against sample number and a number of estimators. The 'species observation' estimator was used in the analysis.
Species richness	The number of different species present in a community
Subject Land (DPIE 2020)	The area of land subject to direct impacts from the Project.

EXECUTIVE SUMMARY

OVERVIEW

This Land Categorisation Assessment (LCA) report has the purpose of identifying and mapping the extent of Category 1 - Exempt Land across the Winterbourne Wind Farm development footprint, hereafter referred to as the Subject Land. The designation of Category 1 - Exempt Land is determined by application of Part 5A of the *Local Land Services Act 2013* (LLS Act). This designation has the effect of excluding lands from the assessment of direct impacts as otherwise performed under the Biodiversity Assessment Method 2020 (BAM).

Category 1 - Exempt Land in this assessment are the same as lands described as 'low conservation value grasslands' and or lands that are significantly disturbed or modified. This type of vegetation sets it apart from woody native vegetation which is Category 2 - Regulated Land. However, in some cases, 'low conservation value grasslands' are to be designated as Category 2 - Regulated Land when they form part of a critically endangered ecological community (CEEC).

Natural Vegetation of the Area

Prior to European settlement, the natural vegetation of the eastern New England Tablelands mostly comprised a mosaic of grassy eucalypt woodlands and forests of montane to subalpine character with average 30 large trees per hectare (Benson and Ashby 2000). A landscape cross-section of the vegetated landscape that shows this character is provided in Benson and Ashby (2000) and is reproduced below for perspective.

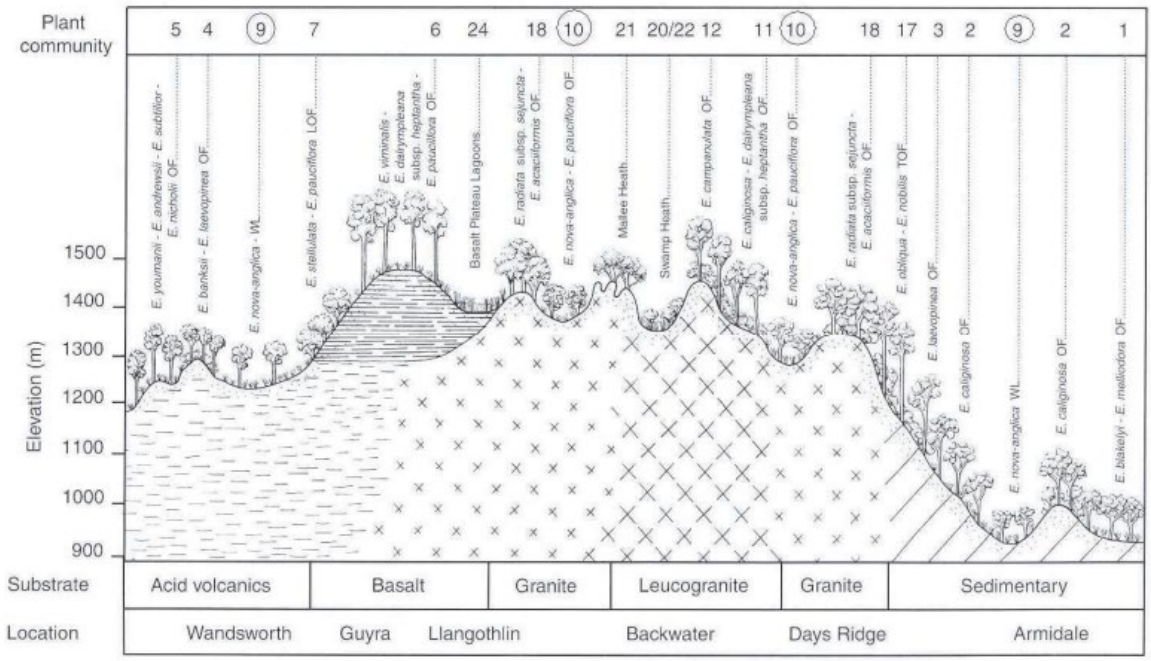


Fig. 1. Schematic transect of the landscapes present in the area covered by the Guyra 1: 100 000 map sheet showing the relationship between topographic position, elevation, substrate and plant communities. OF = Open-Forest, WL = Woodland, LOF = Low Open-Forest, TOF = Tall Open-Forest (after Walker and Hopkins (1990)). Reproduced with permission, from Benson and Ashby (2000). Plant communities 9 and 10, circled, are components of the national ecological community.

Few areas of naturally occurring non-woody vegetation are likely to have once occurred, with identifiable elements of these now restricted to carex fens and mires as the natural temperate grasslands are now indistinguishable from those derived from the clearing of woodlands and forests. These non-woody vegetated landscapes would have occurred in broad valley flats especially at higher altitudes (i.e., frost hollows). These naturally occurring non-woody vegetation associations would have been flanked by grassy woodlands, many of which are now listed at threatened due to clearing for agricultural production (e.g. New England Peppermint Grassy Woodlands in frost follows at high altitude and Box Gum Grassy Woodlands in drier lower elevations).

East of Walcha and within the Project Area, vegetation occurs on a high rolling plateau of elevation between 1050 to 1400 m with local relief of 100 m. Vegetation is formed mainly on steeply dipping sedimentary geologies (Devonian slate, phyllite, tuff, sandstone, conglomerate, chert and jasper, faulted Permian conglomerate, sandstone and mudstone, Carboniferous sandstone, slate and schist) with small areas of Permian granite. These conditions give rise to low to moderate soil fertility, with higher soil fertility restricted to isolated occurrences of basaltic soils. Higher biodiversity values are generally found in the more over cleared landscapes such as on soils with higher fertility.

Higher altitudes, which are mostly in the eastern third of the Project Area, comprise vegetation communities dominated by narrow-leaved peppermint (*Eucalyptus radiata*), messmate (*Eucalyptus obliqua*) and mountain gum (*Eucalyptus dalrympleana* ssp. *heptantha*), with snow gum (*Eucalyptus pauciflora*), black sallee (*Eucalyptus stellulata*) and ribbon gum (*Eucalyptus nobilis*). Tall open forest of New England blackbutt (*Eucalyptus andrewsii* ssp. *campanulata*), silver-top stringybark (*Eucalyptus laevopinea*), diehard stringybark (*Eucalyptus cameronii*), narrow-leaved peppermint (*Eucalyptus radiata*) occurs on the moist plateau margins.

Central and western parts of the Project Area comprise woodland of snow gum and black sallee on western ridges, with manna gum (*Eucalyptus viminalis*) and mountain gum on mid-slopes and New England Peppermint (*Eucalyptus nova-anglica*) in the valleys on cold sites. Open forest of broad-leaved stringybark (*Eucalyptus caliginosa*), Yellow Box (*Eucalyptus melliodora*), narrow-leaved peppermint (*Eucalyptus radiata*), and narrow-leaved black peppermint (*Eucalyptus nicholii*) occur on better soils.

According to regional geological maps, vegetation found on basalt-derived soils is uncommon in the Project Area. These consist of open forests and woodlands of manna gum (*Eucalyptus viminalis*), snow gum and black sallee.

Cold-air drainage inverts the tree patterns in wide valleys, as the distribution of these species is largely determined by climate parameters. Vegetation communities growing on basaltic soils consist of broad-leaved stringybark, New England blackbutt, and narrow-leaved peppermint on the hills, with Yellow Box, wattle-leaved peppermint (*Eucalyptus acaciiformis*), New England Peppermint, snow gum, black sallee and ribbon gum (*Eucalyptus nobilis*) in the valleys.

Agricultural History

European settlement occurred soon after the first recorded European traverse of the region in 1818 by the Surveyor General John Oxley (Benson and Ashby 2000). This heralded the start of land development, which initially involving mining activity (i.e., gold and tin) soon followed by cattle grazing. By the late 1800's, sheep grazing became widespread following improved property fencing (NPWS 2003), clearing up to 10% of the region (Benson and Ashby 2000) or extensive ringbarking (Benson and Ashby 2000), which could have affected up to three-quarters of the region (Stubbs 1998).

Benson and Ashby (2000) note that ringbarking has had a disproportionate impact on grassy woodlands such as Blakely's Red Gum-Yellow Box Grassy Woodland and New England Peppermint communities, these being part of listed CEECs known to occur within the region.

By the late 1970s, the region hosted over 7 million sheep at a stocking rate of seven sheep per hectare, made possible by land clearing and pasture improvement (Benson and Ashby 2000).

Benson and Ashby (2000) note the following in relation to the character of cleared lands throughout the region:

"Pasture improvement, using a range of exotic grasses such as *Lolium perenne* and *Poa pratensis*, and legumes such as *Trifolium repens*, commenced in the 1920s but accelerated in the late 1940s. By 1973 19% of the region was sown to improved pasture. These imported grasses were aided in their establishment by the application of fertilizers, particularly superphosphate. Some of these pastures have been re-invaded by some native grasses and are termed natural pasture. Cultivation of crops has always been limited in extent."

Land use effects on remnant native vegetation have been profound, as noted in Benson and Ashby (2000):

"While the tree species distribution is similar to that of today (Williams 1985), albeit reduced in extent, the understorey has changed significantly in disturbed areas".

This notation is consistent with the detailed vegetation classification provided in ERM (2024) for the Subject Land, which found difficulty in separating several plant community types because of understorey similarity. These similarities are not natural as they arise from grazing and other land use related activities such as fertiliser applications and pasture modification.

Draft Native Vegetation Regulatory Map

A draft NVR map has been published for the Subject Land, meaning that this assessment has been undertaken during the transitional period. The draft NVR map does not create new legal obligations and is not binding. While the draft NVR map is under review, land categories remain defined by the criteria in the legislation. A published final NVR map will end the transitional arrangements.

INVESTIGATION METHODS

The methods used to identify the extent of Category 1 - Exempt Land is generally described in the guide *Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme* (State of New South Wales (NSW) 2024). It outlines:

- An evidence-based approach to identifying native vegetation regulatory map (NVR map) land categorisation; and
- Biodiversity assessment requirements in relation to Category 1 - Exempt Land.

A combination of desktop analysis and site investigations have been used to:

- Map the extent of non-woody vegetation that may qualify for classification as low conservation value grasslands;
- Investigate the per cent cover of indigenous vegetation cover using transects to evaluate candidate low conservation value grasslands;
- Identify the incidence of significantly disturbed or modified lands using historical and/or satellite imagery; and
- Identify the extent of CEECs and critically endangered plants to identify the extent of Category 2 - Regulated Land.

The deeming provision in Section 60F (3) of the LLS Act has been used to identify low conservation value grasslands. The Interim Grasslands and other Groundcover Assessment Method (IGGAM) has not been applied in this LCA report as this method is used to determine low conservation value groundcover following cessation of the transitional period. However, transects used in the site investigations to quantify native vegetation cover are like/compatible with the Stage 2 assessment specified in the IGGAM.

FINDINGS

Desktop analysis and site investigations have identified the following land categories within the Subject Land:

- Category 1 - Exempt Land;
- Category 2 - Vulnerable Land;
- Category 2 - Regulated Land; and
- Excluded Land.

The designation of land categorisation has included the consideration of:

- Per cent indigenous vegetation cover (<50% or ≥50%) determined through 100 m transects (pursuant to s60F (3) of the LLS Act);
- Evidence of significantly disturbed or modified land (pursuant to s60 J(2) of the LLS Act); and
- Presence of Category 2 matters as specified in s 60I (2) of the LLS Act (e.g., presence of a CEEC).

Desktop analysis identified that the following ***do not*** occur within the Subject Land:

- Category 2 - Sensitive Land; or
- An area comprising a critically endangered plant mapped by the Environment Agency Head; or
- An area comprising a CEEC mapped by the Environment Agency Head.

Detailed site investigations undertaken as part of this and prior assessments (ERM 2024) verify the Subject Land does not contain an area of land comprising a critically endangered plant. Lands comprising part of a CEEC have been identified and, where occurring, these lands are designated as Category 2 - Regulated Land (pursuant to s 60I (2)(m) of the LLS Act).

The areal extent of land categorisation for the draft NVR map and proposed NVR map (as produced from this assessment) is summarised in **Table E-1** and shown in **Chart E-1** and **Chart E-2** respectively.

TABLE E-1 LAND CATEGORISATION SUMMARY FOR THE SUBJECT LAND

LLS Act Land Category	Draft NVR map (ha)	Proposed NVR map (ha)	Difference (ha)
Category 1 - Exempt Land	437.1	415.34	-21.76
Category 2 - Regulated Land	437.15	458.5	21.35
Category 2 - Vulnerable Regulated Land	6.34	6.53	0.19
Excluded from the LLS Act	1.48	1.7	0.22
Grand Total	**882.07**	**882.07**	**0**

CHART E1 DRAFT NVR MAP: LAND CATEGORISATION PROPORTIONS

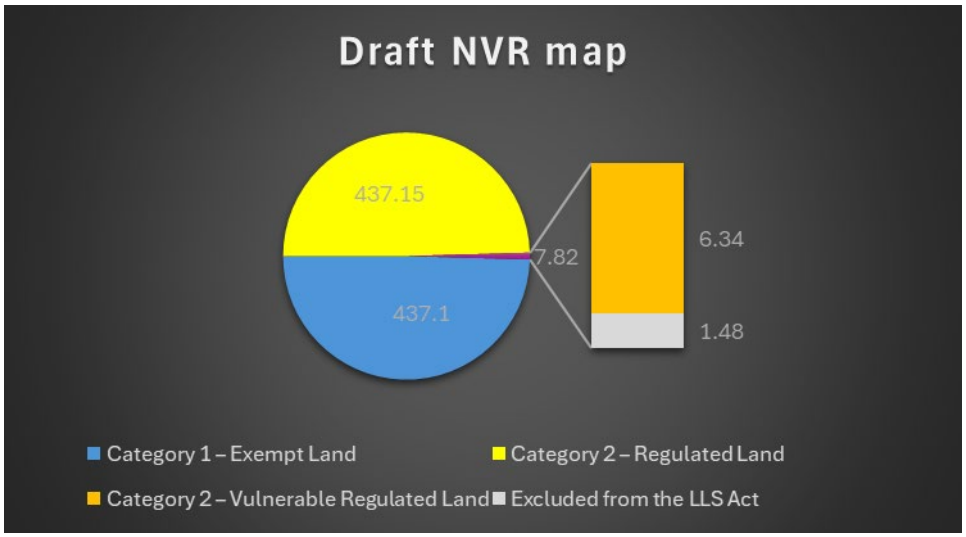
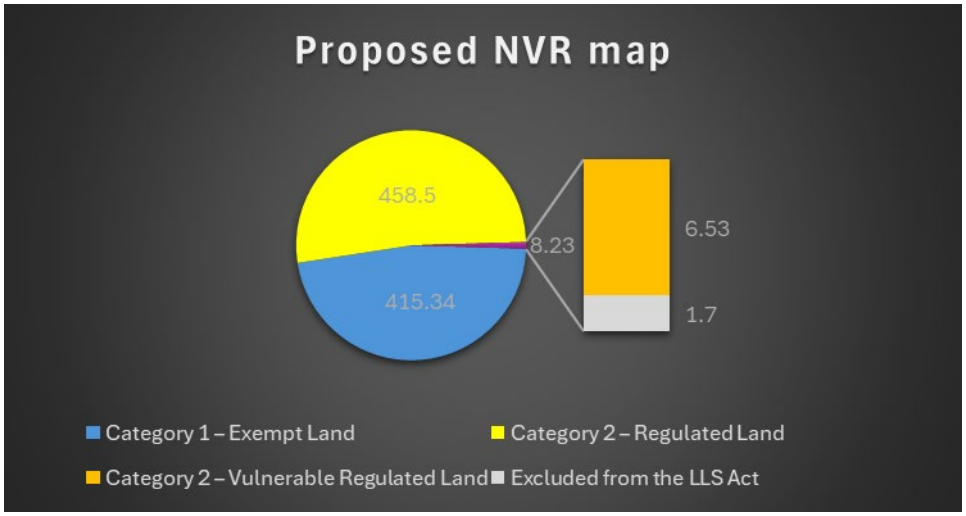


CHART E2 PROPOSED NVR MAP: LAND CATEGORISATION PROPORTIONS



Differences in the extent of land category designations between the published draft NVR map and that presented in this assessment are minor, indicating general consistency between the two independently performed land categorisations of the Subject Land. We point out the lesser amount of Category 1 - Exempt Land identified in this assessment (i.e., -21.76 ha) reflects the knowledge gained from detailed site investigations that have identified:

- The presence of CEECs; and
- Grasslands with >50% indigenous vegetation cover in Category 2 despite being found to be significant disturbed or modified.

The latter cautionary approach allows for the assessment of these grasslands under the BAM.

Differences in species richness between land categories provides insight into the degree of degradation present, which can be understood by reviewing 'species accumulation plots' by land category (i.e., comparing the number of species cumulatively observed in each land category by counting additional species observed in each consecutive sample). Three species accumulation charts were prepared for three map units, with numerical results summarised in Table E-2. For comparative purposes, the number of species observed for 18 BAM plots is reported to equivocate between each mapped area as there were an unequal number of plots sampled for these areas.

TABLE E-2 DIFFERENCES IN SPECIES ACCUMULATION RATES BETWEEN MAPPED LAND UNITS FOR THE SUBJECT LAND

Mapped Unit	Total species Observed	Total species observed in 18 BAM plots	Comment
Category 2 - Regulated Land: Woody vegetation (n=79 BAM plots)	355 Native: 256 Exotic: 99	192±12	• Highest number of native species observed and rate of species accumulation • Lowest percent exotic species incidence (28% exotic species)
Category 2 - Regulated Land: Non-woody vegetation (n = 69 BAM plots)	270 Native: 187 Exotic: 83	148±11	• Second highest number of native species observed and rate of species accumulation • Second lowest percent exotic species incidence (31% exotic species)
Category 1 - Exempt Land: Non-woody vegetation (n = 18 BAM plots)	116 Native: 77 Exotic: 40	116	• Lowest number of native species observed and rate of species accumulation • Highest percent exotic species incidence (34% exotic species)

The low species diversity recorded for areas mapped as Category 1 - Exempt Land reflects the degraded character of this vegetated landscape. This finding is consistent with the very low Shannon-Weiner Diversity values calculated for lands mapped as being low conservation value grasslands. An example of Category 1 - Exempt Land is shown in **Plate E1**.

Plate E1 Example of Category 1 - Exempt Land

An example of Category 2 - Regulated Lands is shown in **Plate E2**.

Plate E2 Example of Category 2 – Exempt Land

CONCLUSION

Category 1 - Exempt Land occurs throughout the Subject Land. These lands are highly degraded by having no woody vegetation, low species diversity and high exotic species cover.

Areas that qualify for Category 2 - Vulnerable Land have been identified and preserved irrespective of the native vegetation condition state. Lands that form part of a listed CEEC have been identified and used to map the extent of Category 2 - Regulated Land. There is no area of the Subject Land that comprises a critically endangered plant, which would otherwise warrant the designation of Category 2 - Regulated Land.

The revised land categorisation map prepared on this basis identified less Category 1 - Exempt Land than that identified in the draft NVR map. This reflects a detailed site based consideration of the factors specified in the LLS Act for land category designation.

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) have prepared this Land Categorisation Assessment (LCA) for the Winterbourne Wind Farm (the Project) on behalf of WinterbourneWind Pty Ltd (the Applicant).

1.1 PURPOSE OF THIS REPORT

Except for prescribed impacts, Part 6 Division 2 section 6.8(3) of the NSW *Biodiversity Conservation Act 2016* (BC Act) excludes Category 1 - Exempt Land (within the meaning of Part 5A of the NSW *Local Land Services Act 2013* (LLS Act)) from the assessment of direct impacts under the Biodiversity Assessment Method 2020 (BAM). This is repeated in section 1.5 (1)(d) of the BAM.

For this reason, this LCA report has the purpose of categorising lands within the Subject Land into one of two land categories, being:

- Category 1 - Exempt Land; and
- Category 2 - Regulated Land (inclusive of sensitive and Vulnerable lands).

Land categorisation provided by this report has had reference to the draft Native Vegetation Regulatory (NVR) map published during the transitional period and relevant legislation/regulation pertaining to land categorisation (i.e., Part 5A of the LLS Act). It also refers to the guide *Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme* (State Government of NSW and DPE, 2023).

1.2 THE PROJECT

The Project involves the construction, operation, maintenance and decommissioning of:

- Up to 118 wind turbine generators (WTG) with a hub height of 149 metres (m) and maximum height tip height of 230 m (vertical tip);
- A battery energy storage system (BESS) of up to 100 megawatt (MW)/200 megawatt hour (MWh) capacity;
- Two 33/330 kilovolt (kV) electrical substations, including control room, transformers, circuit breakers, switches, and other ancillary equipment; and
- Ancillary infrastructure including (but not limited to) internal access tracks, road upgrades, meteorological masts (met masts), and an operation and maintenance (O&M) facility.

The Project design is shown in **Figure 1-1** and has a linear length of approximately 220 kilometres (km).

1.2.1 LOCATION

The Project is situated 6.5 km north-east of Walcha, 35 km south of Armidale, and 75 km north-east of Tamworth, in the New England Tablelands region of NSW as shown in **Figure** 1-1. The Project area occurs across two Local Government Areas (LGA), the Walcha LGA and the Uralla Shire LGA and is within the New England Renewable Energy Zone (REZ).

NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
MIHI CREEK
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
GROBE CREEK
LAMBING FLAT CREEK
WINTERBOURNE CREEK
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
CROFTS KNOLL SF
OXLEY WILD RIVERS National Park
OXLEY WILD RIVERS National Park
MACLEAY RIVER

B76
Coffs Harbour
A15
M1
B51
Tamworth
B56
Port Macquarie

Legend
- Project Area
- Highway / Major Road
- Local Road
- Watercourse
- Other Waterways
- Existing 330kV Transmission Line
- National Parks
- State Forest
- LGA

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 2 4 6km
1:160,000

F1-1 The Project

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

1.2.2 APPLICABLE PROPERTIES

Land title within the Project area is provided in **Table 1-1**.

TABLE 1-1 PROJECT AREA LOT AND DP DETAILS

Landowner Group	Lot	DP	Title
Project Area			
Landowner Group 1	5	866652	Freehold
Landowner Group 2	98, 99, 100	1128816	Freehold
	48	756473	Freehold
Landowner Group 3	89	756474	Freehold
Landowner Group 4	80, 105	756504	Freehold
Landowner Group 5	1	1154216	Freehold
	91, 92, 93, 94, 96	755820	Freehold
	1, 2	207146	Freehold
Landowner Group 6	95, 96, 97	1128816	Freehold
Landowner Group 7	1	590453	Freehold
	2	710615	Freehold
	3	1221142	Freehold
	50, 58, 81, 95, 117, 118	756477	Freehold
Landowner Group 8	2	529780	Freehold
	47, 95	756504	Freehold
	351	873508	Freehold
	1, 2, 3, 4	1090942	Freehold
Landowner Group 9	1	120126	Freehold
	70	661944	Freehold
	37, 38, 39, 44, 45, 46, 67, 68, 112, 113, 123	765477	Freehold
	3	1111348	Freehold
	1	1221141	Freehold
Landowner Group 10	1	131437	Freehold
	2	247741	Freehold
	6, 7, 24, 29, 68, 69, 70, 71, 72, 77, 83, 89	756504	Freehold
	1	1175912	Freehold
Landowner Group 11	34, 51, 52	756476	Freehold
	352	873508	Freehold
	123	1062583	Freehold
Landowner Group 12	81	756504	Freehold
	1	1210945	Freehold

Landowner Group	Lot	DP	Title
Landowner Group 13	1	127753	Freehold
	2	211479	Freehold
	26, 28, 38	756473	Freehold
	103, 109	756474	Freehold
	53, 84, 85, 86, 87	756477	Freehold
	8	1144370	Freehold
	2	1192373	Freehold
	11	1199615	Freehold
	120	804549	Freehold
Landowner Group 14	131, 132	756477	Freehold
	3	1238969	Freehold
	6	1147105	Freehold
Landowner Group 15	1	1069933	Freehold
Landowner Group 16	29, 32, 33, 36, 37	756473	Freehold
Landowner Group 17	46	756473	Freehold
	1	595834	Freehold
	2	1234912	Freehold
	51	1126596	Freehold
Landowner Group 18	1, 2	360166	Freehold
	20	756504	Freehold
	3	234456	Freehold
Landowner Group 19	99	756504	Freehold
	4	234456	Freehold
	1	576324	Freehold
	1	211106	Freehold
	1, 2	810885	Freehold
	3	618977	Freehold
	7	866652	Freehold
	1	529780	Freehold
Landowner Group 20	55, 101, 102	756504	Freehold
Landowner Group 21	65, 104, 106, 107, 108, 119, 120, 140, 141, 462	756492	Freehold
	53	756476	Freehold
	1	344471	Freehold
	5, 12, 13, 17, 18, 19, 60, 68, 69, 70, 72, 73, 74, 75, 76, 77, 101, 121	755820	Freehold

Landowner Group	Lot	DP	Title
	2	344472	Freehold
Landowner Group 22	1	512960	Freehold
Landowner Group 23	2	512960	Freehold
	117	756492	Freehold
	33, 50	756476	Freehold
Landowner Group 24	B	381236	Freehold
	335, 336, 337, 364, 366, 369, 399	756502	Freehold
Landowner Group 25	1	1221143	Freehold
Landowner Group 26	10	1204696	Freehold
Landowner Group 27	2	595834	Freehold
Transmission Line and Switching Station			
Landowner Group 28	92, 115, 116, 117, 129, 146, 180, 183, 189, 198, 199, 302, 303	755836	Freehold
	1	184356	Freehold
	1	126202	Freehold
	9	1237026	Freehold
	127	755829	Freehold
	2	1243987	Freehold
Landowner Group 29	114	755829	Freehold
	205, 206	755846	Freehold
Landowner Group 30	14, 33, 34, 39, 40, 42, 78, 87	755820	Freehold
Landowner Group 31	45, 154, 155	755820	Freehold
Landowner Group 32	1	172254	Freehold
	1	1241971	Freehold
Landowner Group 33	B	372668	Freehold
Relevant Transport Route Road Upgrades			
N/A	7010	1058937	Crown
N/A	7031	1058953	Crown
N/A	5A	38704	Freehold
N/A	1	835733	Freehold
N/A	7016	94120	Crown
N/A	1	529780	Freehold
N/A	39	756504	Freehold
N/A	1	784322	Freehold
N/A	52	517948	Freehold

The Project's development footprint, inclusive of the Project area, transmission line and switching station and relevant areas for transport route road upgrades, is hereafter referred to as the Subject Land (i.e., where direct impacts are to occur).

1.3 REGULATORY FRAMEWORK

Category 1 - Exempt Land may be designated on a draft or final NVR map if:

- The Environmental Agency Head reasonably believes the land is deemed to be **low conservation value grassland** during the transitional period (pursuant to s60F (3) of the LLS Act); or
- The land is determined to be **low conservation value grasslands** (pursuant to s60H (5) of the LLS Act) or **low conservation value groundcover (not being grasslands)** (pursuant to c109 (1) of the *Local Land Services Regulation 2014* (LLS Regulation)) under the "*Interim Grasslands and other Groundcover Assessment Method*"; or
- The land is significantly disturbed or modified, with such areas **taken to be cleared** (pursuant to s60J (2) of the LLS Act).

These are independent tests with only one being required to satisfy the designation of Category 1 - Exempt Land provided criteria related to Category 2 - Regulated Land are not evident.

With respect to lands identified as *significantly disturbed or modified land* under s 60J (2) of the LLS Act and c 114 of the LLS Regulation, it is important to note that these areas are **taken to be cleared** (i.e., not containing native vegetation). This deeming provision sets it apart from other kinds of landcover such as **low conservation value grasslands** or **low conservation value groundcover (not being grasslands)**. Such land may be designated Category 1 - Exempt Land irrespective of its condition (pursuant to s60H (4) of the LLS Act).

The following sections outline the framework for land categorisation including consideration of the transitional arrangements.

1.3.1 TRANSITIONAL ARRANGEMENTS (SECTION 60F LLS ACT)

This LCA report has been prepared in the 'transitional period' (see s60F of the LLS Act), as the final NVR map is yet to be published. A draft NVR map has been published with the extent of this map covering the Subject Land (see **Figure 1-2**).

Transitional arrangements are in place until the final NVR map is published. These arrangements are described under Part 5A Division 2 section 60F of the LLS Act.

Section 60F is a deeming provision (see s60F (3) of the LLS Act) where it states:

> *…an area is taken, during the transitional period, to be low conservation value grasslands if it comprises only groundcover whose clearing was permitted by section 20 of the Native Vegetation Act 2003, as in force immediately before the repeal of that Act*.

Section 60F refers to the application of section 20 of the now repealed NSW *Native Vegetation Act 2003* (NV Act) during the transitional period, which ends when the draft NVR map is finalised. This states:

> *20 Clearing of certain groundcover permitted*

> *The clearing of native vegetation that comprises only groundcover is permitted if:*
>
> *(a) the vegetation comprises less than 50% of indigenous species of vegetation, and*
>
> *(b) not less than 10% of the area is covered with vegetation (whether dead or alive), and*
>
> *(c) those percentages are calculated in accordance with the regulations.*

In this assessment, lands cleared of their overstory stratum (i.e., woody vegetation)[1] thus now comprise only non-woody groundcover with less than 50% of indigenous species of vegetation are taken to be low conservation value grasslands. According to s60H (2)(a) of the LLS Act, lands deemed to be low conservation value grasslands are to be designated as Category 1 - Exempt Land if the Environmental Agency Head reasonably believes so, unless (see s60H (4)(a) and (c) of the LLS Act):

- The Environmental Agency Head reasonably believes a matter under section 60I(2) of the LLS Act requires the land to be designated as Category 2 - Regulated Land; and/or
- The land was unlawfully cleared of native vegetation after 1 January 1990.

Clause 62(1) of the now repealed NSW *Native Vegetation Regulation 2013* identifies the method for calculating the per cent cover of native vegetation (i.e., s20(c) of the NV Act). It states the following in this regard:

> *62 Clearing of groundcover—calculations*
>
> *(1) The percentages referred to in section 20 of the Act are to be calculated in accordance with the following methodology:*
>
> *(a) the percentages are to be calculated by the landholder in a scientific and objective manner that is appropriate to the area proposed to be cleared and the species of vegetation that are present,*
>
> *(b) the calculation can only be made at the time of year when the proportion of the amount of indigenous vegetation in the area to the amount of non-indigenous vegetation in the area is likely to be at its maximum.*

A 'transect-intercept' method, hereafter referred to as the Land Categorisation Assessment transect or LCA transect, has been used to estimate the per cent indigenous vegetation cover of grasslands within the Subject Land. LCA transects, being 100 m in length with measures taken at every metre interval, represent a scientific and objective method for approximating indigenous vegetation cover. This transect is similar to and compatible with that used in Stage 2 of the Interim Grasslands and other Groundcover Assessment Method (IGGAM).

Sampling of the Subject Land using the LCA transect survey has had regard for:

- Location: use of vegetation mapping to stratify survey (i.e., vegetation zones);
- Timing: the time of year where native cover is likely to be at its highest (i.e., spring to summer); and
- Survey effort: meet or exceed the minimum number of transects for a vegetation zone.

[1] Before 1 January 1990 or lawfully after that date.

The per cent cover of native vegetation cover per transect is calculated by dividing the total number of native vegetation hits intercepted at each 1 m intercept by the total length of the transect (i.e., 100 m). This metric allows for a direct comparison with the 50% or more threshold specified in section 20 of the NV Act.

This approach has allowed for a comprehensive assessment of prospective low conservation value grasslands, thus reducing uncertainty in the classification of such lands.

1.3.2 SECTION 60J (2) OF THE LLS ACT

Part 5A Division 2 s60J (2) of the LLS Act states the following in relation to significantly disturbed or modified land:

> *Native vegetation that comprises grasslands or other non-woody vegetation is taken to have been cleared if the native vegetation was significantly disturbed or modified. The regulations [Local Land Services Regulation 2014] may make provision for the purposes of determining whether native vegetation has been significantly disturbed or modified for the purposes of this Division*.

For this to apply:

- Native vegetation must have been cleared as of 1 January 1990 (see s60H (1)(a) of the LLS Act); or
- Clearing of native vegetation must have been done lawfully between 1 January 1990 and the commencement of Part 5A of the LLS Act on 25 August 2017 (see s60H (1)(b) of the LLS Act).

In accordance with s60J (4) of the LLS Act, the best available aerial photographs or satellite imagery before and after the relevant date, must form the basis of any determination by the Environment Agency Head regarding when the woody vegetation stratum was cleared between 1 January 1990 and 25 August 2017 (i.e., native vegetation).

For the purposes of s60J (2) of the LLS Act, Part 14 Division 2 c 114(1) of the LLS Regulation provides further specification as to whether land has been significantly disturbed or modified. For clarity, this is provided as follows:

1. *Native vegetation that comprises grasslands or other non-woody vegetation is taken to have been significantly disturbed or modified (and therefore cleared) only if –*
    a) *there has been a detectable variation (from information obtained from aerial or satellite imagery) in the structure or composition, or both, of non-woody vegetation, and*
    b) *that variation is consistent with management of pasture or crops for agricultural purposes, and*
    c) *that variation has been sustained for at least 12 months on more than one occasion before the commencement of Part 5A of the Act [the LLS Act], and*
    d) *that variation has not been caused only by grazing on the land, and*
    e) *that variation occurred (from information obtained from aerial or satellite imagery) between 1 January 1990 and the date of commencement of Part 5A of the Act [the LLS Act].*

The use of these provisions to identify significantly disturbed or modified land to map **cleared lands** is a test separate to that performed under section 60F(3) of the LLS Act, which is used to identify **low conservation value grasslands** during the transitional period. Land could be mapped as Category 1 - Exempt Land for either or both reasons. Sections 60H (1)(a) and 60H(2)(a) of the LLS Act verify this distinction, as these sections operate separately and do not require both matters to be satisfied for the designation of Category 1 - Exempt Land.

1.3.3 SECTION 60H (5) OF THE LLS ACT

The parameters defining Category 1 - Exempt Land are set out in s60H of the LLS Act. Notably, in s60H (5), the following is stated with respect to the method for determining the conservation value of grasslands:

> *60H Category 1 - Exempt Land mapping*
>
> *(5) The regulations may make provision for the purposes of determining whether grasslands are low conservation value grasslands for the purposes of this Division.*

In being silent on s60F of the LLS Act, c110 of the LLS Regulation refers specifically to s60H (5) of the LLS Act, where it states the following:

> *110 Determining conservation value of grasslands or other groundcover (s60H (5))*
>
> *(1) For the purposes of section 60H (5) of the Act, land contains low conservation value grasslands for the purposes of Division 2 of Part 5A of the Act if the land is determined to contain low conservation value grasslands under the* "Interim Grasslands and other Groundcover Assessment Method*" published by the Minister for the Environment in the Gazette on 25 August 2017.*

Here, the IGGAM has the purpose of determining the conservation value of grasslands. This contrasts with the deeming provision specified in s60F (3) of the LLS Act (see **Section 1.3.1**), which applies in the transitional period.

This LCA has been prepared in the transitional period where the deeming provision set out in s60F of the LLS Act applies to identifying land comprising low conservation value grasslands. Application of the IGGAM is pertinent to land categorisation assessments performed after the cessation of the transition period (i.e., publishing of final NVR map). The use of the IGGAM in this assessment is limited to guidance provided on the establishment of line transects used to estimate the per cent cover of native vegetation (i.e., Stage 2 assessment of the IGGAM).

1.3.4 SUMMARY

Land categorisation is defined by application of Part 5A Division 2 s60A, s60G, s60F, s60H, s60I and s60J of the LLS Act, as well as clauses 107-115 of the LLS Regulation. Relevant sections of the LLS Act, and relevant provisions of the LLS Regulation, which define Category 1 - Exempt Land and Category 2 - Regulated Land respectively, is summarised in **Table 1-2**.

TABLE 1-2 LAND CATEGORY DEFINITIONS UNDER THE LLS ACT AND LLS REGULATION

Land Category	Definition
Category 1 - Exempt Land	• Land cleared of native vegetation as of 1 January 1990 or lawfully cleared after 1 January 1990 and before 25 August 2017 • Land containing low conservation value grasslands or groundcover • Native vegetation identified as regrowth in a Property Vegetation Plan (PVP) under the repealed *Native Vegetation Act 2003* only where the PVP specifies a regrowth date • Land bio-certified under the *Biodiversity Conservation Act 2016*
Category 2 - Regulated Land	• Land not cleared of native vegetation as of 1 January 1990 or unlawfully cleared of native vegetation after 1 January 1990 • Land containing native vegetation grown or preserved using public funds • Land subject to an expired remedial action to restore or protect the biodiversity values • Land in the proximity area of a coastal wetland or littoral rainforest areas of the coastal zone under the *Coastal Management Act 2016* • Land subject to (or previously subject to) a private native forestry plan under either the *Forestry Act 2012* or the *Native Vegetation Act 2003* • Land subject to a Private Native Forestry Plan or Private Native Forestry property vegetation plan (PVP) that is in force • Land containing medium conservation value grasslands • Land containing low conservation grasslands beneath the canopy or drip line of woody vegetation • Land is a travelling stock reserve (unless the land is located in the Western Division) • The land is otherwise prescribed by the Local Land Services Regulation as category 2–regulated land.
Category 2 - Vulnerable Regulated Land	• Steep (greater than 18 degrees from the horizontal) or highly erodible land • Protected riparian areas • Land that is otherwise environmentally sensitive

Category 2 - Sensitive Regulated Land	• Where the Environment Agency Head reasonably believes it to contain:
	  ◦ old growth forest, rainforest, critically endangered ecological communities or critically endangered plants, or core koala habitat
	  ◦ high conservation value grasslands
	  ◦ land recommended for declaration as areas of outstanding biodiversity value
	  ◦ Ramsar wetlands within the meaning of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
	  ◦ land described as Coastal Wetlands or Littoral Rainforest in the coastal zone referred to in the *Coastal Management Act 2016*
	  ◦ land subject to an approved conservation measure that was the basis for other land being biodiversity certified
	  ◦ conservation areas under the Southern Mallee Land Use Agreement
	  ◦ native vegetation that must be retained under the *Plantation and Reafforestation Act 1999*
	  ◦ land subject to a condition of development consent requiring the land to be set aside for conservation purposes under the *Environmental Planning and Assessment Act 1979*.
	• Land contained in the following types of agreements:
	  ◦ biodiversity stewardship agreements, conservation agreements, and wildlife refuge agreements made under the *Biodiversity Conservation Act 2016*

Land Category	Definition
	◦ conservation agreement made under the *National Parks and Wildlife Act 1974* ◦ trust agreements made under the *Nature Conservation Trust Act 2001* ◦ conservation areas made under Southern Mallee Landuse Agreements ◦ registered property agreements made under the *Native Vegetation Conservation Act 1997* ◦ incentive or conservation property vegetation plans made under the *Native Vegetation Act 2003* that have not expired. • Land required to be set aside, offset or retained as a condition of development consent or subject to a remedial direction, including: ◦ land required to be set aside under a code compliant certificate made under the Land Management (native vegetation) Code 2018 ◦ land currently subject to a remedial action to restore or protect biodiversity values ◦ land required to be set aside under a Ministerial Order made under the *Native Vegetation Act 2003* ◦ land established as an offset in a property vegetation plan made under the *Native Vegetation Act 2003* ◦ land contains native vegetation that is required to be retained under a plantation authorisation made under the *Plantations and Reafforestation Act 1999* ◦ the land is, by a condition of a development consent or approval under the *Environmental Planning and Assessment Act 1979* notified to the Environment Agency Head, required to be set aside for nature conservation, for re-vegetation of native vegetation or as a native vegetation offset.
Excluded Land	• Land where the Land Management (Native Vegetation) Code 2018 and allowable activities do not apply.

Transitional arrangements exist under s60F of the LLS Act when designating land categories. These arrangements apply after the commencement of Part 5A of the LLS Act and the concurrent repeal of the NV Act and before publication of the final NVR map (see s60F (1) of the LLS Act). As the final NVR map is not yet published, these transitional arrangements are applicable to this assessment, meaning that the process for identifying 'low conservation value grasslands' is via application of section 20 of the NV Act (despite this Act being repealed). This process has been adopted in this assessment.

1.4 DETERMINING NATIVE VEGETATION LAND CATEGORISATION FOR APPLICATION IN THE BIODIVERSITY OFFSETS SCHEME

BAM accredited assessors may establish by way of reasonable approximation the land categorisation of an assessment area for consideration by the Environment Agency Head. An outline of an evidence-based approach to identifying NVR mapped land categorisation, and the biodiversity assessment requirements in relation to Category 1 - Exempt Land, is provided in the guide *Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme* (State Government of NSW and DPE, 2023).

As mentioned in the guide, Section 60F of the LLS Act remains relevant to this assessment as it has been prepared during the transitional period (i.e., before publication of the final NVR map). Land identified as 'low conservation value grasslands', as per s60F(3) of the LLC Act, is to be designated as Category 1 - Exempt Land (s60H(2)(a)) provided s60I(2) does not apply to the land.

1.5 STATUS OF THE NVR MAP

The Subject Land is currently included in the draft NVR map, which is shown in **Figure 1-2**. The draft NVR map has been published to enable landholders to review the accuracy of the mapped land categorisations on their land before finalisation of this map. Thematics used to depict the differing land categories are summarised in **Table 1-3**.

TABLE 1-3 LAND CATEGORY THEMATICS USED IN THE DRAFT NVR MAP

Land Category	Colour on the NVR map
Category 1 - Exempt Land	• Not visible (transitional NVR map) • Blue (draft NVR map)
Category 2 - Regulated Land	• Not visible (transitional NVR map) • Yellow (draft NVR map)
Category 2 - Vulnerable Regulated Land	• Orange (transitional and draft NVR maps)
Category 2 - Sensitive Regulated Land	• Pink (transitional and draft NVR maps)
Excluded Land	• Grey (transitional and draft NVR maps)

Note that reference made to Category 1 - Exempt Land and Category 2 - Regulated Land layers visible on the draft NVR map for the Subject Land may not be the same as the land categorisation determination presented in this Report. The proposed land categorisation presented is based on legislative provisions including site assessment and represents *what a reasonable person would believe about the matter* (s60F (4) of the LLS Act).

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F1-2 Draft NVR Map for the Subject Land

Map 1 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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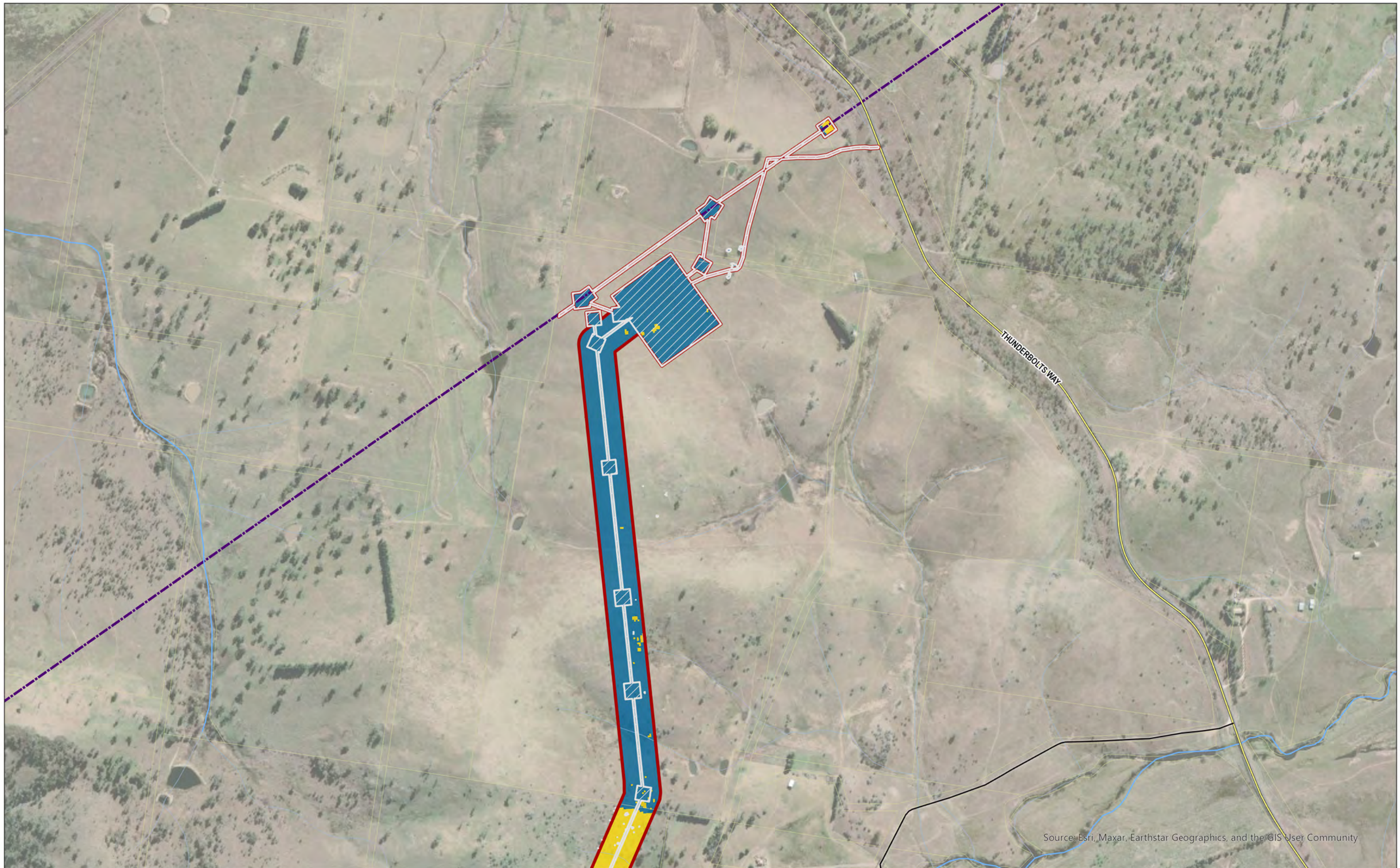

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025
Created By: VN
Drawing Size: A3

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F1-2 Draft NVR Map for the Subject Land

Map 2 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 4 of 43

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THUNDERBOLTS WAY

COOK STATION CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 5 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 6 of 43

Winterbourne Wind Farm
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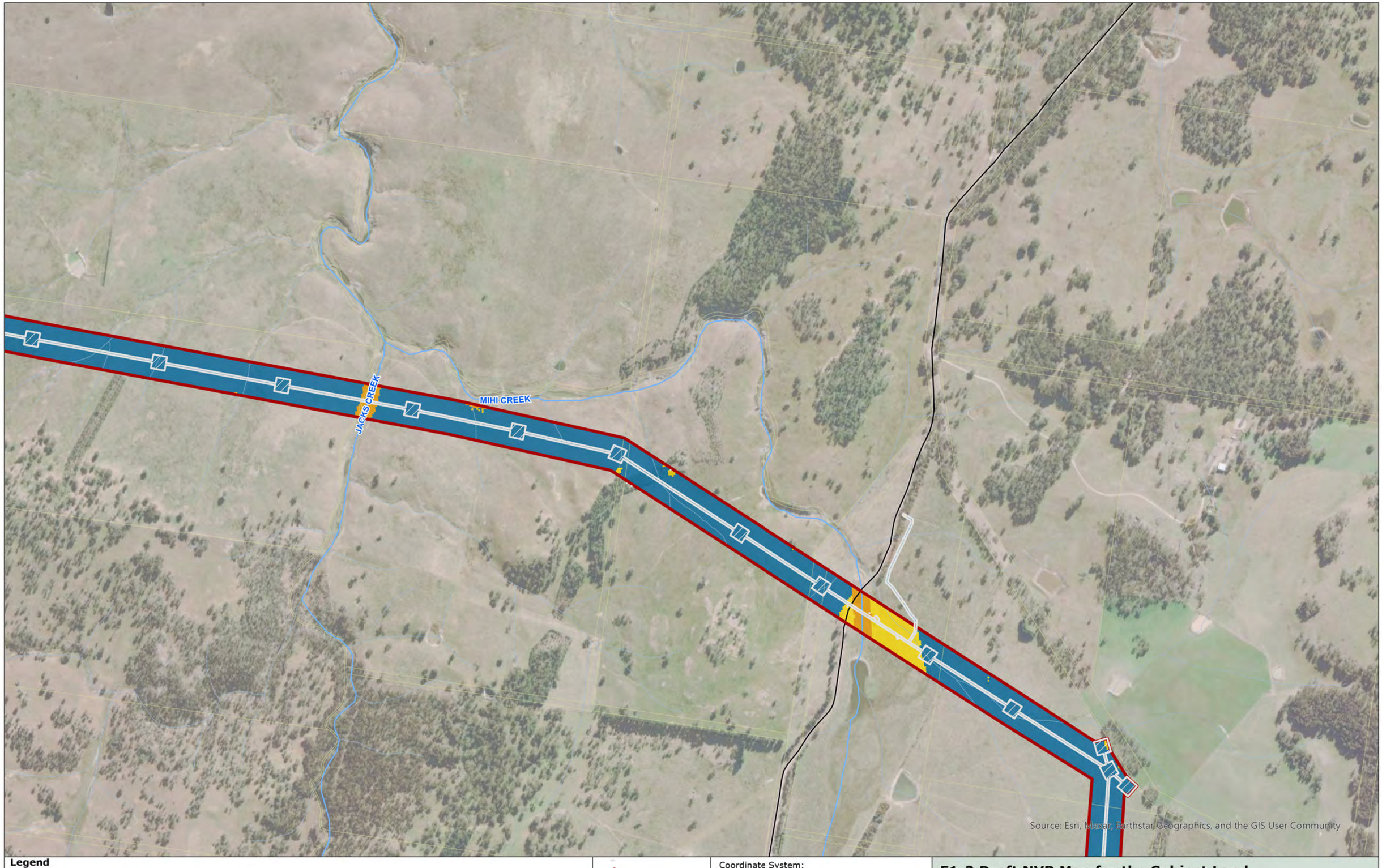

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

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BLUE MOUNTAIN ROAD

MIHI CREEK

JACKS CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 8 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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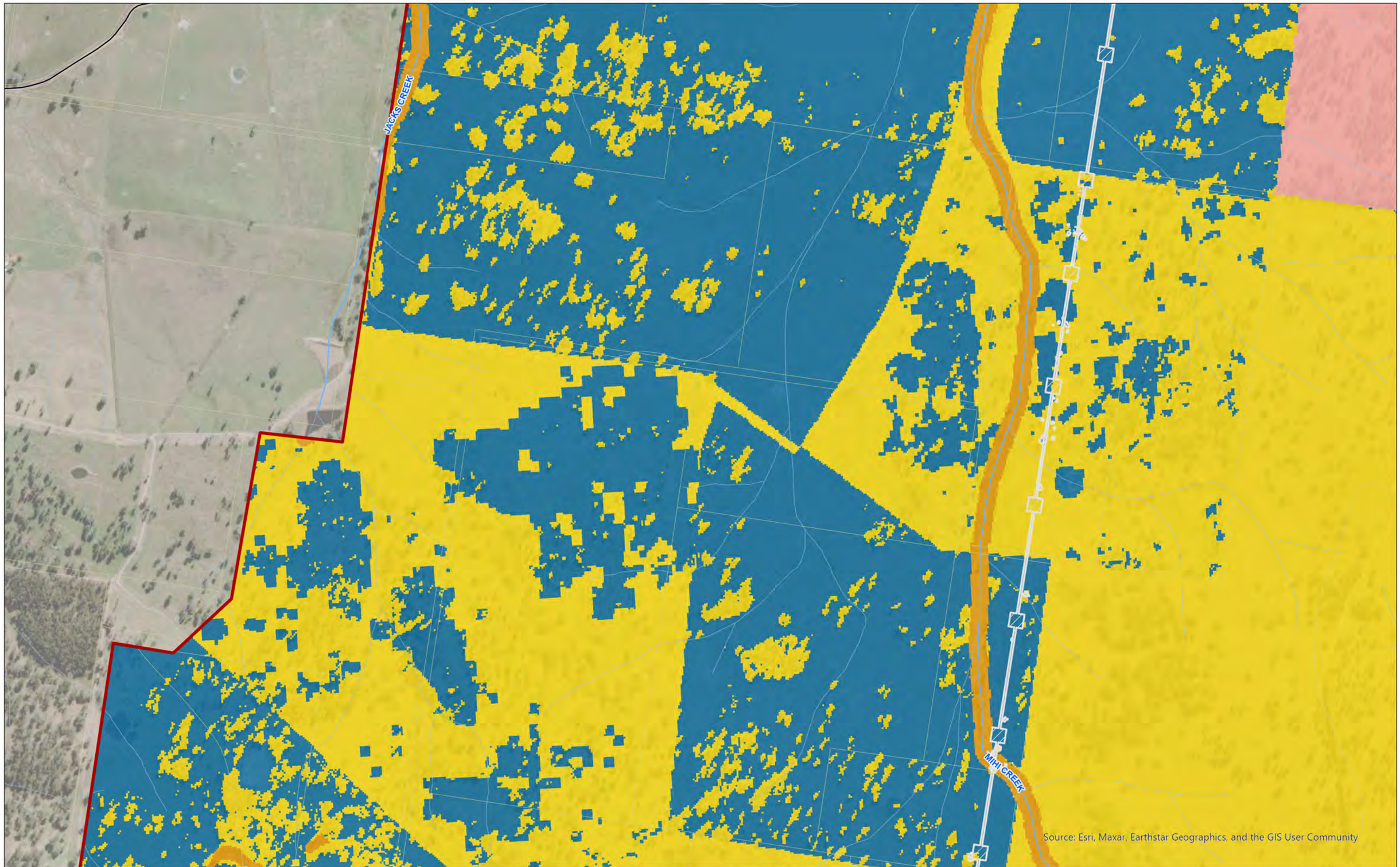

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

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GDA 1994 MGA Zone 56
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
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MIHI CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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GROSE CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 11 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

GROSE CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
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F1-2 Draft NVR Map for the Subject Land

Map 13 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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- Category 2 - sensitive and vulnerable regulated lands areas of overlap
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Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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BLUE MOUNTAIN ROAD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 16 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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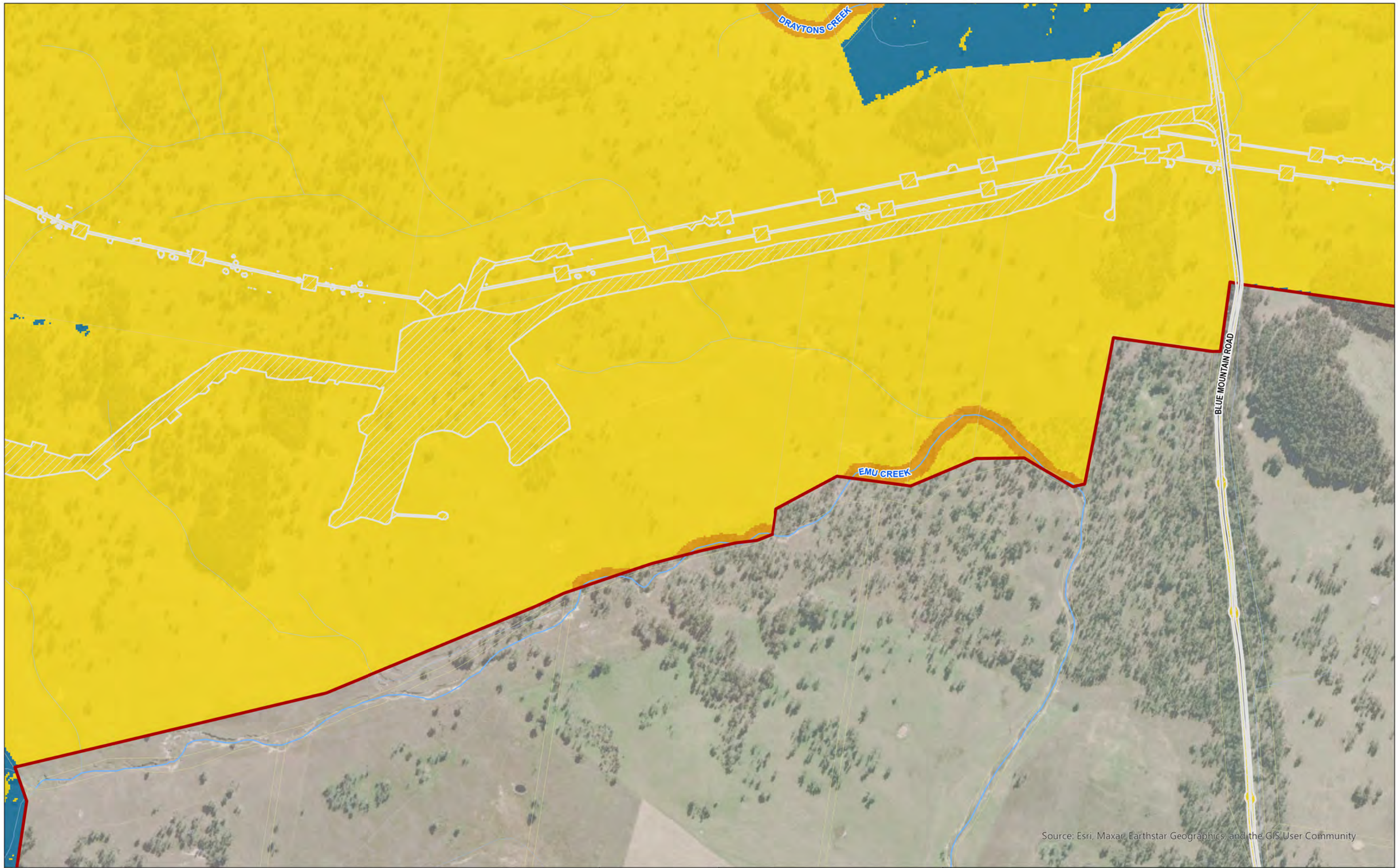

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
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GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 17 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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0760651_WWF_LCA_R3.aprx

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 18 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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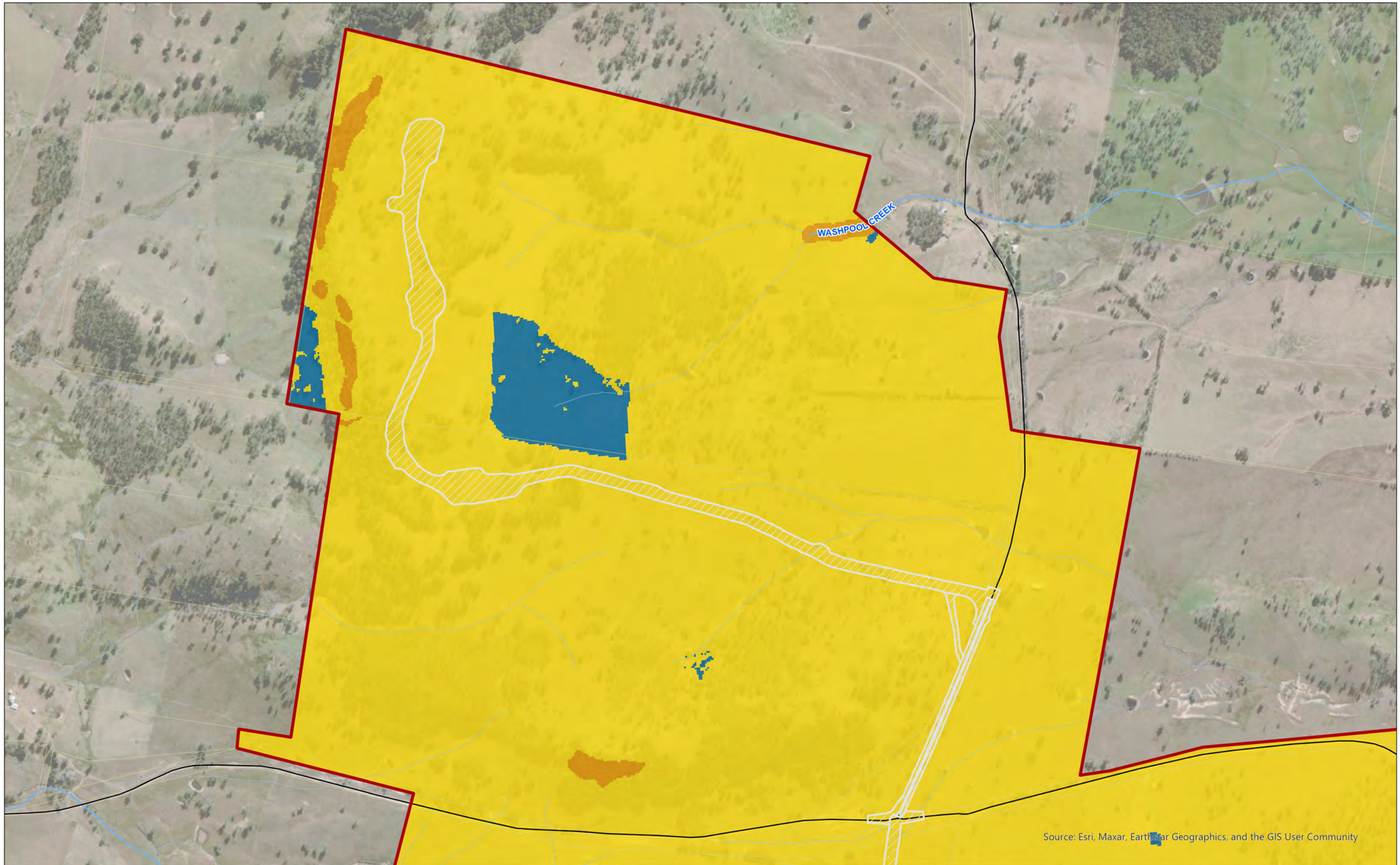

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 19 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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SCRUBBY CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 20 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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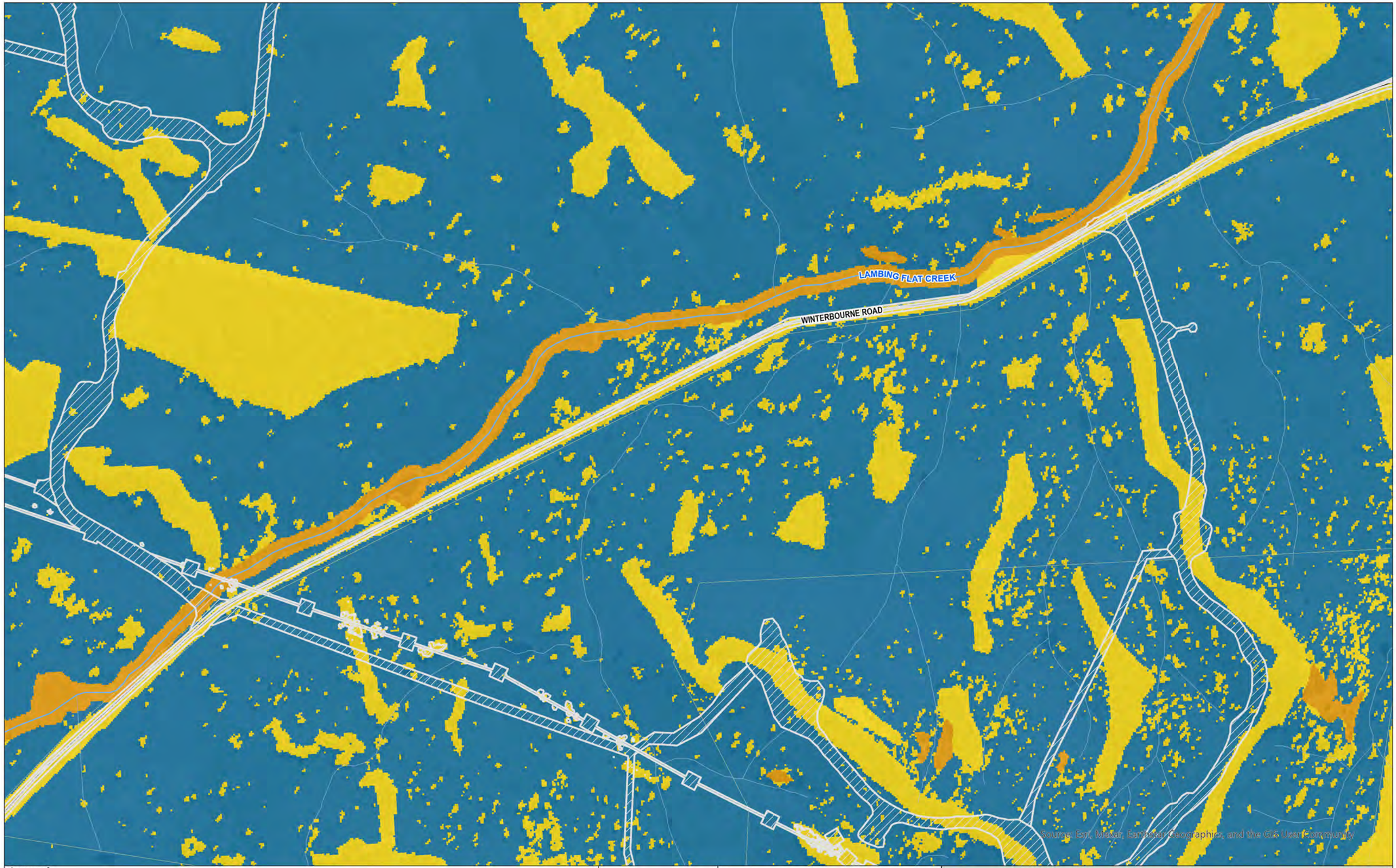

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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WINTERBOURNE ROAD

BARK HUT ROAD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 22 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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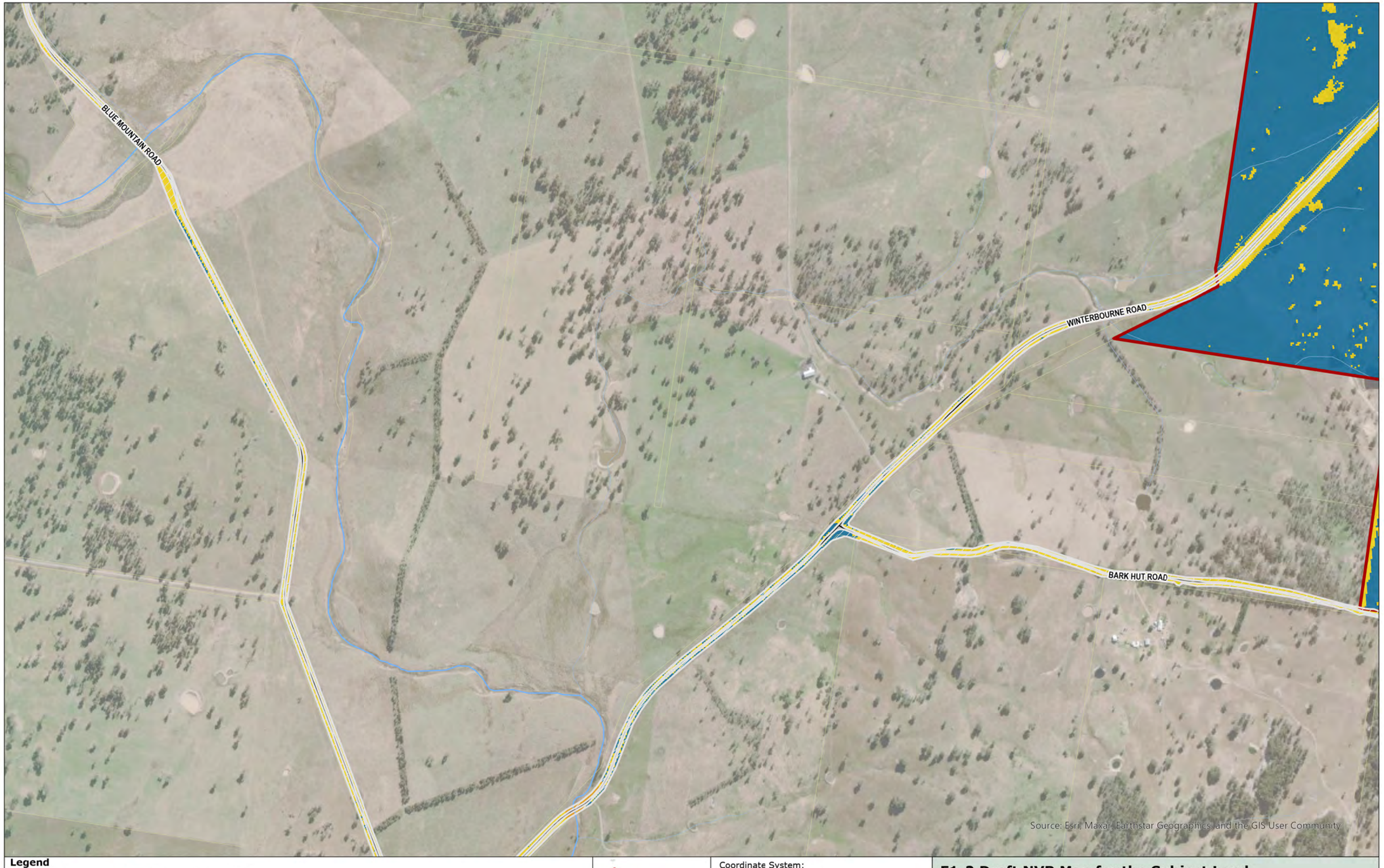

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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F1-2 Draft NVR Map for the Subject Land

Map 23 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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WINTERBOURNE ROAD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
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WWPL

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WINTERBOURNE ROAD

EMU CREEK ROAD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
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WWPL

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EMU CREEK ROAD

MOONA PLAINS ROAD

APSLEY RIVER

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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URALLA ROAD

EMU CREEK ROAD

DERBY STREET

WALCHA

OXLEY HIGHWAY

APSLEY RIVER

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

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Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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WINTERBOURNE ROAD

WINTERBOURNE CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 28 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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NICHOLS GULLY

EAGLE GULLY

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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- Category 2 - sensitive regulated land
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F1-2 Draft NVR Map for the Subject Land

Map 29 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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WINTERBOURNE ROAD

WINTERBOURNE CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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- Category 2 - sensitive regulated land
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- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 30 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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WINTERBOURNE CREEK

HOLE CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 31 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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DOG TRAP CREEK

BARK HUT ROAD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 32 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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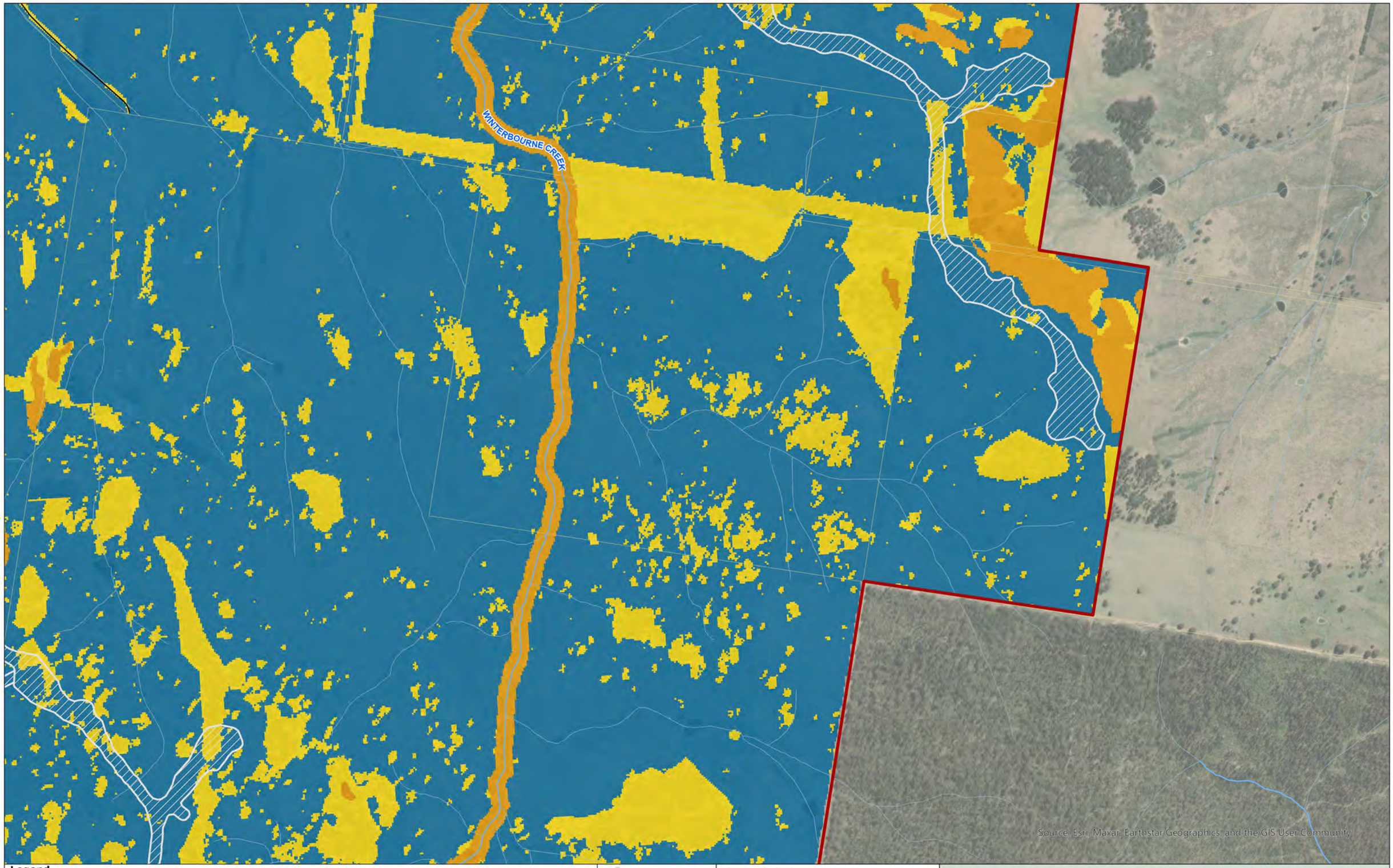

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 33 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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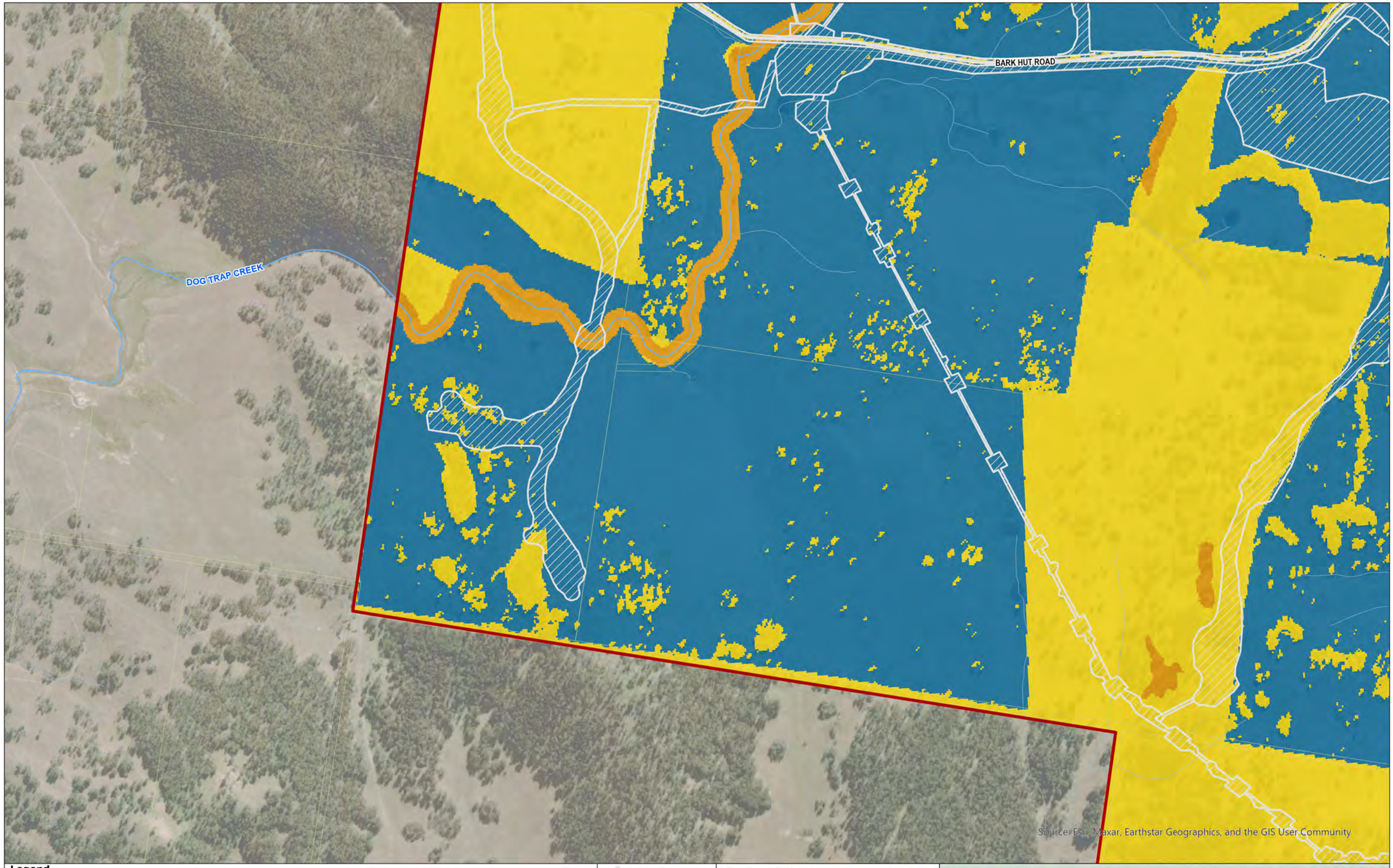

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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- Category 2 - sensitive regulated land
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- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 34 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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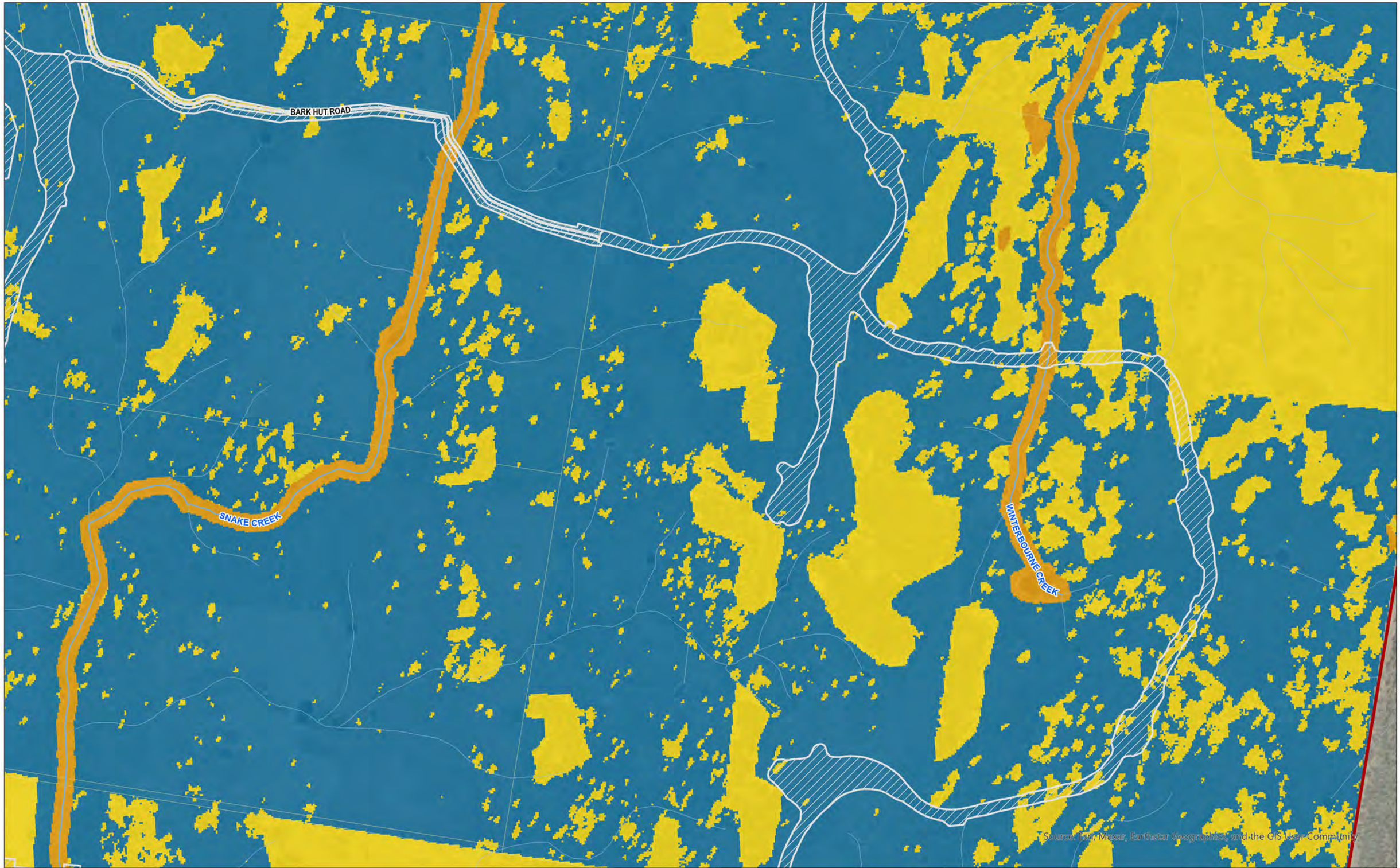

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 35 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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SNAKE CREEK

BROOKMOUNT CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 36 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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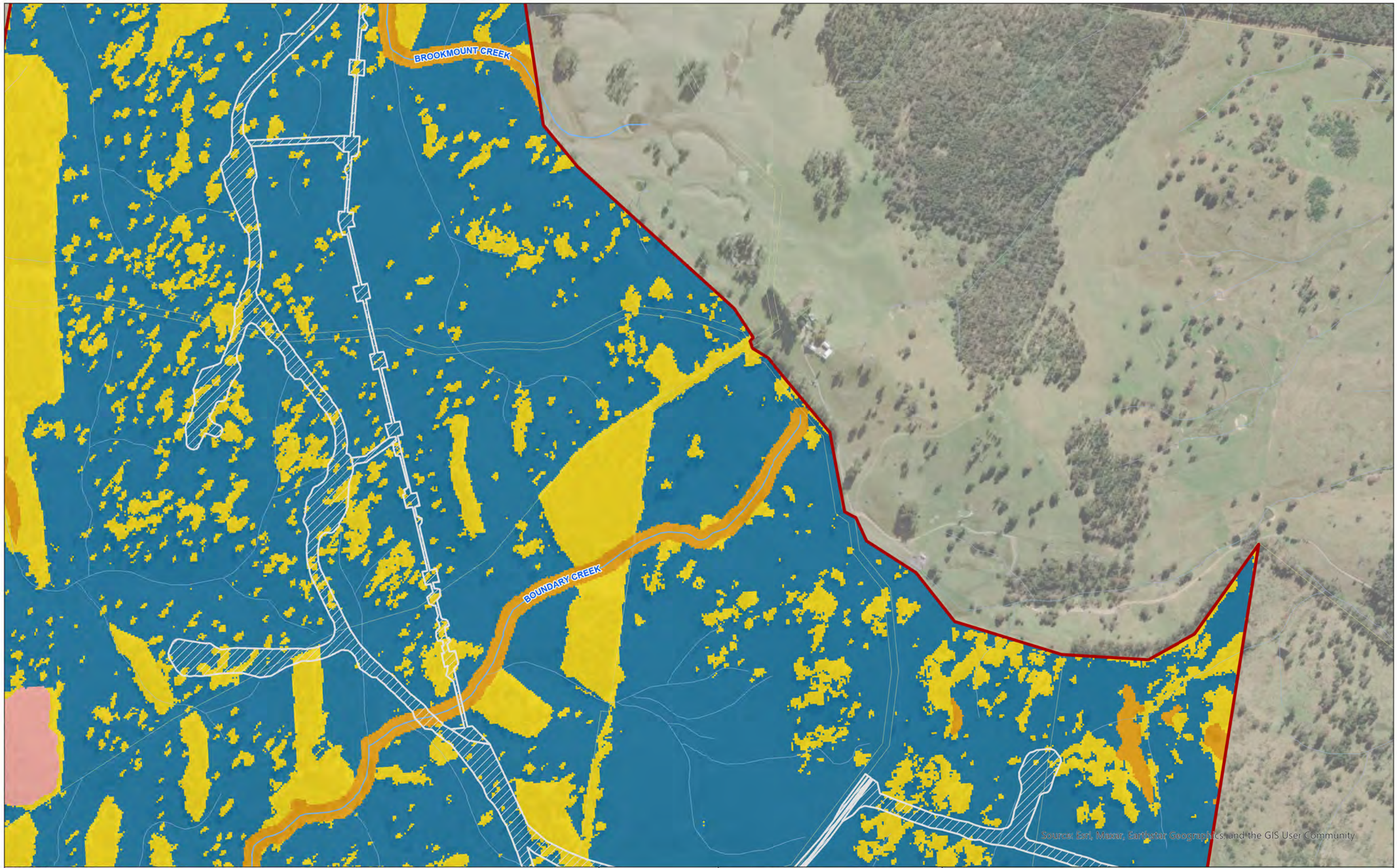

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 37 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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BOUNDARY CREEK

MOONA PLAINS ROAD

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025

Created By: VN

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F1-2 Draft NVR Map for the Subject Land

Map 38 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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F1-2 Draft NVR Map for the Subject Land

Map 39 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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MOONA PLAINS ROAD

STOCKYARD CREEK

GRAVEYARD CREEK

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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Coordinate System:
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F1-2 Draft NVR Map for the Subject Land

Map 40 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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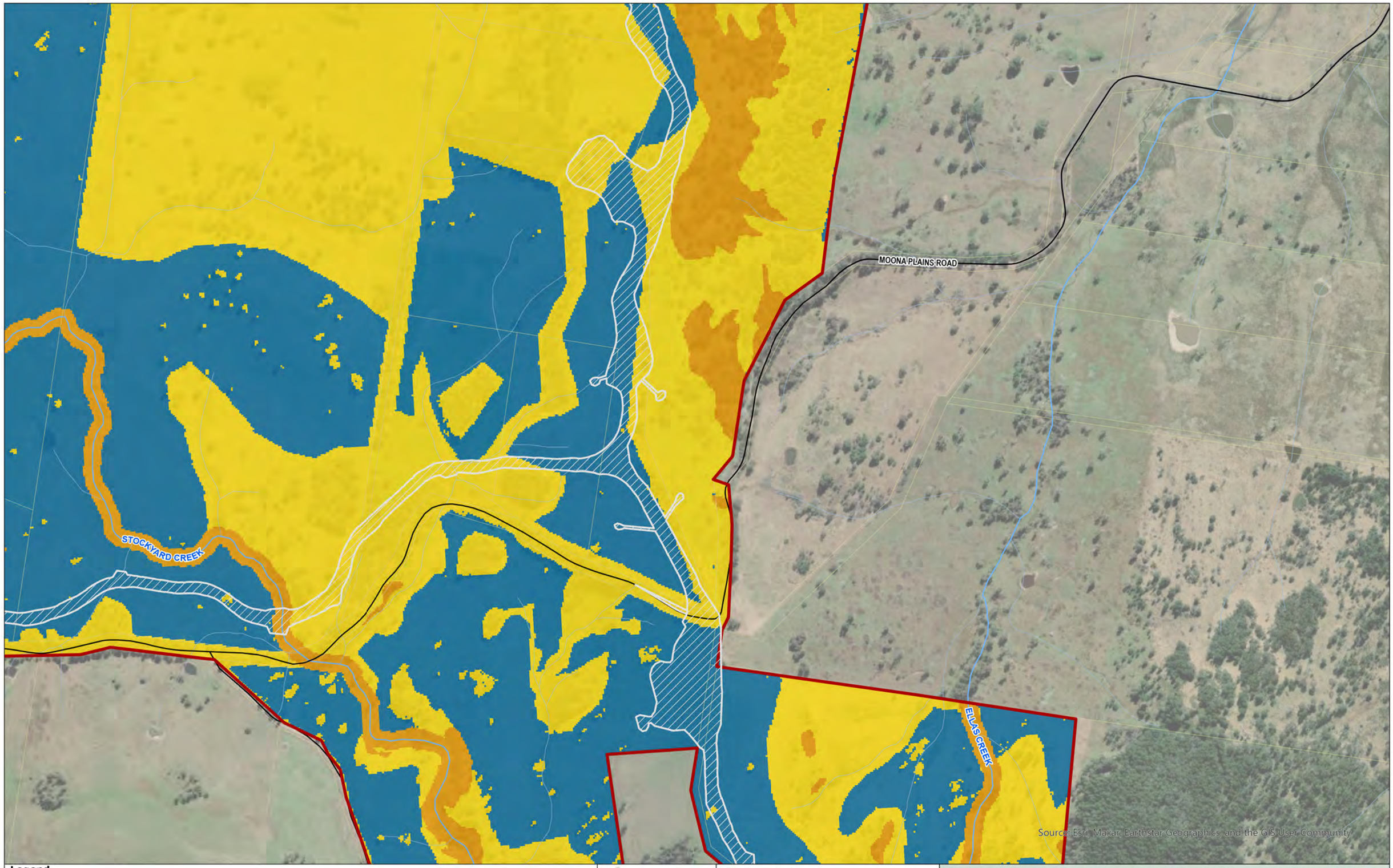

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
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F1-2 Draft NVR Map for the Subject Land

Map 41 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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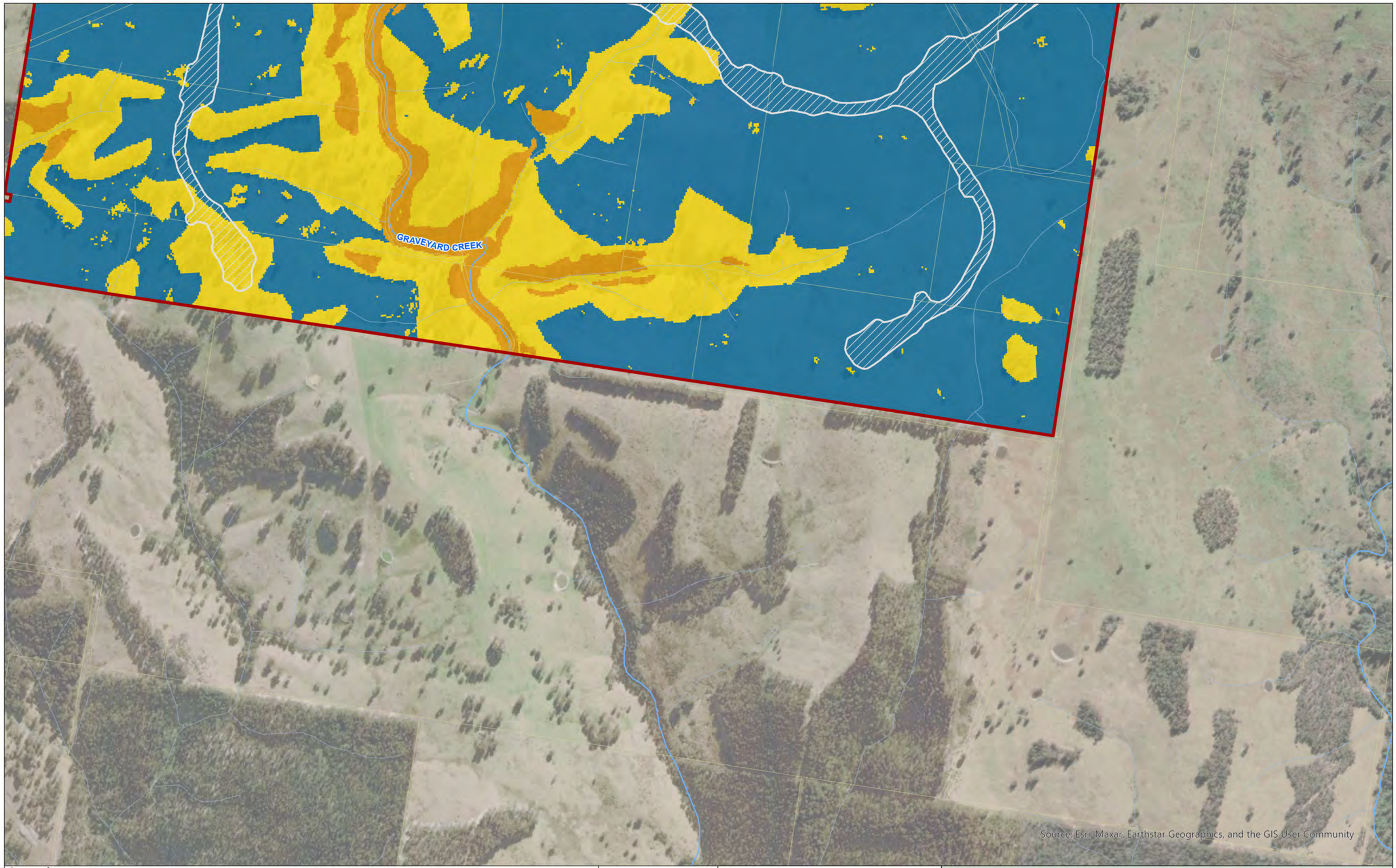

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
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Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
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F1-2 Draft NVR Map for the Subject Land

Map 42 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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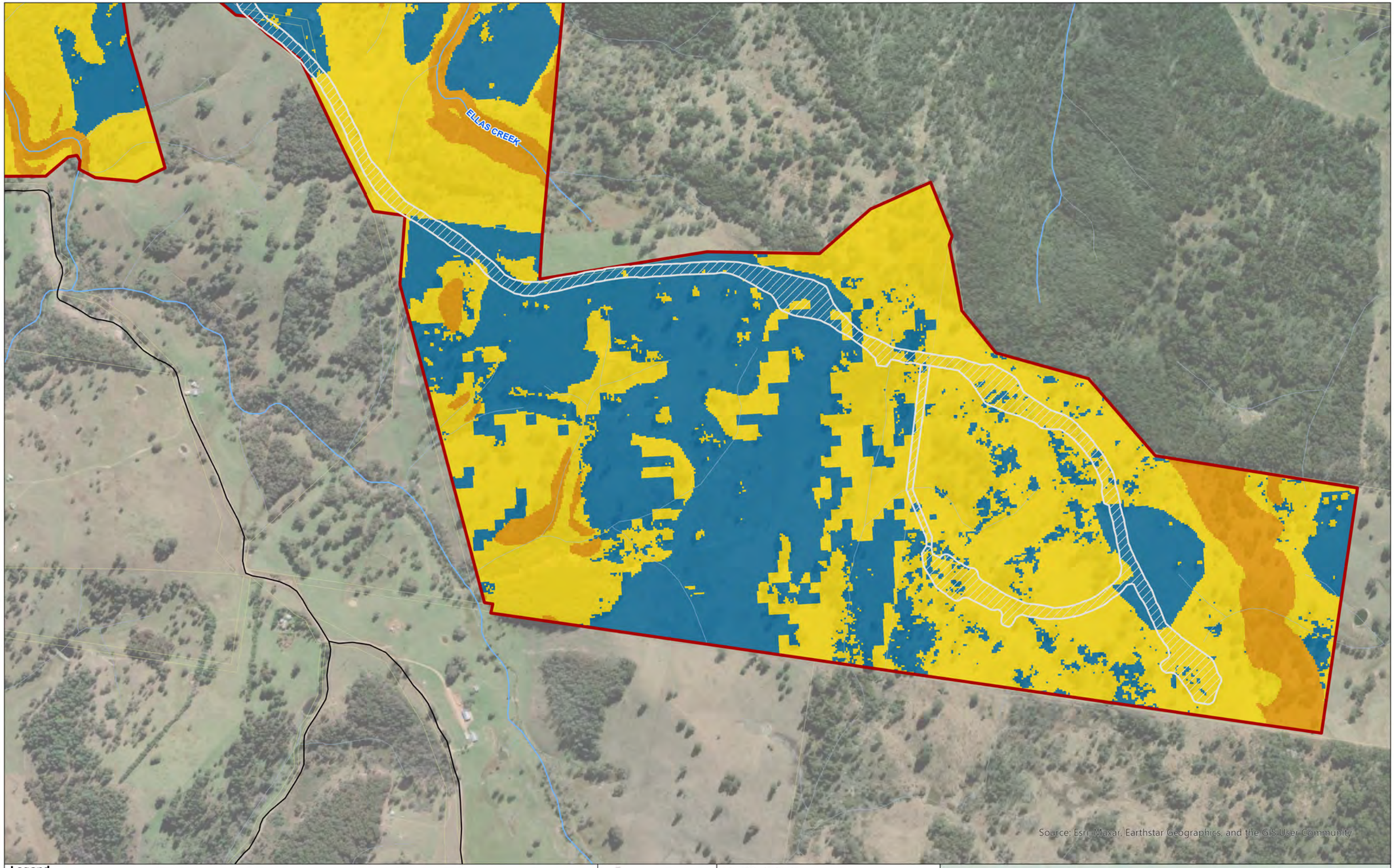

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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Coordinate System:
GDA 1994 MGA Zone 56

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F1-2 Draft NVR Map for the Subject Land

Map 43 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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2. METHODOLOGY

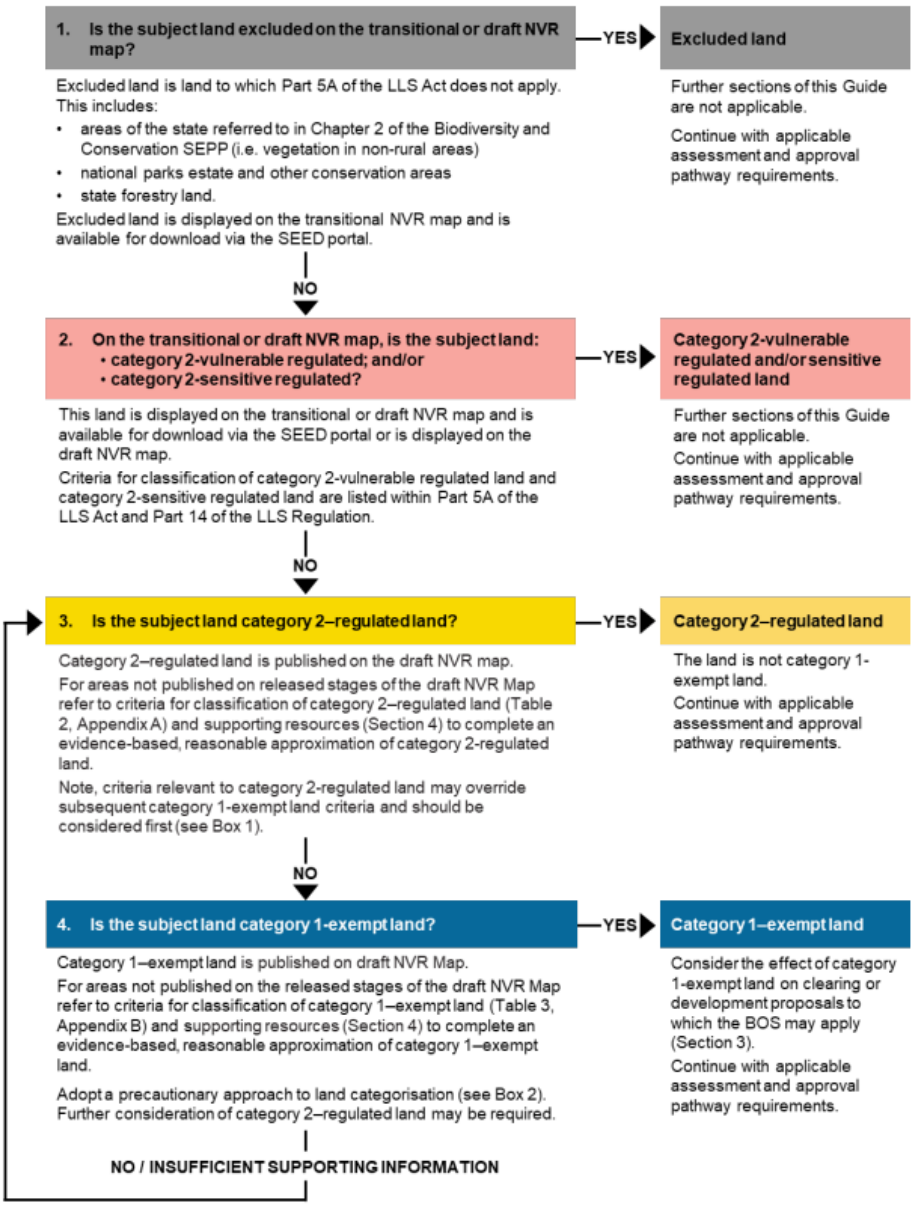
2.1 OVERVIEW

The methods used to prepare the LCA detailed in this document have considered:

- The regulatory context outlined in **Section 1.3**;
- The guide for BAM accredited persons, which is referred to as *Determining Native Land Categorisation for Application in the Biodiversity Offsets Scheme* (DPE, 2023); and
- The draft NVR map.

The steps used in this assessment are summarised in **Figure 2-1**, noting that transitional arrangements continue to apply and are relevant to both steps 3 and 4.

FIGURE 2-1 PROCESS FOR DETERMINING LAND CATEGORISATION IN NSW (DPE, 2023)



The approach taken includes a combination of desktop analysis and site investigation. These are outlined in the following sections.

2.2 DESKTOP ANALYSIS

Several spatial datasets were reviewed as part of this LCA, these being:

- The draft NVR map;
- Publicly available spatial datasets including those mentioned in guide Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme;
- Historic imagery;
- Multispectral satellite imagery (Sentinel-2); and
- Subject Land native vegetation mapping (ERM 2024).

The following spatial data was used in this assessment:

- The draft Native Vegetation Regulatory Map to determine the extent of Category 2 - Sensitive Regulated Land and Category 2 - Vulnerable Regulated Land. (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=DraftNVRmap);
- NSW ePlanning Spatial Viewer to determine the land zoning of the Subject Land. (https://www.planningportal.nsw.gov.au/spatialviewer);
- Historical Imagery Viewer to obtain imagery from 1990. (https://www.spatial.nsw.gov.au/products_and_services/aerial_and_historical_imagery);
- Sentinel-2 imagery for 29th June 2016 and 24th June 2017 (Digital Earth Australia Map);
- NSW Government SIX Maps public/NSW Imagery (MapServer) to obtain imagery from 2011. (https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Imagery/MapServer);
- NSW Landuse 2017 dataset v1.5. (https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017);
- NSW Native Vegetation Woody Vegetation Extent 2011 5m (https://datasets.seed.nsw.gov.au/dataset/nsw-woody-vegetation-extent-2011c0569);
- NSW State Vegetation Type Map (SVTM) C2.0M2.0. (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map); and
- Vegetation mapping for the Subject Land (ERM 2025).

Each of these datasets were used to address relevant parts of Part 5A of the LLS Act, as outlined in **Section 1.3**.

2.2.1 LAND USE ANALYSIS

The Plant Community Type (PCT) and vegetation zone map prepared for the amended BDAR (ERM 2024) was intersected with the NSW Landuse 2017 spatial layer to create land use by vegetation zone polygons for further evaluation. These included:

- Examination of LCA Transect results by VZ and mapped land use; and
- Review of historical imagery to verify areas of significant disturbance/modification.

Results were used to aid land categorisation where relevant.

2.2.2 TEMPORAL IMAGERY ANALYSIS

A spatial analysis was conducted to identify vegetation cover changes within the project boundary. NDVI (Normalized Difference Vegetation Index) was applied to imagery from 2016 and 2017.

Differences in NDVI values between these years highlighted areas of disturbance or improved pasture. These changes were then compared against the 2017 NSW Land Use spatial layer for Cropping and Modified Pasture, revealing additional areas of Cropping and Modified Pasture.

2.3 SITE INVESTIGATIONS

2.3.1 INDIGENOUS SPECIES PER CENT COVER AND CONDITION

Systematic flora surveys have been conducted throughout the Subject Land using:

- Full floristic plots to classify PCTs and BAM plots to define vegetation integrity scores (VIS) for mapping PCT condition states (i.e., vegetation zones) (ERM 2024); and
- LCA transects to determine the per cent cover of indigenous vegetation.

Spatially representative samples were obtained for all qualifying sampling units (i.e., sample replicates) to improve assessment accuracy. Survey methods and effort is summarised in **Table 2-1**, with the location of LCA transects shown in **Figure 2-**.

TABLE 2-1 SURVEYS PERFORMED

Survey Method	Quantity	Survey Dates
Full floristic plot (20 x 20 m) (400 m^2)	118	• 8th to 21st November 2019 • 28th September to 2nd October 2020 • 8th March to 1st April 2021 • 4th to 7th December 2023 • 29th January to 3rd February 2024 • 28th – 30th June 2024 • 23rd and 25th July 2024 • 10th, 11th, 20th and 22nd August 2024
LCA transects (100 m)	208	• 29th November to 5th December 2024 • 17th February to 5th March 2025

2.3.1.1 FULL FLORISTIC PLOTS

The vegetation integrity score (VIS) for a vegetation zone was calculated from BAM Plots performed in accordance with s4.2.1 of the BAM. BAM plots were established by walking a random distance into the vegetation zone and establishing the plot on a random bearing. Each BAM Plot was established around a central 50 m transect and each included:

- A 20 m x 20 m plot to sample flora species. The plots were carefully examined to identify all flora species present. This search continued until it was confident that all flora species within the plot were detected. Data collected for each species included:
  - Stratum and layers in which each species occurs;
  - Growth form for each species;
  - Scientific and common name for each species;
  - Percentage foliage cover (PFC) across the plot, of each species rooted in or overhanging the plot;
- Abundance rating for each species;
- One 1000 m^2 (20 m x 50 m) plot to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs; and
- Five 1 m^2 sub-plots to assess average litter cover (and other groundcover components).

BAM Plot locations and other survey methods such as rapid vegetation assessments that informed the ground-verified PCT mapping are reported in ERM 2024.

2.3.1.2 LCA TRANSECTS

Transects of 100 m length were performed to evaluate the percent native and exotic vegetation cover for degraded lands that may not constitute native vegetation. A 100 m measuring tape is used to measure the length of a LCA transect were several observations (and measures) are obtained at each 1 metre point intercept along this transect. Measures recorded were:

- Indigenous vegetation;
- Exotic vegetation (perennial);
- Exotic vegetation (annual);
- Bare earth; and
- Litter.

Several measures may coincide at any given point.

LCA transect placement was restricted to the Subject Land boundary, with the location of each transect sampling non-woody groundcover vegetation using the following sampling design principles (i.e., survey stratification):

- Tenure and land use;
- The draft NVR map, with transects located in both Category 1 and 2 vegetation;
- PCT/vegetation zone mapping (ERM 2024); and
- Extent of woody vegetation.

LCA transects were not placed under trees or areas with overstory woody vegetation cover.

Guidance for the minimum number of LCA transects by vegetation zone is provided in State of NSW 2017, which is reproduced below for ease of reference.

TABLE 2-2 MINIMUM NUMBER OF LCA TRANSECTS BY VEGETATION ZONE

Vegetation zone area (ha)	Minimum number of transects
<2	1
>2-5	2
>5-20	3
>20-50	4
>50-100	5
>100-250	6
>250-1,000	7 (More plots may be needed if the condition of the vegetation is variable across the zone)[2]
>1,000	8 (More plots may be needed if the condition of the vegetation is variable across the zone)[2]

[2] ERM (2024) vegetation zone mapping included consideration of flora composition and structural condition to minimise the variation across the vegetation zone. Increased sampling rates used in this assessment are principally for spatial representativeness purposes.

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

144

145

146

147

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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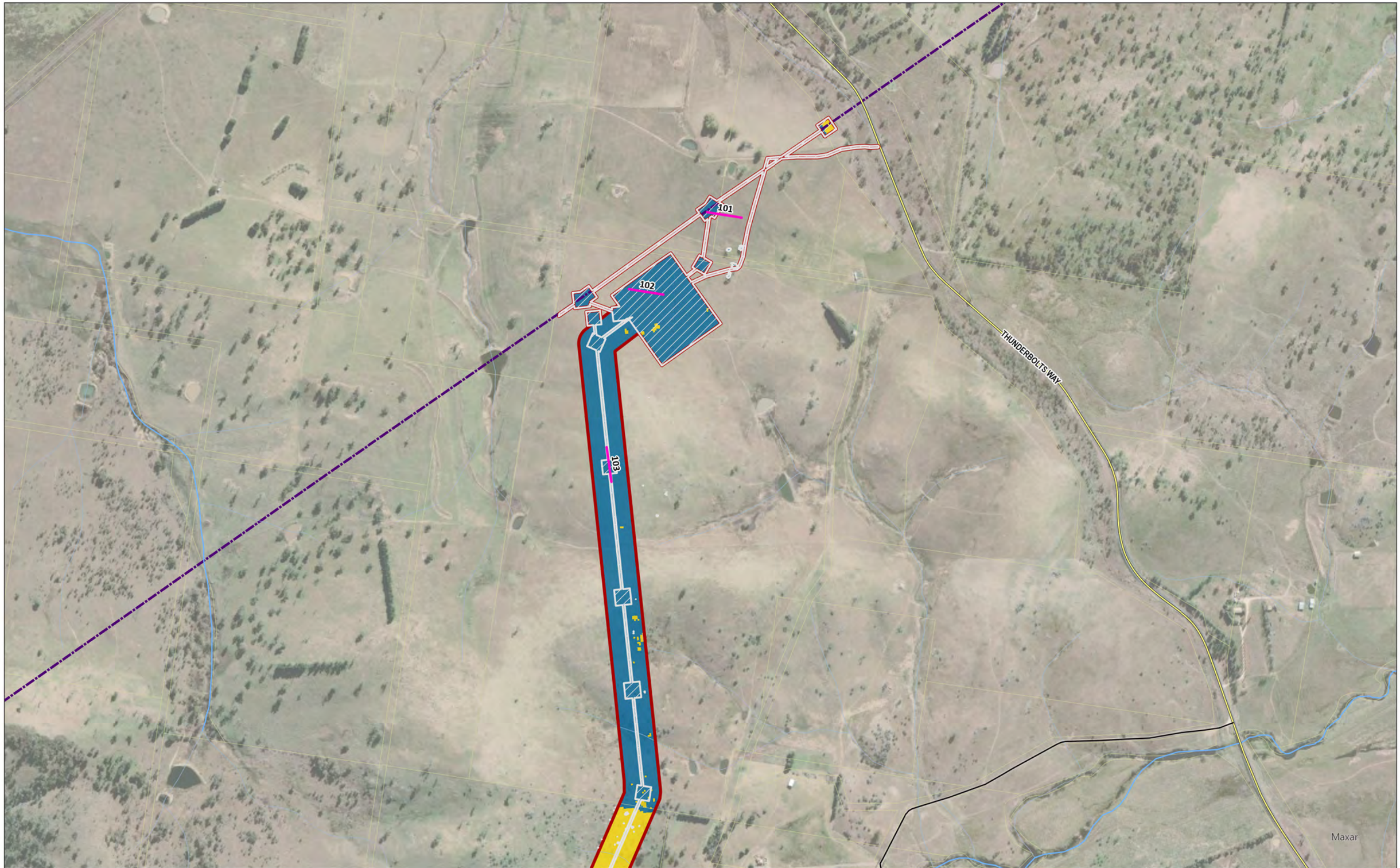
F2-2 LCA Transect Locations

Map 1 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Legend

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Coordinate System:
GDA 1994 MGA Zone 56
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F2-2 LCA Transect Locations

Map 2 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
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- Local Road
- Category 1 – Exempt (draft)
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Coordinate System:
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F2-2 LCA Transect Locations

Map 3 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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- Category 2 - sensitive regulated land
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Coordinate System:
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F2-2 LCA Transect Locations

Map 4 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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- Land excluded from the LLS Act

Coordinate System:
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F2-2 LCA Transect Locations

Map 5 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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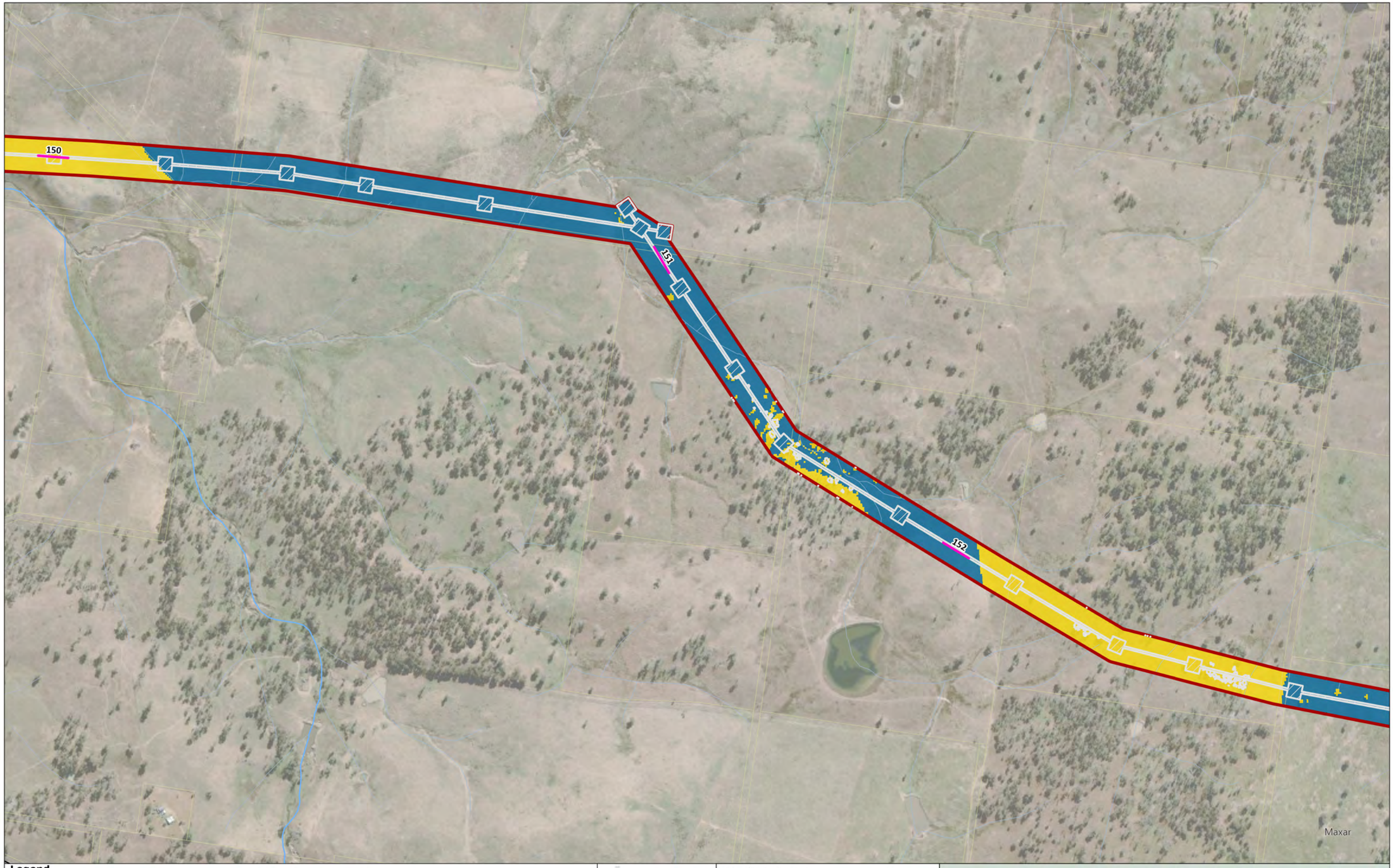

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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- Land excluded from the LLS Act

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F2-2 LCA Transect Locations

Map 6 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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F2-2 LCA Transect Locations

Map 7 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

BLUE MOUNTAIN ROAD
JACKS CREEK
MIHI CREEK
155
153
84
81
Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
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Coordinate System:
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Date: 02/04/2025
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F2-2 LCA Transect Locations

Map 8 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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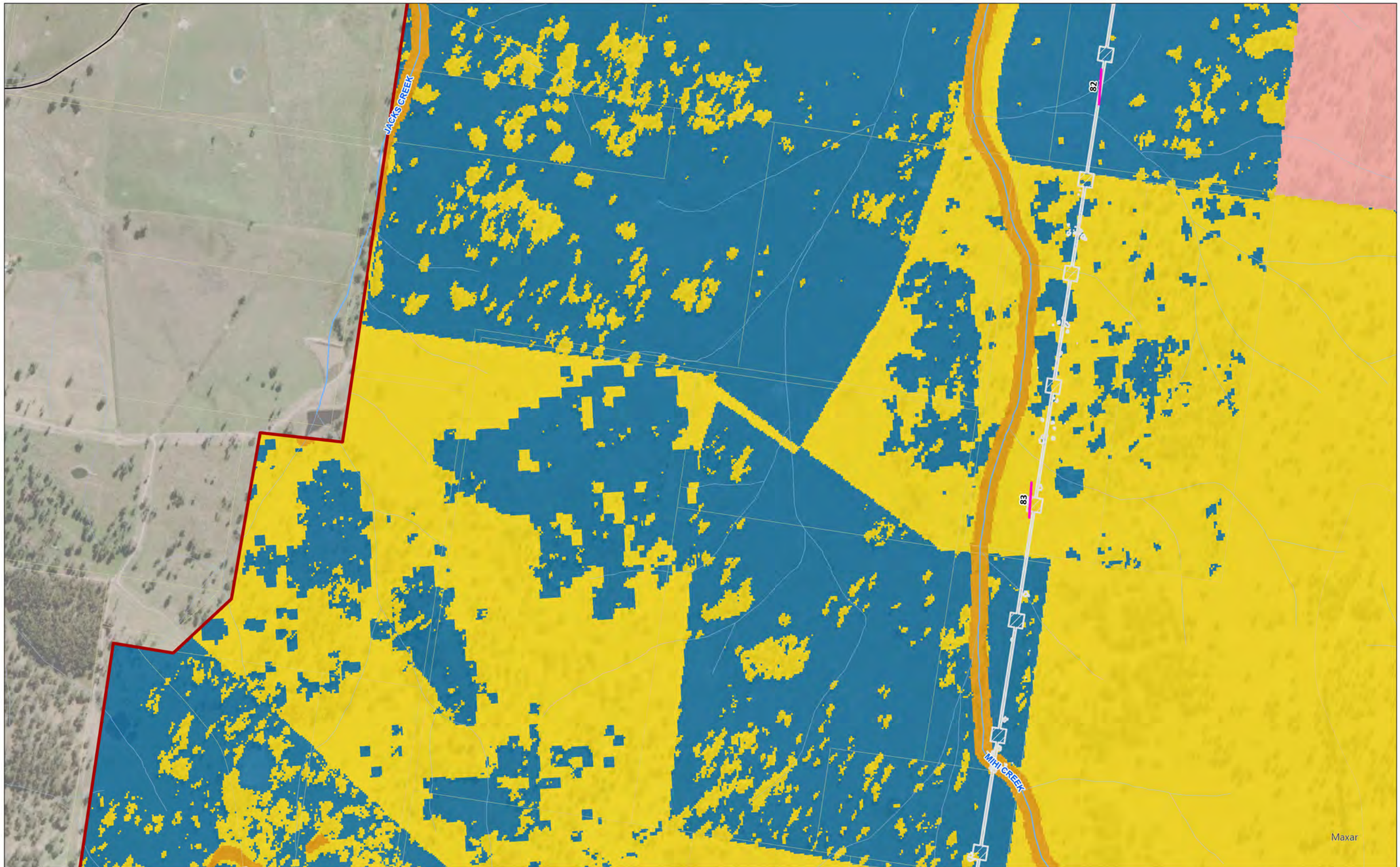

Legend

- Project Area
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Coordinate System:
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F2-2 LCA Transect Locations

Map 9 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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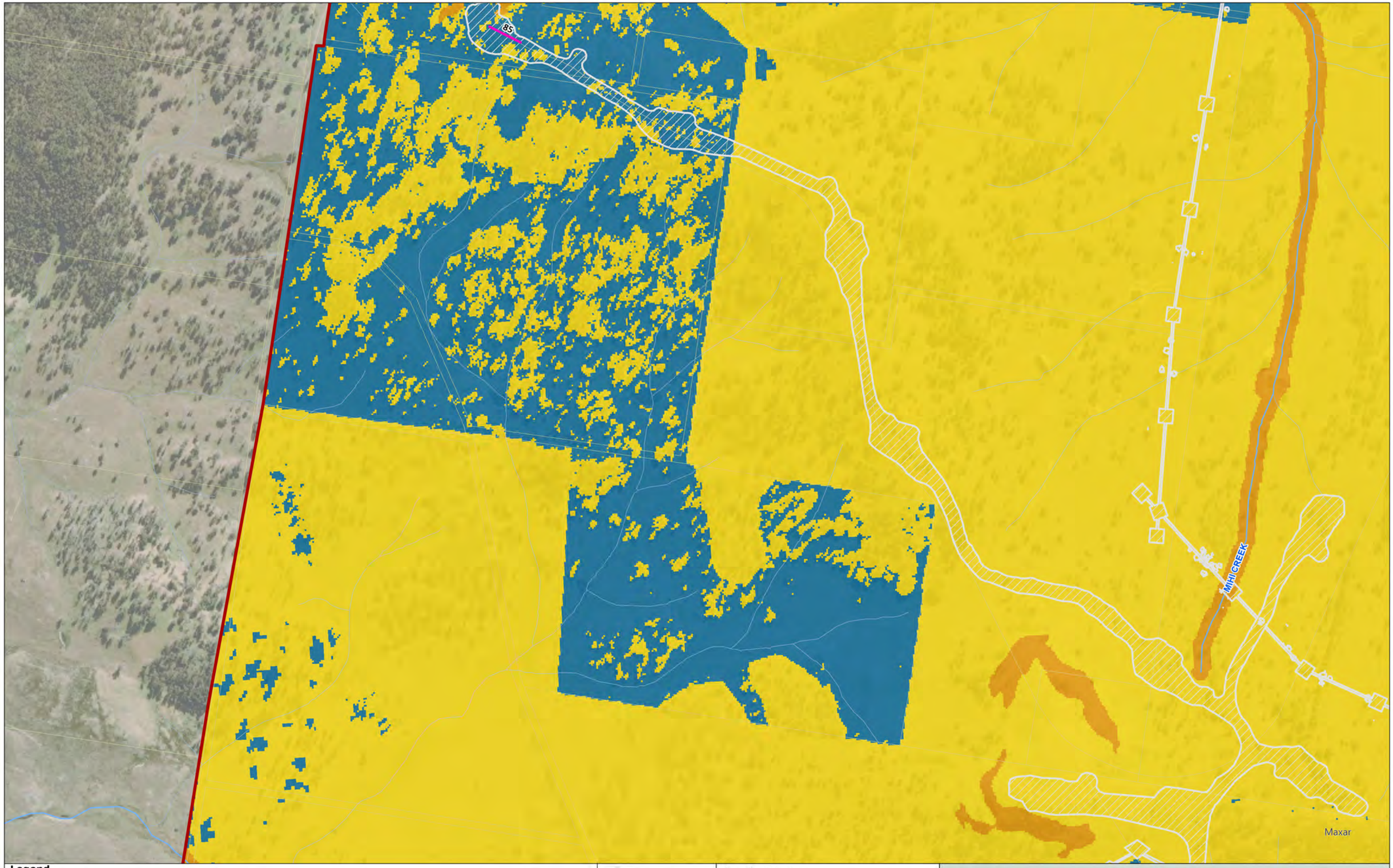

Legend

- Project Area
- Subject Land
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- Category 1 – Exempt (draft)
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- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
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F2-2 LCA Transect Locations

Map 10 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

GROSE CREEK

68

69

70

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
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F2-2 LCA Transect Locations

Map 11 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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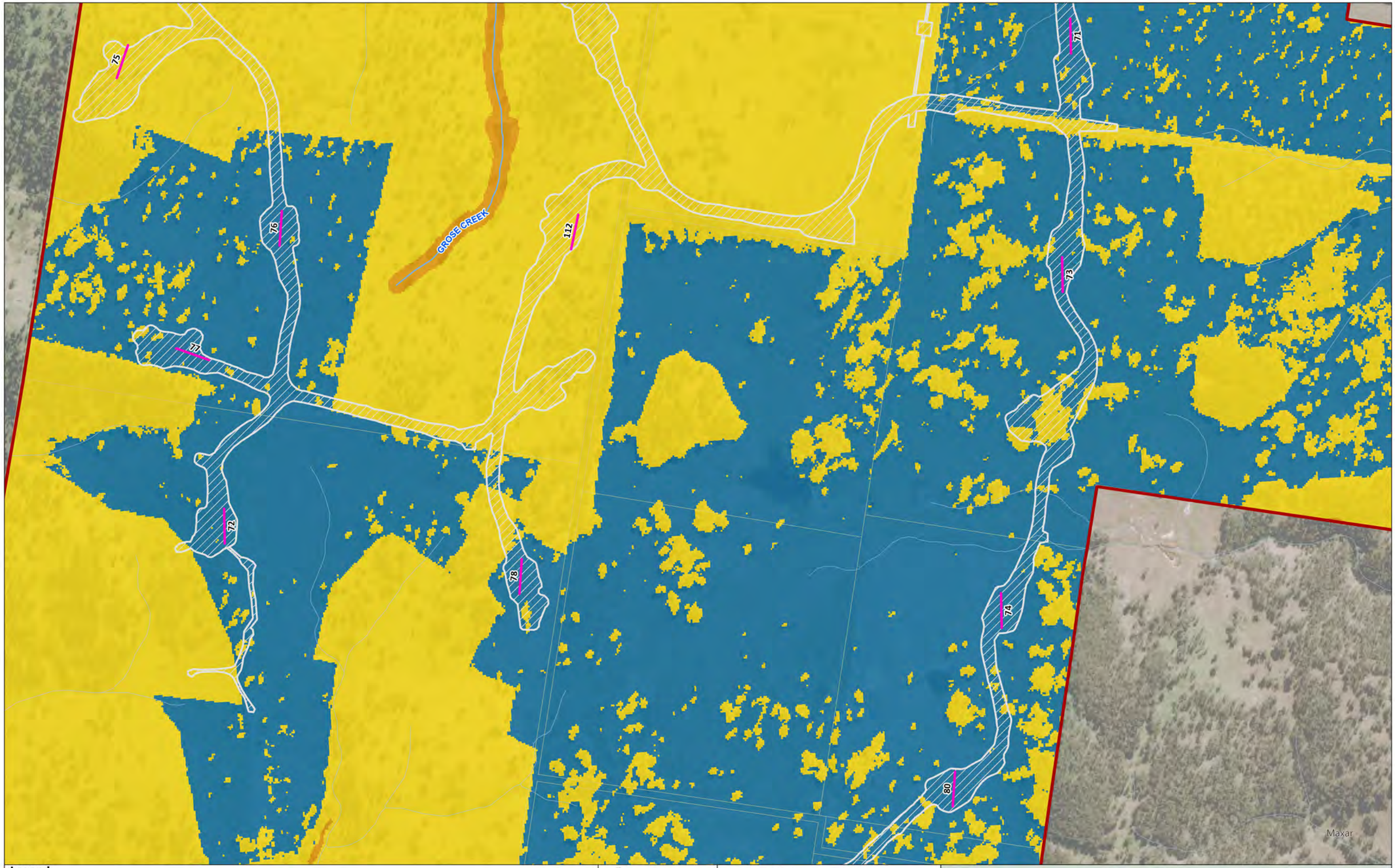

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- Project Area
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Coordinate System:
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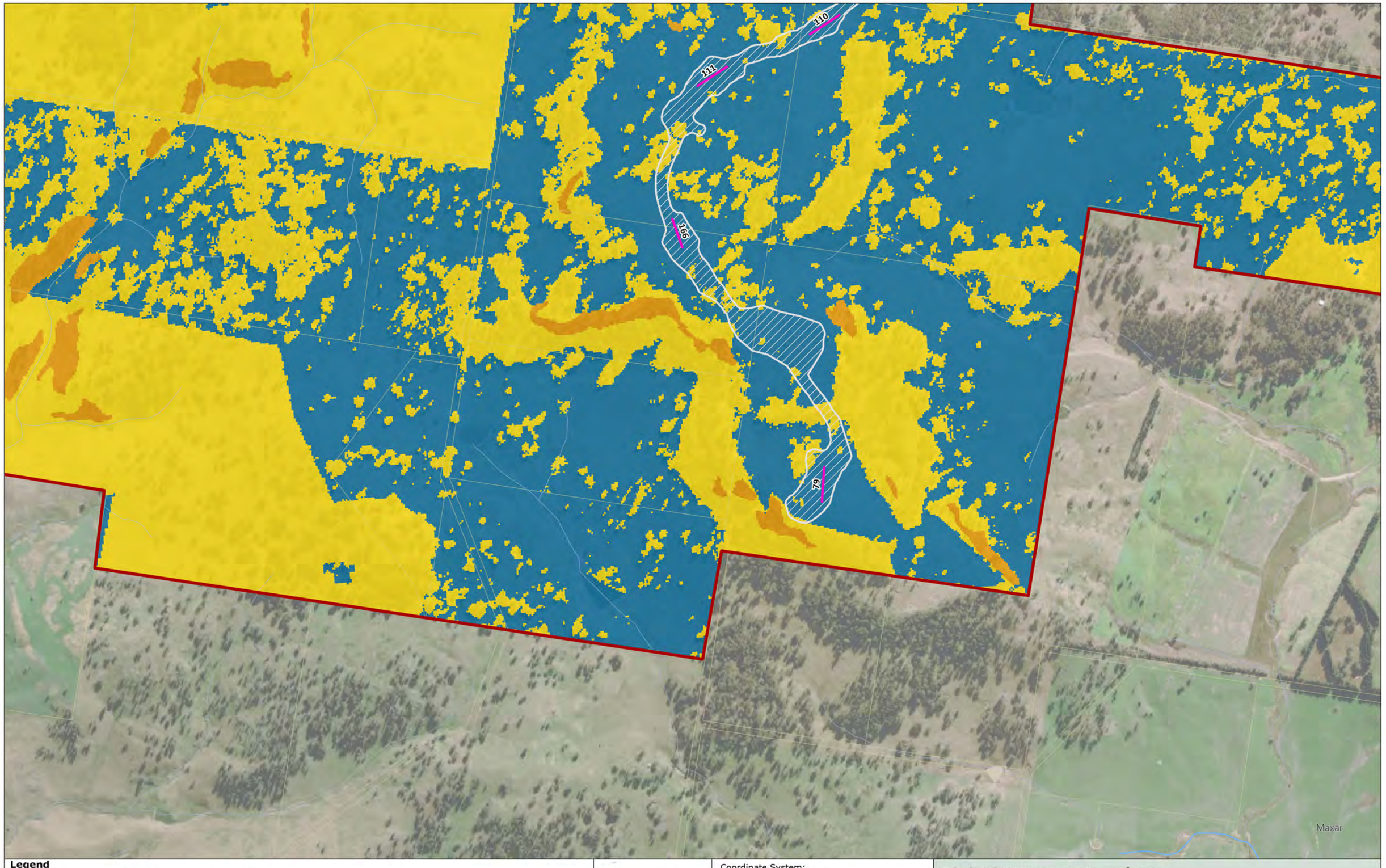
F2-2 LCA Transect Locations

Map 12 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM



Legend

- Project Area
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- Local Road
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Coordinate System:
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F2-2 LCA Transect Locations

Map 13 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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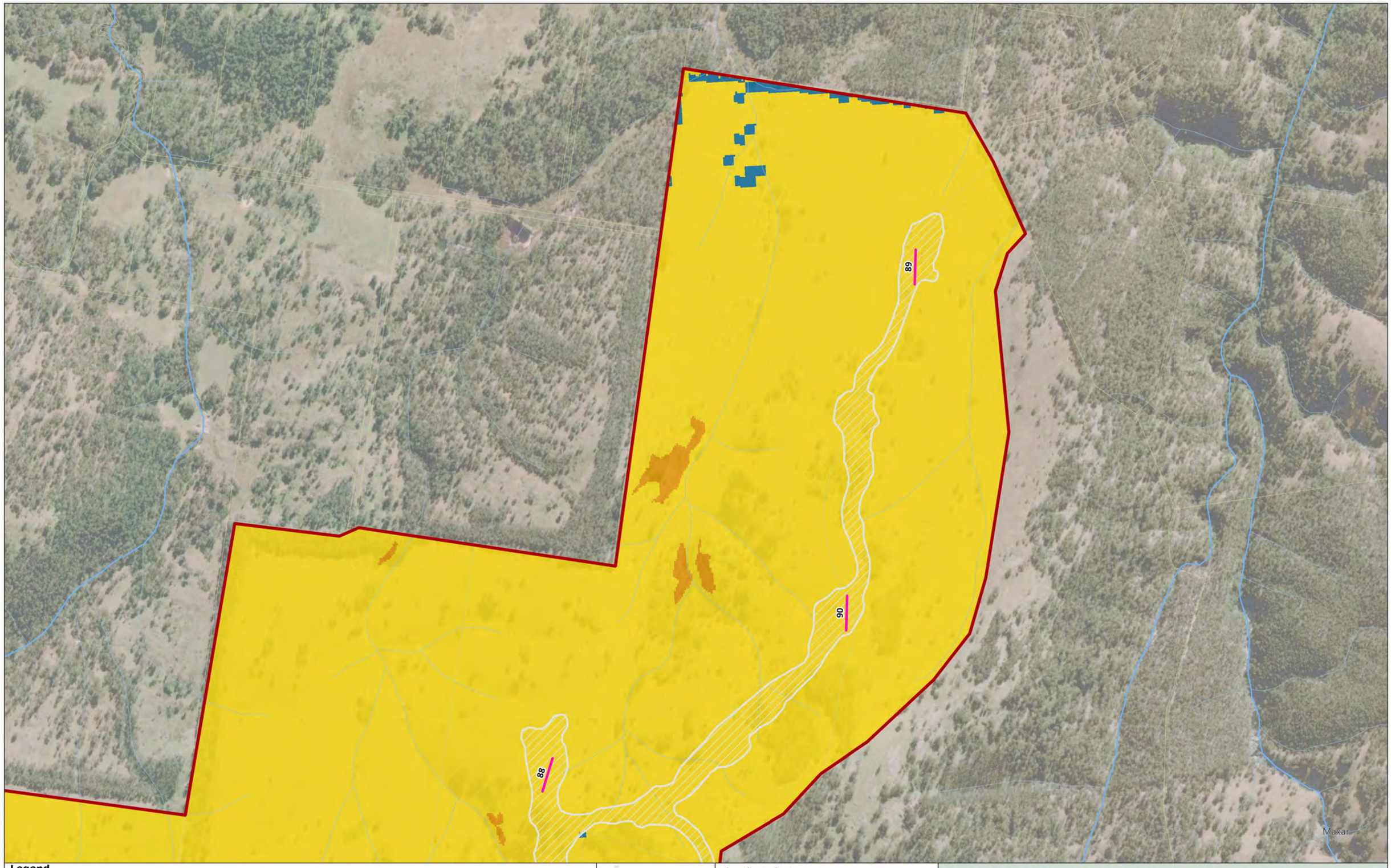

Legend

- Project Area
- Subject Land
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- Local Road
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Coordinate System:
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F2-2 LCA Transect Locations

Map 14 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
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Drawing Size: A3
0 100 200 300m
1:10,000

F2-2 LCA Transect Locations

Map 15 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
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Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F2-2 LCA Transect Locations

Map 16 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

DRAYTONS CREEK
66
67
113
208
65
EMU CREEK
BLUE MOUNTAIN ROAD
Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
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F2-2 LCA Transect Locations

Map 17 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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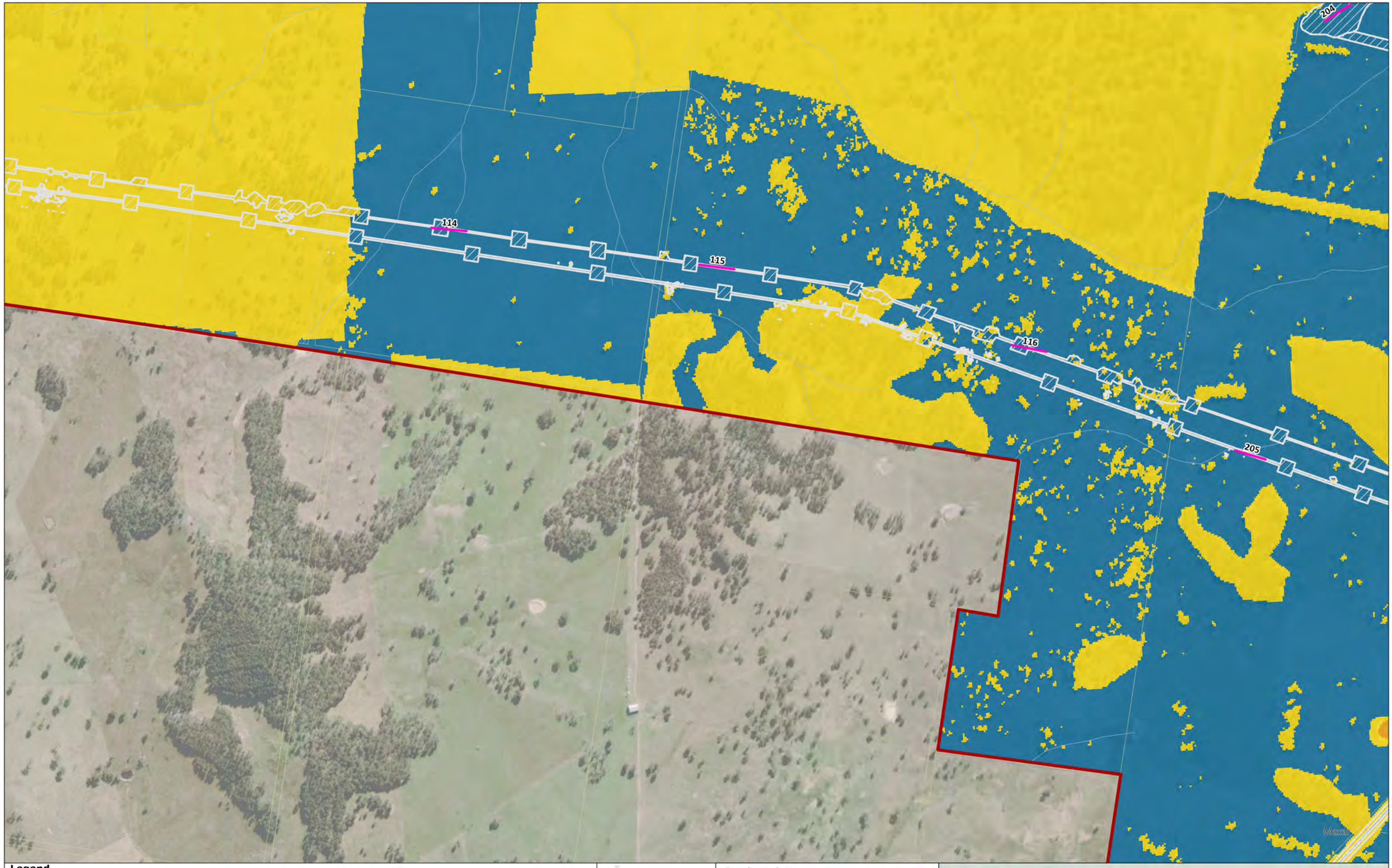

Legend

- Project Area
- Subject Land
- Highway / Major Road
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- Category 1 – Exempt (draft)
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Coordinate System:
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Date: 02/04/2025
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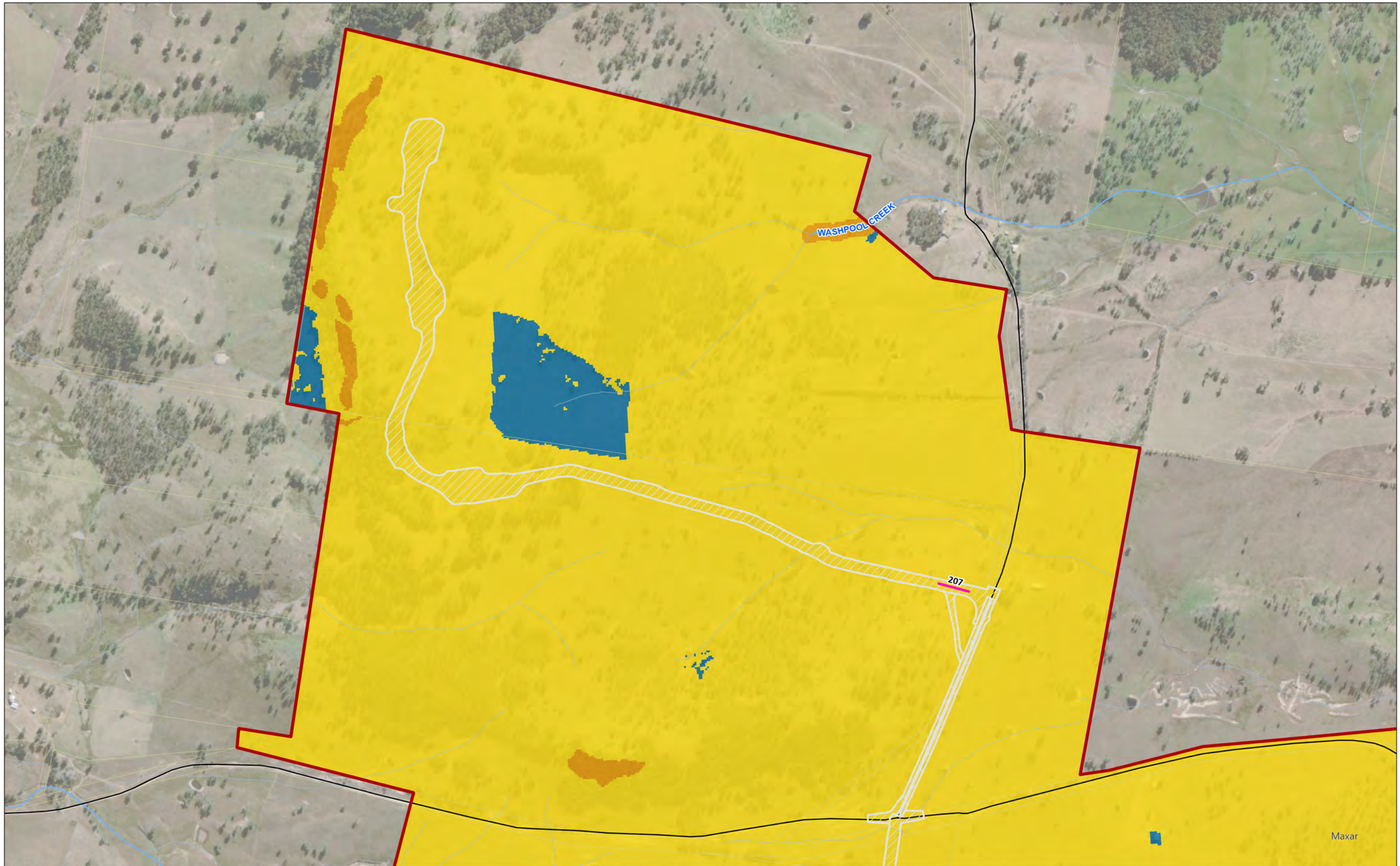
F2-2 LCA Transect Locations

Map 18 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM



Legend

- Project Area
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F2-2 LCA Transect Locations

Map 19 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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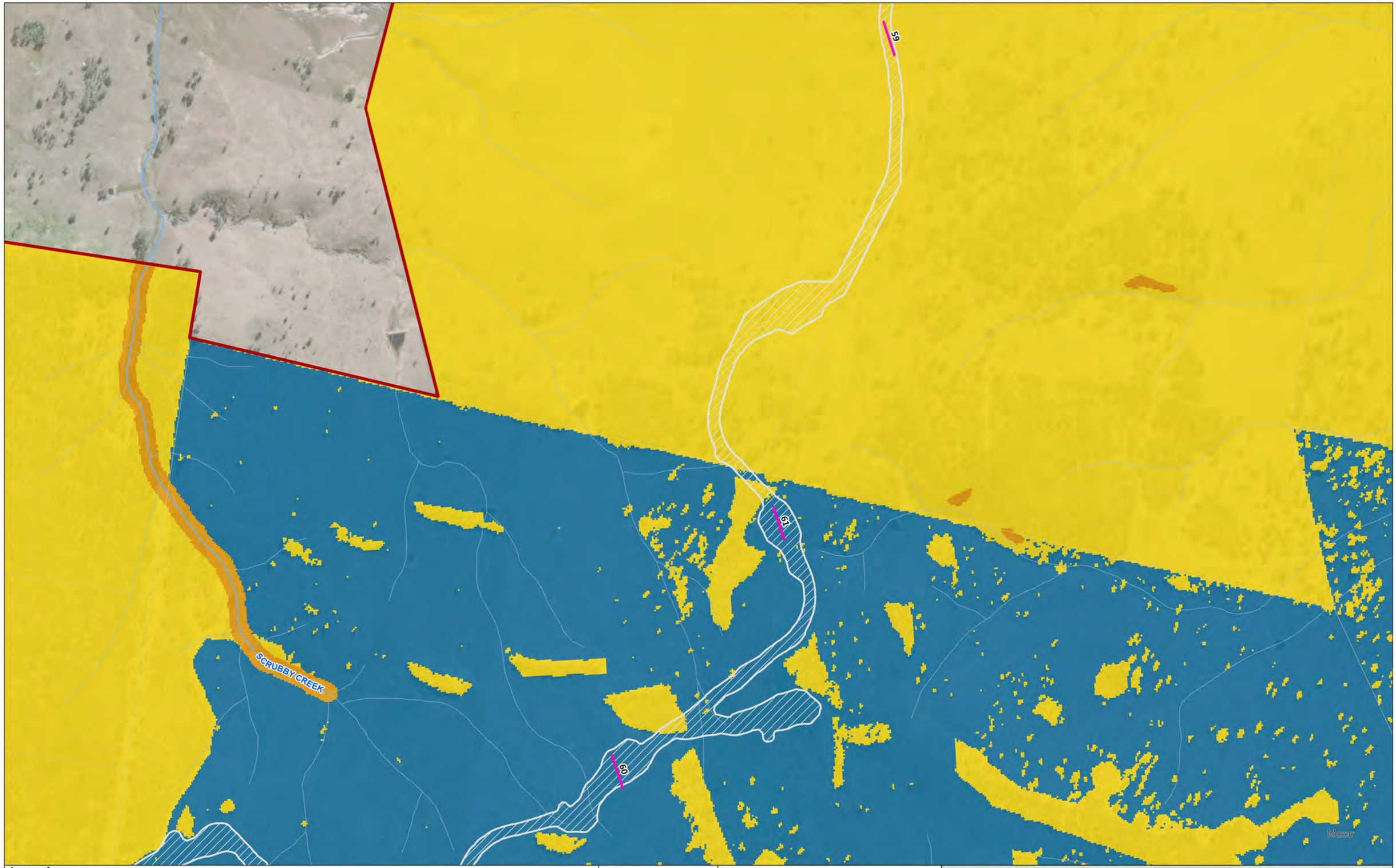

Legend

- Project Area
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GDA 1994 MGA Zone 56
Date: 02/04/2025
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F2-2 LCA Transect Locations

Map 20 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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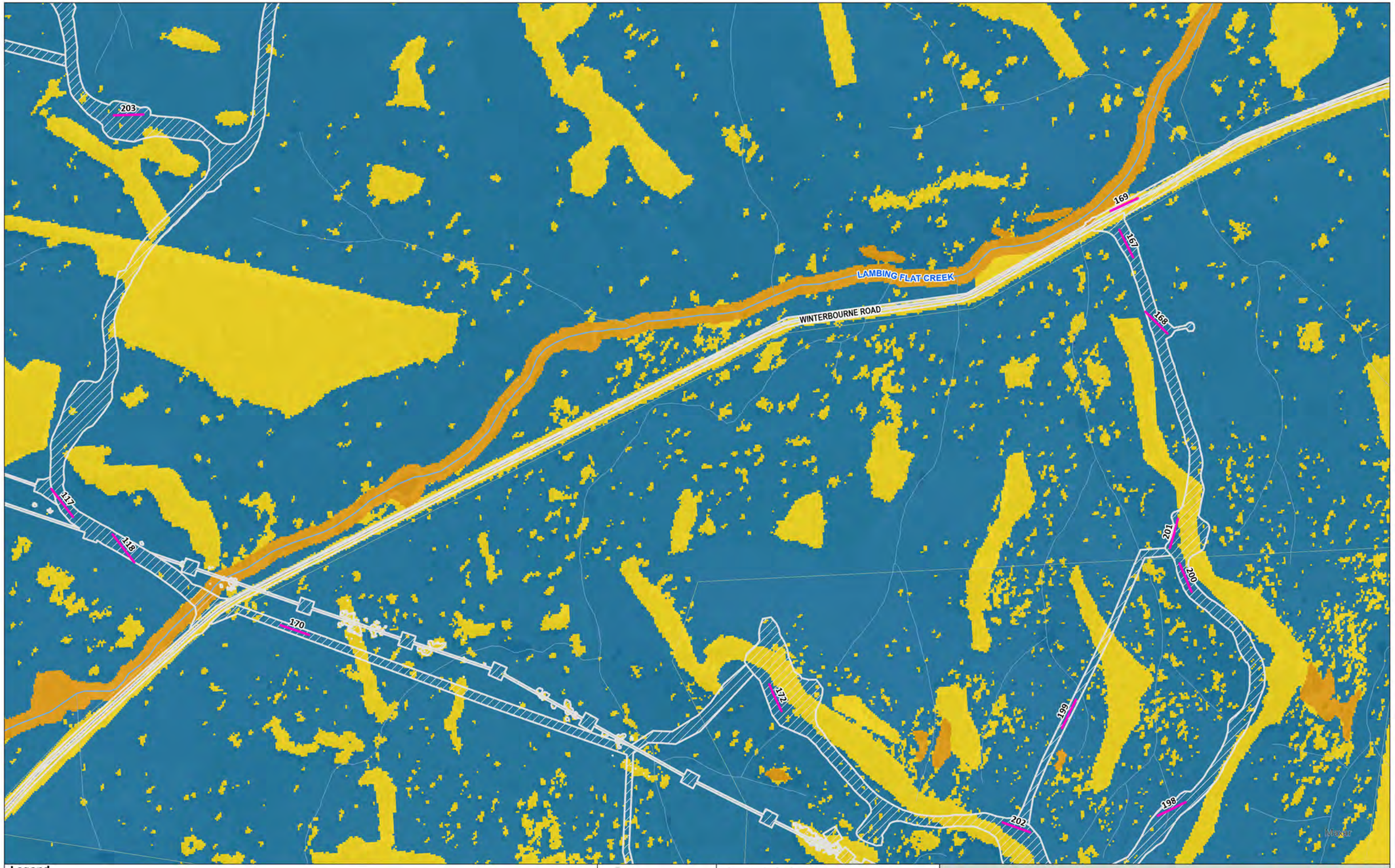

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
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Date: 02/04/2025
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F2-2 LCA Transect Locations

Map 21 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

171
197
196
92
139
141
140
125
142
195
124

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
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Coordinate System:
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F2-2 LCA Transect Locations

Map 22 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
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- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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1:10,000

F2-2 LCA Transect Locations

Map 23 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 24 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F2-2 LCA Transect Locations

Map 25 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 26 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
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F2-2 LCA Transect Locations

Map 27 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

WINTERBOURNE ROAD

WINTERBOURNE CREEK

57

206

56

55

164

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F2-2 LCA Transect Locations

Map 28 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 29 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

WINTERBOURNE ROAD

162

163

165

54

52

53

96

WINTERBOURNE CREEK

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F2-2 LCA Transect Locations

Map 30 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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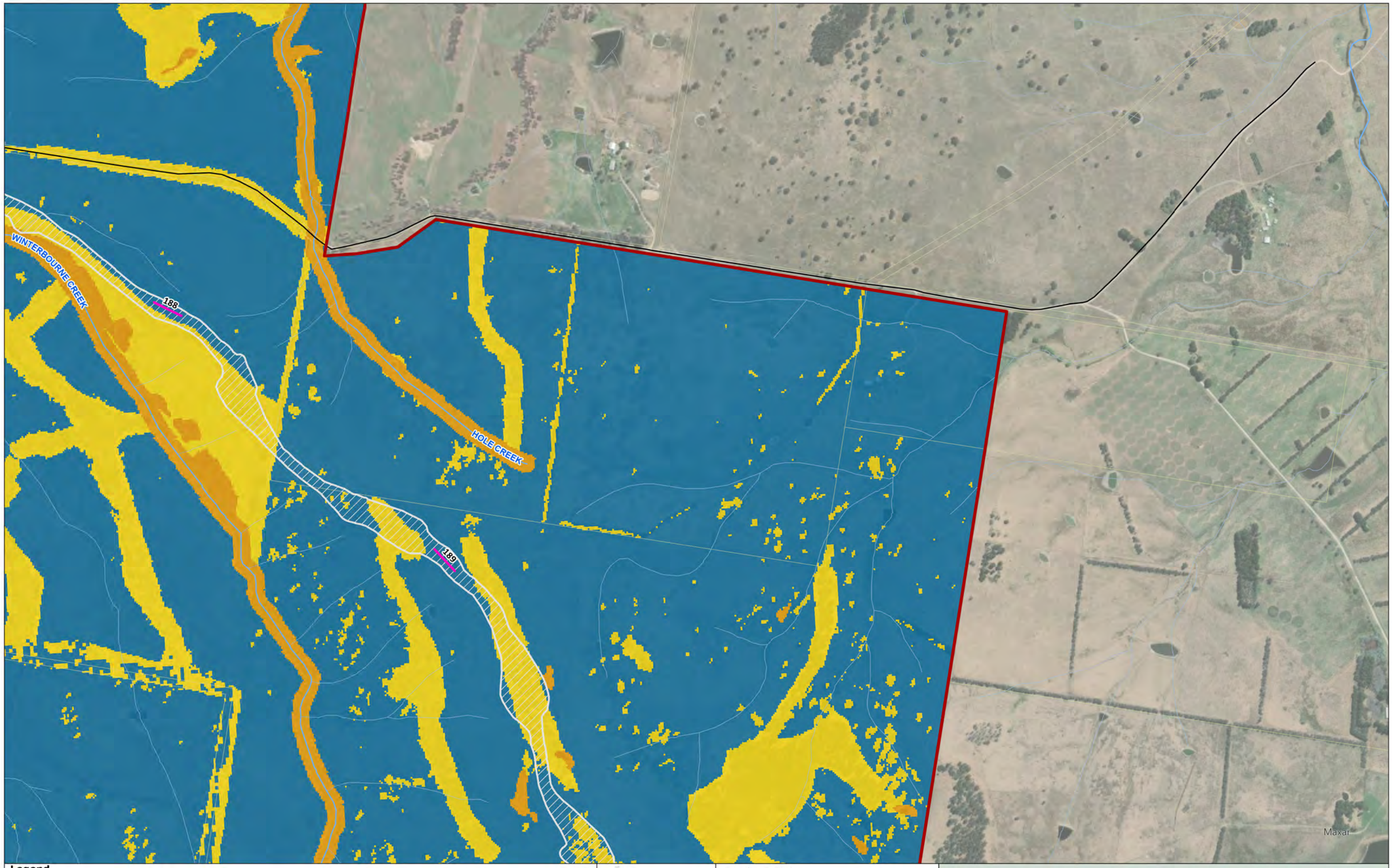

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025
Created By: VN
Drawing Size: A3

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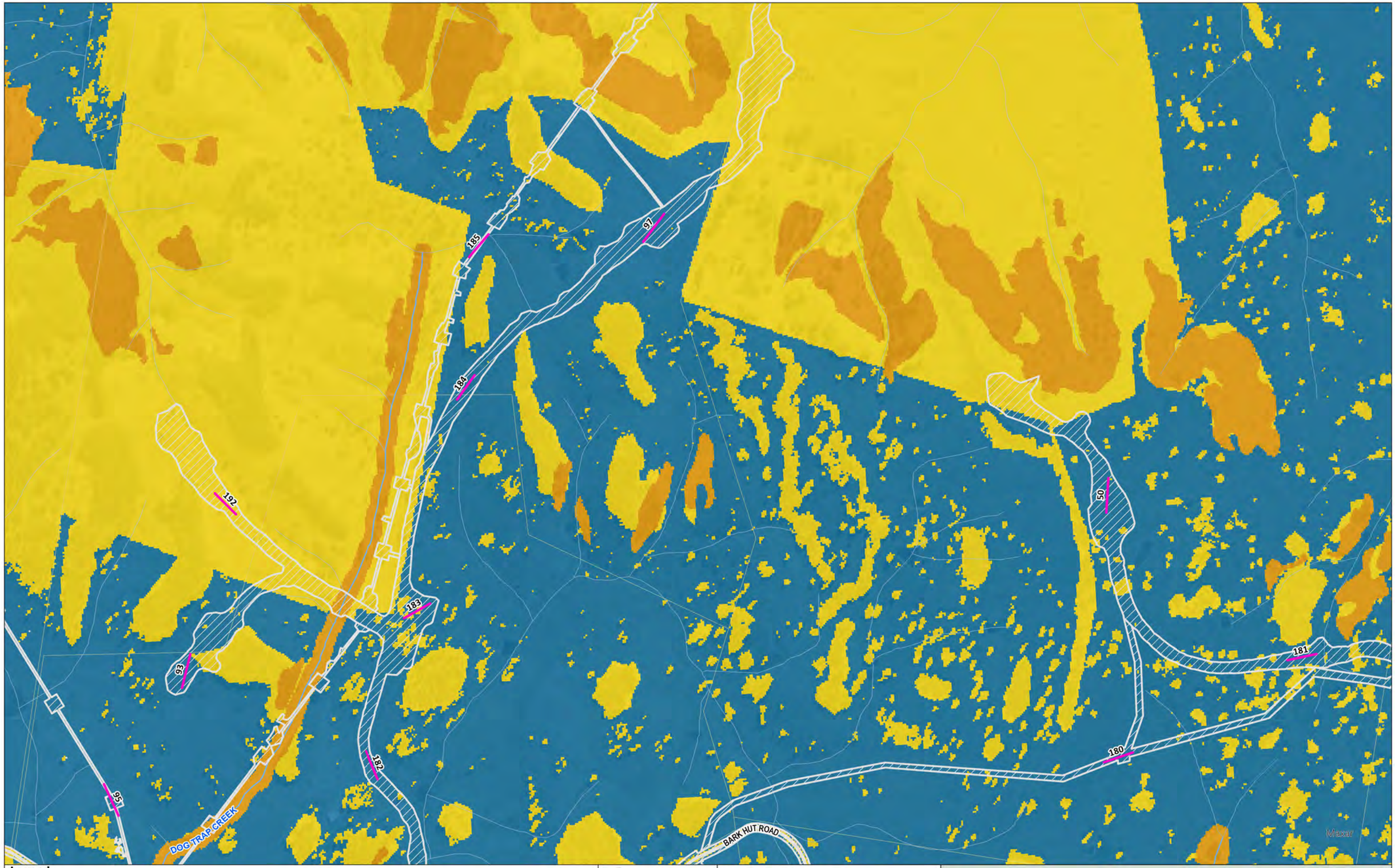
F2-2 LCA Transect Locations

Map 31 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
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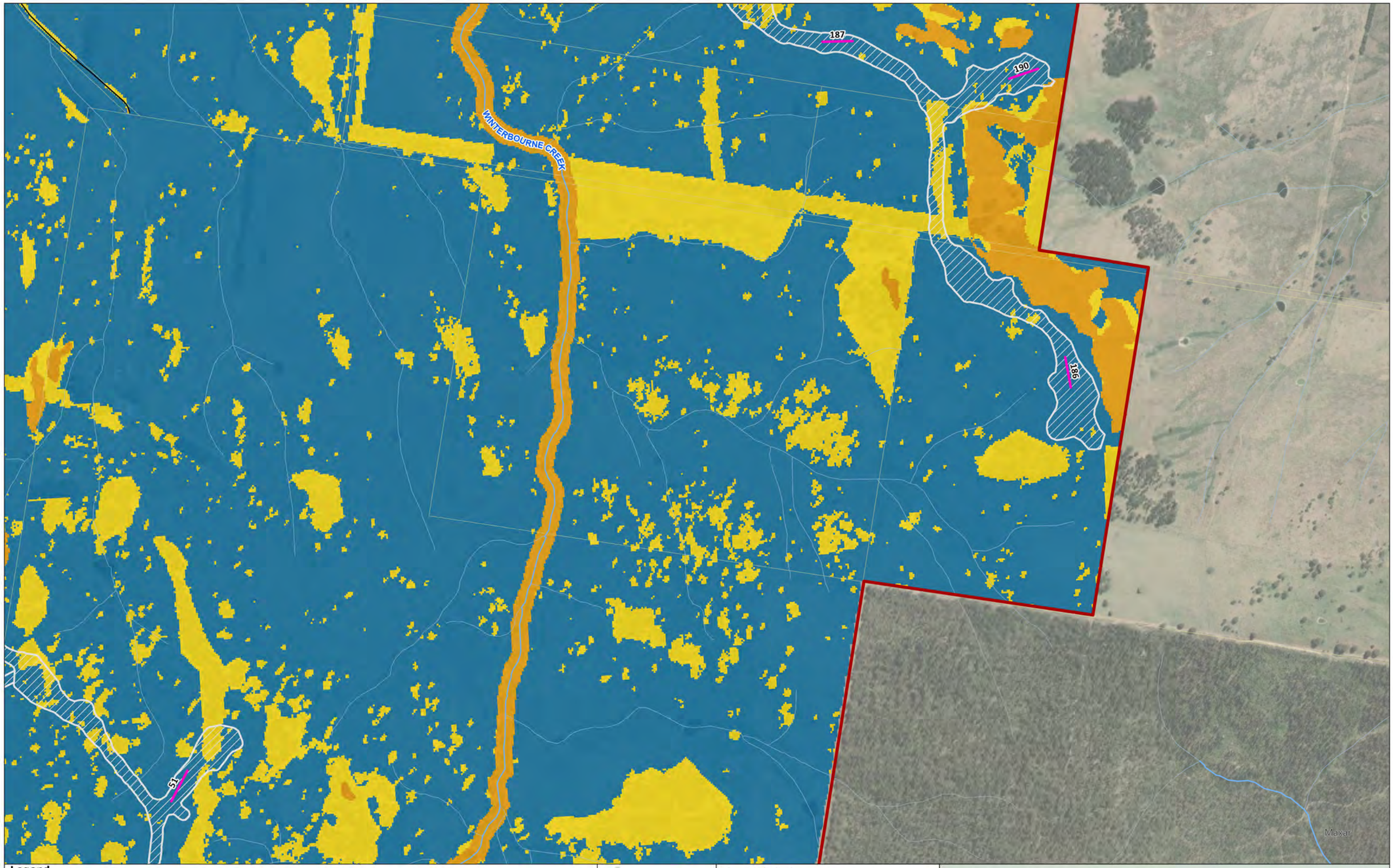
F2-2 LCA Transect Locations

Map 32 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 33 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

DOG TRAP CREEK

BARK HUT ROAD

91
191
48
179
49
45
44
178
193
194

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 34 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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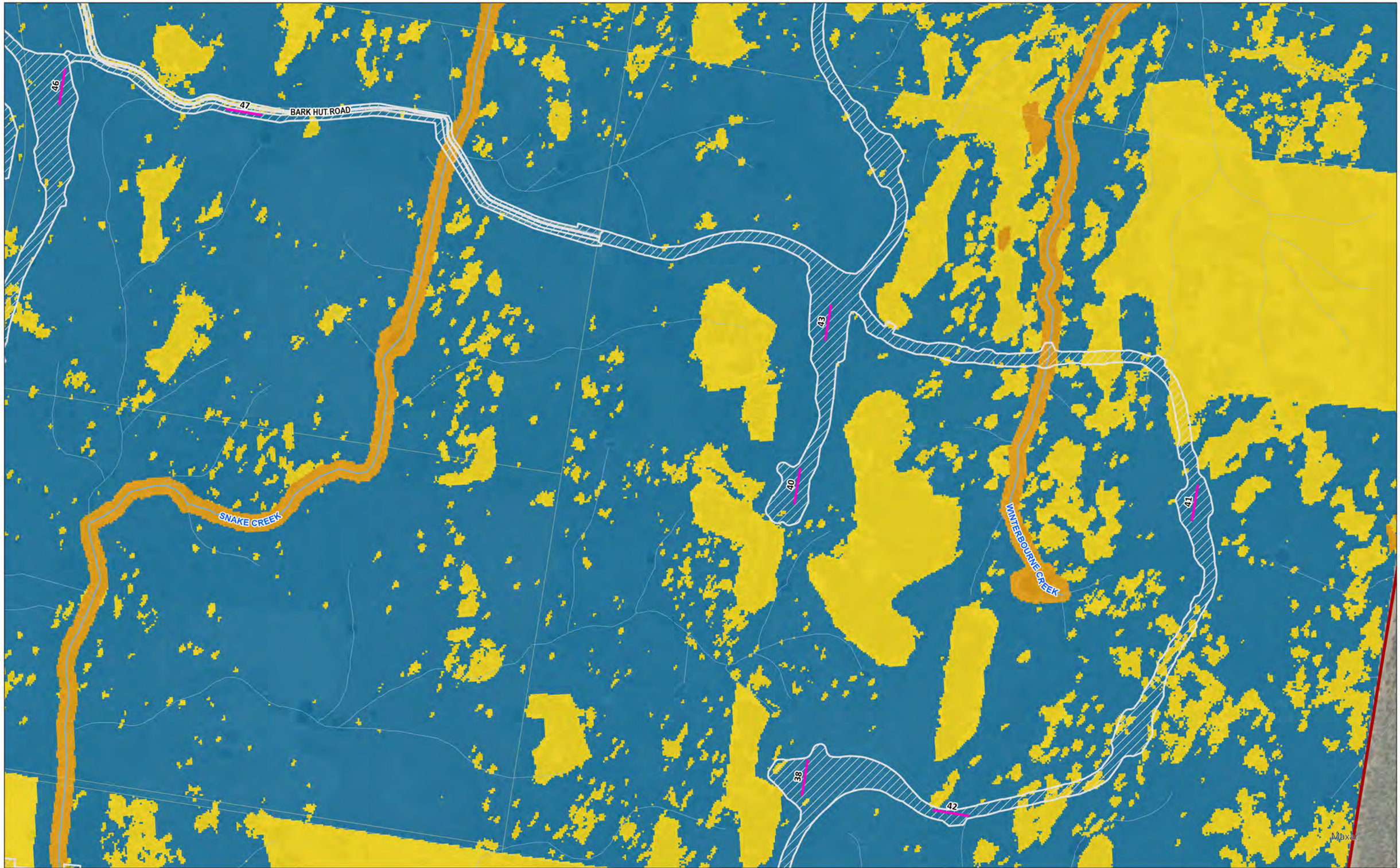

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 35 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

SNAKE CREEK

BROOKMOUNT CREEK

39

37

36

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025
Created By: VN
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F2-2 LCA Transect Locations

Map 36 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

BROOKMOUNT CREEK

BOUNDARY CREEK

34

35

177

32

33

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025

Created By: VN

Drawing Size: A3

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F2-2 LCA Transect Locations

Map 37 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

BOUNDARY CREEK

176

175

26

24

25

MOONA PLAINS ROAD

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025
Created By: VN
Drawing Size: A3

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F2-2 LCA Transect Locations

Map 38 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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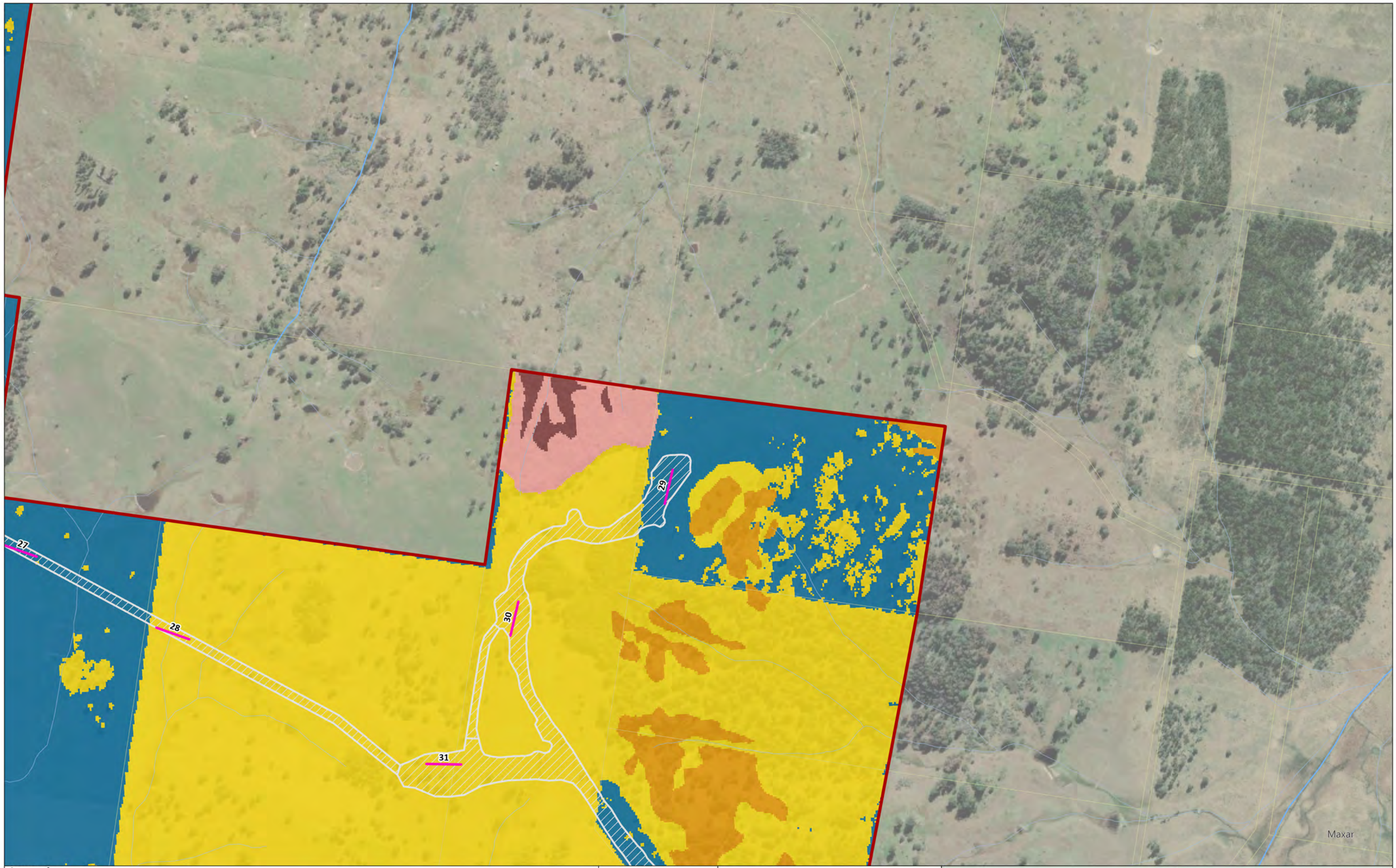

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o: overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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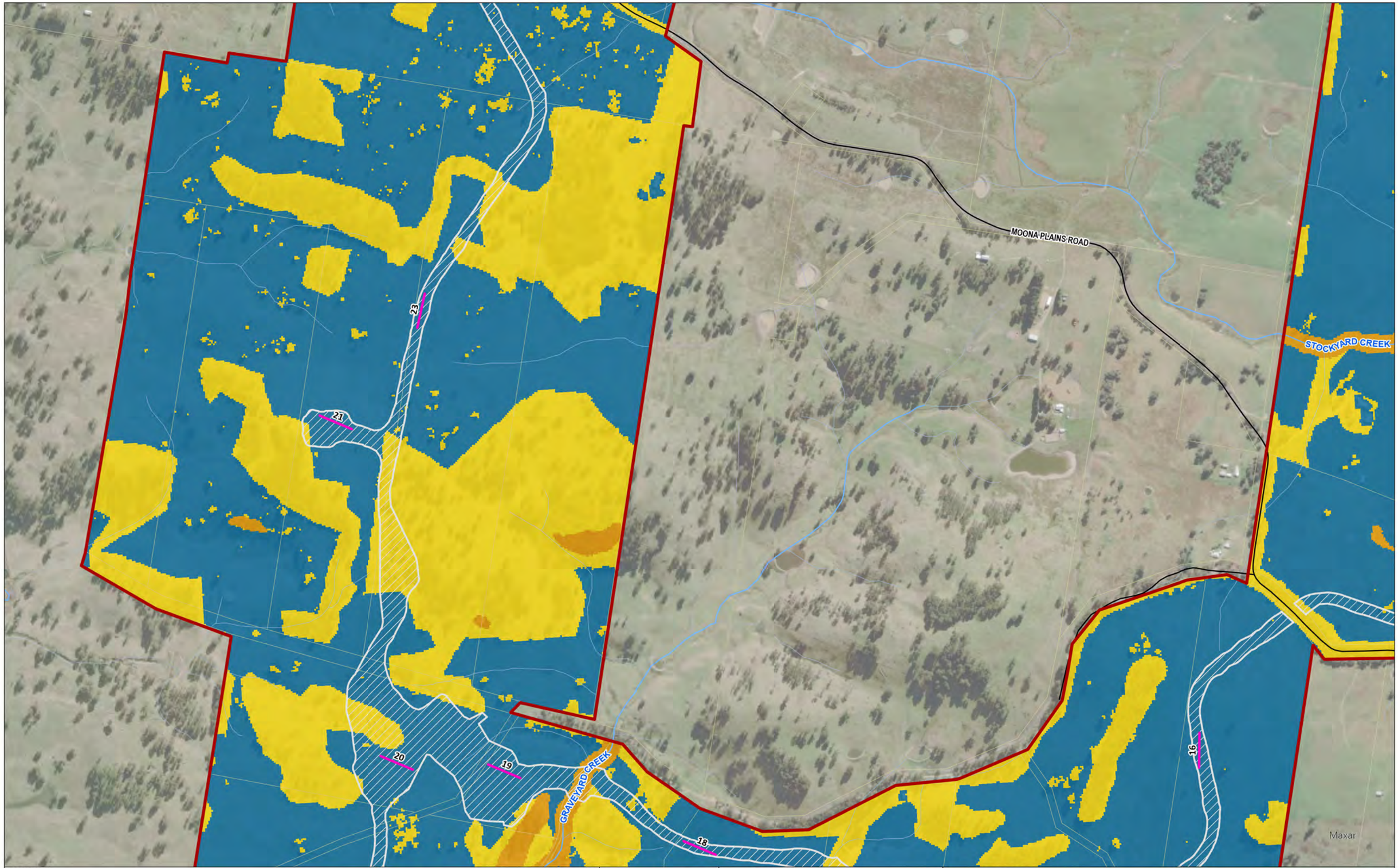
F2-2 LCA Transect Locations

Map 39 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o^2 overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025
Created By: VN
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F2-2 LCA Transect Locations

Map 40 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

MOONA PLAINS ROAD

STOCKYARD CREEK

ELLAS CREEK

10

9

11

12

17A

7

8

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas of overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025

Created By: VN

Drawing Size: A3

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F2-2 LCA Transect Locations

Map 41 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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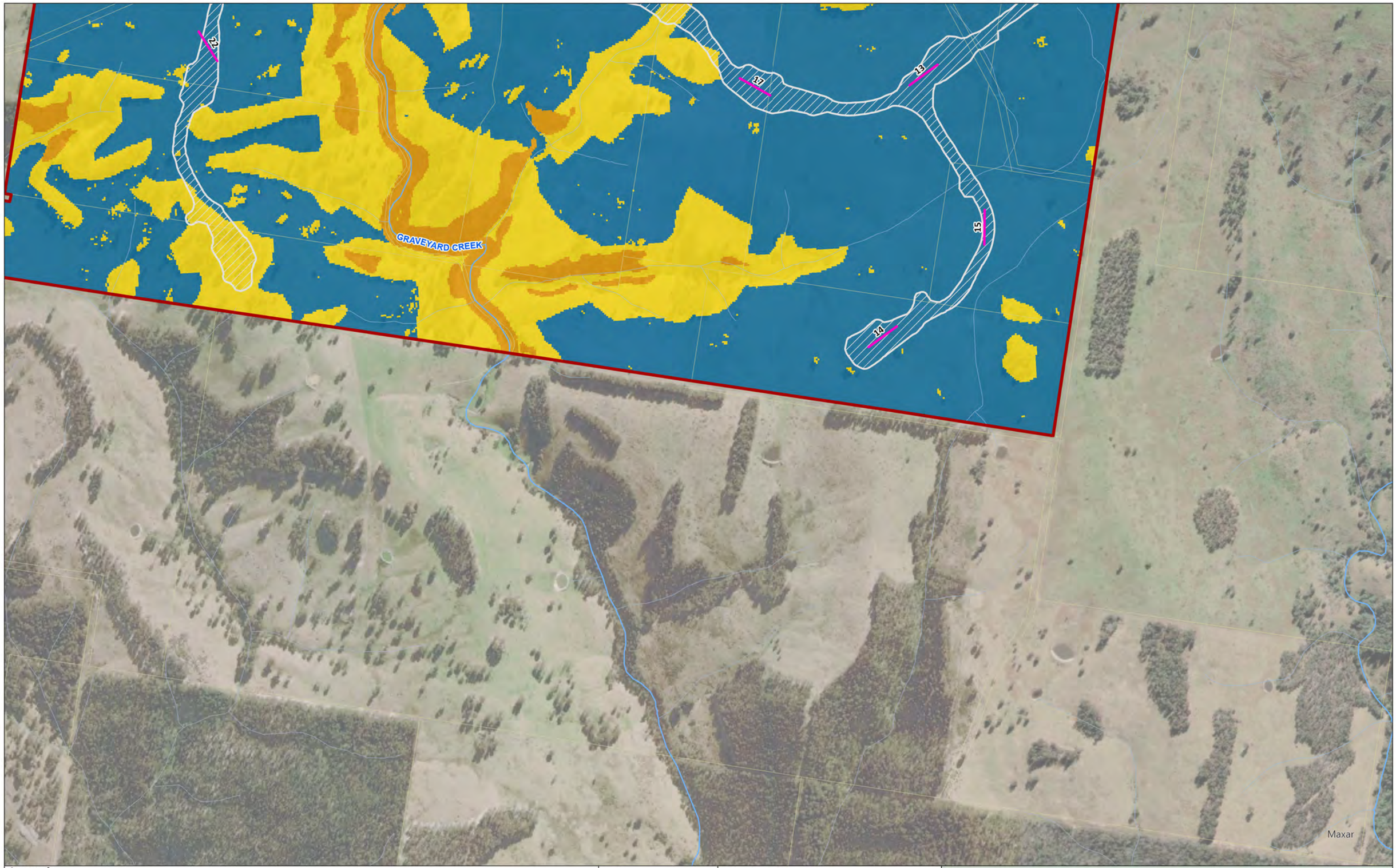

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o: overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F2-2 LCA Transect Locations

Map 42 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

ELLAS CREEK

8
173
6
4
5
3
2
1

Maxar

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 – Exempt (draft)
- Category 2 - Regulated Land (draft)
- Category 2 - Vulnerable Regulated Land (in-force)
- Category 2 - sensitive regulated land
- Category 2 - sensitive and vulnerable regulated lands areas o² overlap
- Land excluded from the LLS Act

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F2-2 LCA Transect Locations

Map 43 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

2.3.2 CRITICALLY ENDANGERED PLANTS AND ECOLOGICAL COMMUNITIES

Land is to be mapped as Category 2 – Regulated (Sensitive) Land where it has been mapped by the Environment Agency Head as comprising a:

- Critically endangered plant (pursuant to s60I(2)(L)); and/or
- Critically endangered ecological community (pursuant to s60I(2)(m)).

A review of the Environment Agency Head published mapping (i.e., NSW SEED portal) shows no area of critically endangered plant and/or critically CEEC as being mapped by the Environment Agency Head within the Subject Land.

Investigations performed within the Subject Land have not identified any occurrence of a critically endangered plant (ERM 2024; ERM *in prep*).

ERM (2024) identified two listed CEECs as occurring within the Subject Land, as listed below, with the extent of these being refined as part of this assessment:

- White Box-Yellow Box-Blakely's Redgum Grassy Woodland and Derived Native Grasslands (Hereafter referred to as Box Gum Woodland); and
- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands (hereafter referred to as New England Peppermint Grassy Woodland).

ERM (2024) conservatively identified the extent of CEECs within the Subject Land (based on PCT associations and use of final determinations); although, this assessment was limited by available site investigation data. Where data was not available, a precautionary approach was applied.

A revised CEEC extent map was prepared as part of this assessment for the following reasons:

- An amended disturbance footprint; and
- Availability of additional field data for analysis, including
    - LCA transect data; and
    - Targeted investigations using rapid data points at roadside locations (see **Figure 2-3**).

A dichotomous key was applied at specified rapid data points to aid refinements in CEEC mapping. These dichotomous keys are provided in **Appendix A**, with results used to evaluate land categorisation relative to s60I(2)(m) of the LLS Act.

Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F2-3 CEEC Rapid Data Points

Map 1 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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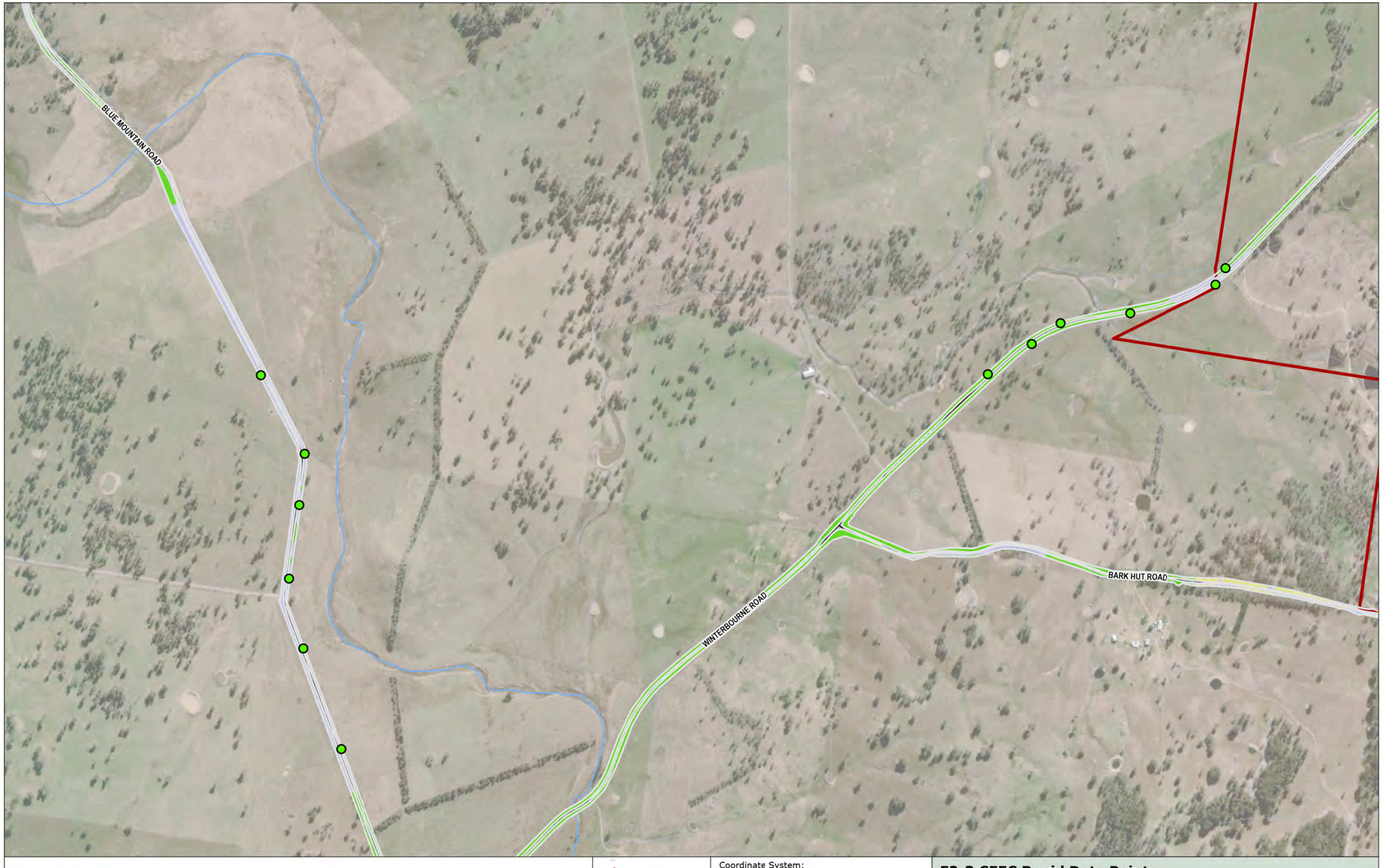
F2-3 CEEC Rapid Data Points

Map 2 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F2-3 CEEC Rapid Data Points

Map 3 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F2-3 CEEC Rapid Data Points

Map 4 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England; 571,Ribbon Gum - Rough-
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F2-3 CEEC Rapid Data Points

Map 5 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

EMU CREEK ROAD

MOONA PLAINS ROAD

APSLEY RIVER

Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
- Non-indigenous vegetation cover
- N/A

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F2-3 CEEC Rapid Data Points

Map 6 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

URALLA ROAD

DERBY STREET

EMU CREEK ROAD

APSLEY RIVER

WALCHA

OXLEY HIGHWAY

Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland
- Non-indigenous vegetation cover
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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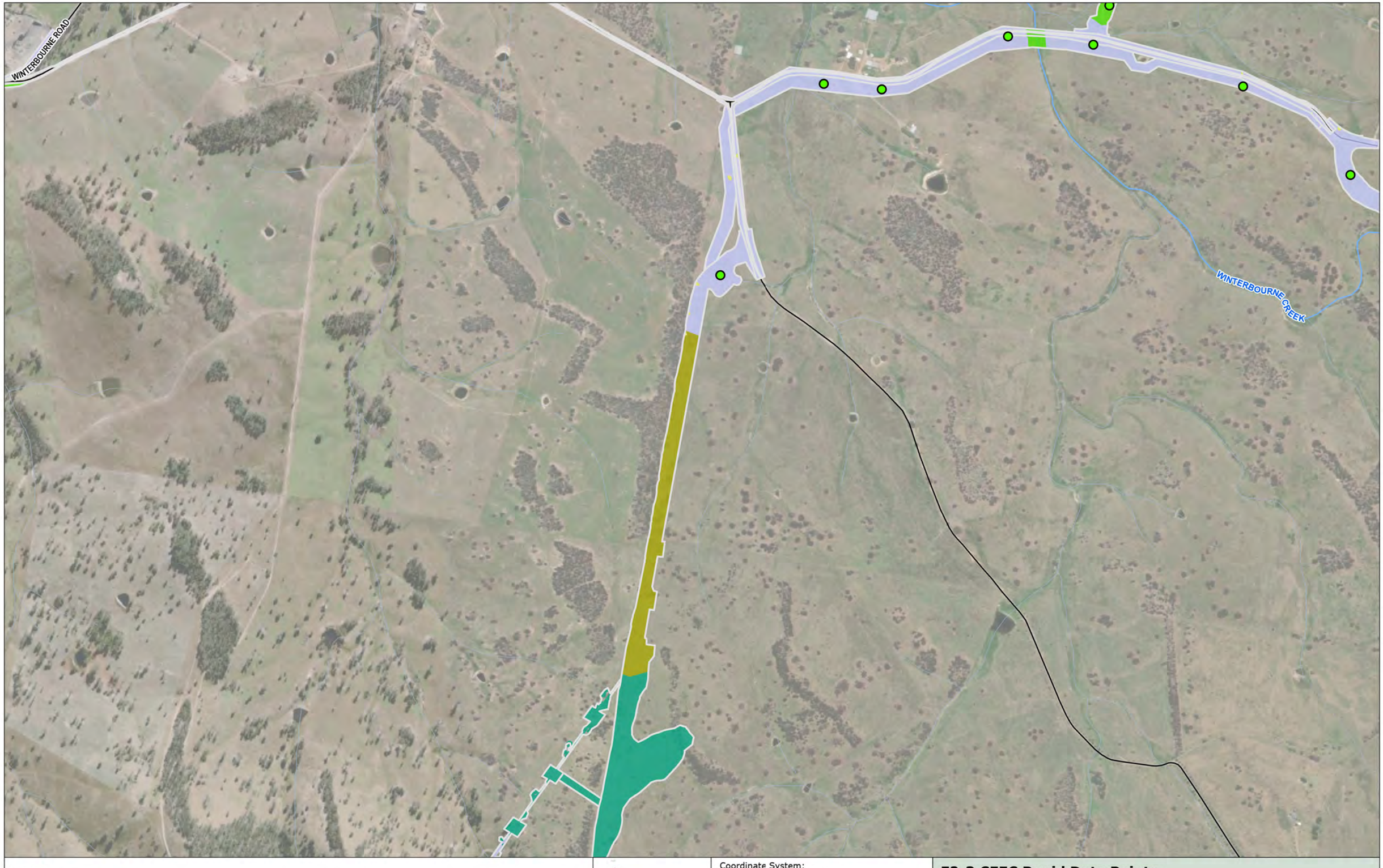
F2-3 CEEC Rapid Data Points

Map 7 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

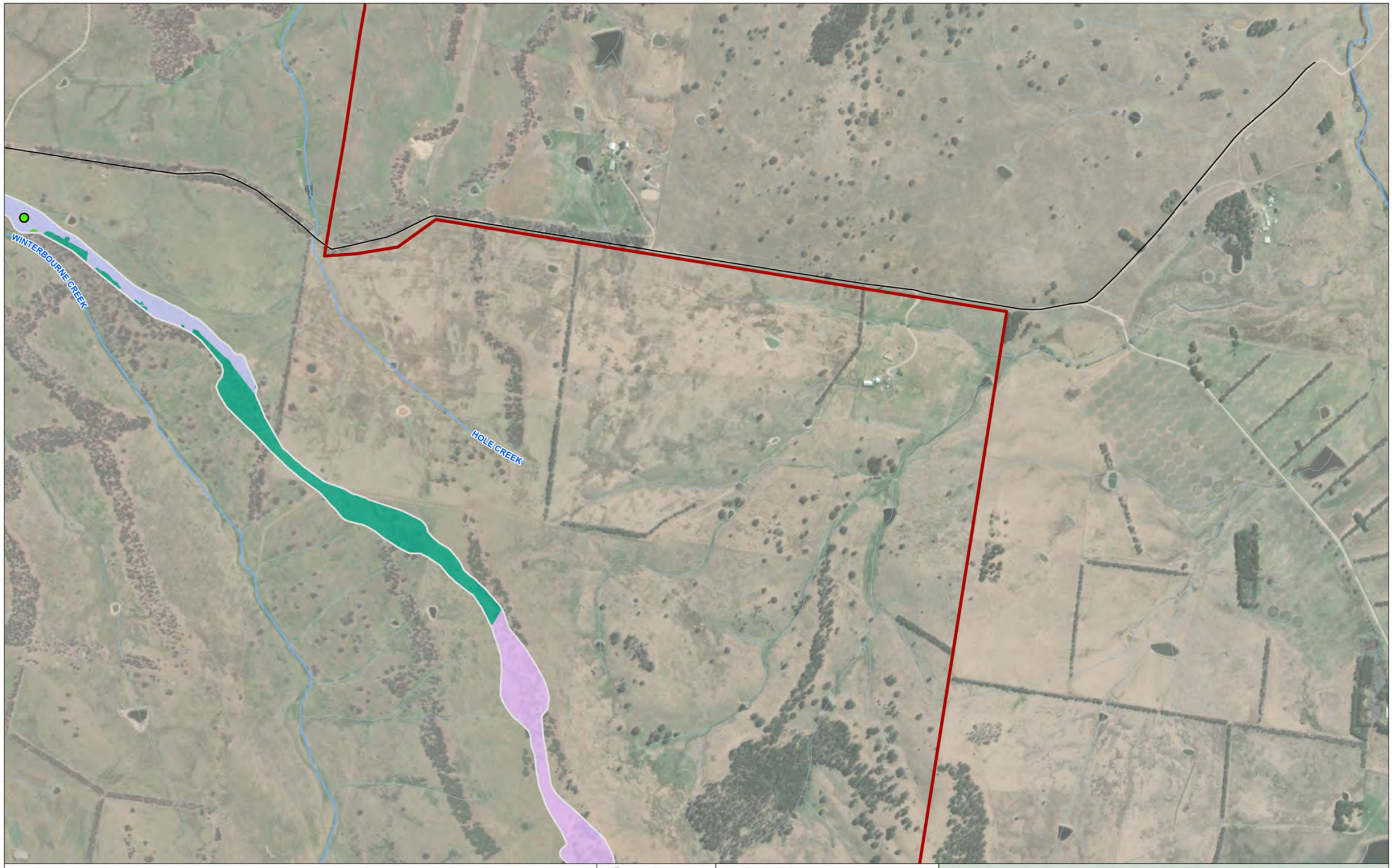
F2-3 CEEC Rapid Data Points

Map 8 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland
- N/A

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m

1:10,000

F2-3 CEEC Rapid Data Points

Map 9 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

DOG TRAP CREEK

BARK HUT ROAD

Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands

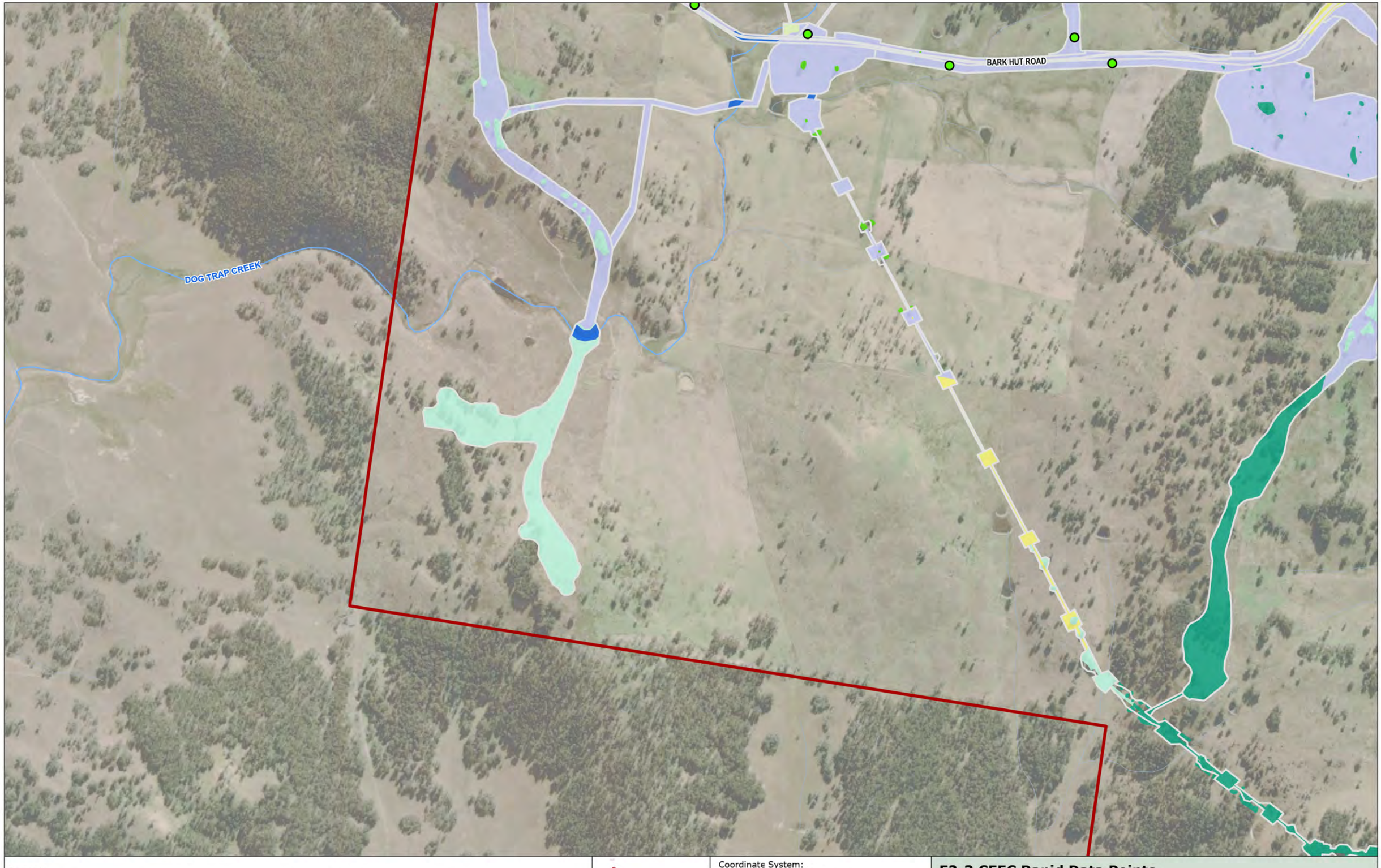
Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
1:10,000

F2-3 CEEC Rapid Data Points

Map 10 of 11

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM



Legend

- CEEC Rapid Point
- Project Area
- Subject Land
- Local Road
- Watercourse
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F2-3 CEEC Rapid Data Points

Map 11 of 11

Winterbourne Wind Farm
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WWPL

ERM

0760651_WWF_LCA_R3.aprx

2.4 SCALE AND RESOLUTION

Scale refers to the ratio between a distance on the map (or image) and the corresponding distance on the ground, while resolution describes the level of detail or the smallest distinguishable feature. The scale/resolution of NSW Government released spatial layers used in the preparation of the NSW draft NVR map varies and is outlined in **Table 2-3**.

TABLE 2-3 SCALE AND RESOLUTION OF LAYERS USED

Spatial Layer	Scale	Resolution
Draft Native Vegetation Regulatory Map	1:10,000	5 m pixels (SPOT 5 Satellite Imagery)
Land zoning	N/A	N/A
Historical Imagery 1991	1:25,000	~1 m pixels (scanned aerial imagery)
Historical Imagery 2011	1:10,000	0.5 m pixels (ADS digital aerial imagery)
NSW Landuse 2017 dataset v1.5	1:10,000	5 m pixels (SPOT 5 Satellite Imagery) 0.5 m pixels (ADS digital aerial imagery)
NSW Native Vegetation Woody Vegetation Extent 2011	1:10,000	5 m pixels (SPOT Satellite Imagery)
NSW State Vegetation Type Map (SVTM) C2.0M2.0	1:10,000	0.5 m pixels (40/80 ADS digital aerial imagery) 5 m pixels (non-native vegetation)
Vegetation mapping for the Subject Land (ERM 2024).	<1:1,000	0.5 m pixels (ADS digital aerial imagery)

The guide *Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme*, as used in this LCA report, has the purpose of linking land categorisation with the requirements for assessment specified under the BAM. Lands included in the Category 1 - Exempt Land do not require assessment in the BAM other than for prescribed impacts. Thus, differences in scale/resolution need to be considered when evaluating land categorisation to ensure a reliable assessment of biodiversity values is made as part of a biodiversity assessment method.

2.4.1 THE IMPORTANCE OF ACCURACY

The accuracy of condition state mapping for a PCT (i.e., vegetation zones) is an important factor in designing a field survey. Such mapping supports the calculation of VISs and is important to upholding the 'no net loss' standard set by the BAM.

The 1:1,000 capture scale used to map the boundaries of PCTs and vegetation zones in the Project BDAR (ERM 2024) is at least an order of magnitude greater than the scale/resolution reported for spatial layers used to prepare the draft NVR map. That is, the ERM (2024) map for PCTs and vegetation zones is more accurate than available NSW Government supplied resources (e.g., SVTM). Accordingly, vegetation mapping differences exist between site specific mapping and NSW Government published sources.

Mapping features and native vegetation cover at 1:1,000 or better is a requirement of the NSW Biodiversity Assessment Method 2020 (BAM) (i.e., s4.3.1 of the BAM). For ease of reference, this section provides the following relevant guidance:

> *Disturbance to growth form groups for tree, shrub and ground cover or extent of exotics (or combinations of these) can be used to identify areas of similar condition*.

This guidance matters, as the basis for calculating a vegetation zone's VIS relies on the quantitative measures obtained from a BAM plot including:

- Plant species composition (i.e., number of native plant species); and
- Plant species structure (i.e., per cent cover of native plant species); and
- Habitat function (i.e., number of large trees, measures of tree age classes, presence of hollow-bearing trees, length of fallen logs, evidence of overstory regeneration and per cent cover of high threat weeds).

These quantitative measures are generated from two nested plots measuring:

- 20 m x 20 m for composition and structure; and
- 20 m x 50 m for function.

Meaningful variation can occur over a 50 m or even 20 m transect length (e.g., edge effects, vegetation modification, natural ecotone). This is recognised in s4.3.4 of the BAM, where plot establishment includes the following guidance:

> *Plot boundaries should not be established within 50 m of ecotones, vehicle tracks and their edges, or other disturbed areas that are easily distinguishable from the broad condition state of the vegetation zone*

This level of mapping accuracy is also supported by c113 (1)(g) of the LLS Regulation where it states:

> *113 Additional land to be designated as category 2-regulated land (s 60I (2) (n))*
>
> *(g) the land contains low conservation grasslands beneath the canopy or drip line of woody vegetation (being woody vegetation that satisfies the criteria for classification of the land as category 2-regulated land).*

Maps generated on this basis improve the delineation of homogenous map units such as vegetation zones in a manner that meaningfully differentiates floristic composition and structural variation across a landscape. This approach supports the reliable calculation of VISs for vegetation zones assessed under the BAM.

2.4.2 EFFECT OF VARIANCE

The fine scale mapping used in ERM (2024) increased the accuracy of boundary delineation for:

- Woody vegetation in a landscape subject to extensive clearing activity; and
- Woodland matrix (i.e., defining the interface between grasslands and woody vegetation).

The approach taken was consistent with c113 (1)(g) of the LLS Regulation that specifies a requirement for mapping of woody vegetation using the tree canopy dripline where the groundcover is likely to be Category 1 - Exempt Land. The granularity of this approach is exemplified in mapping guidance provided the guide *Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme,* as reproduced below.

Figure 4 **Reasonable approximation of category 2-regulated land and category 1-exempt land displayed with published transitional NVR map layers on NSW Imagery**

Variance generated by differences in scale and resolution for the Subject Land is exemplified in **Figure 2-4**.

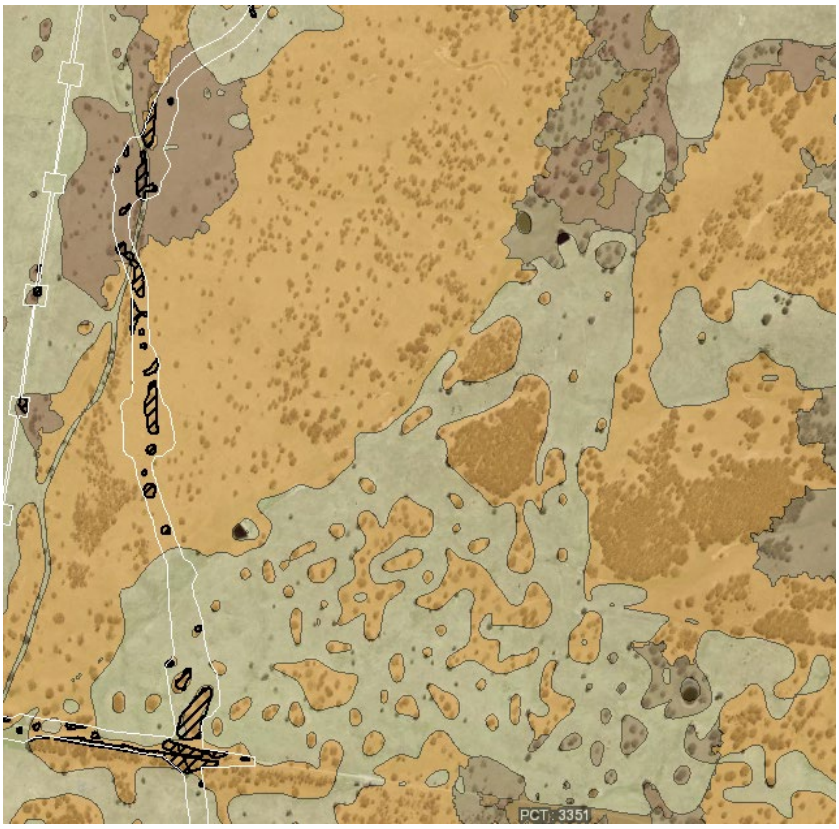


FIGURE 2-4 SVTM (COLOURED THEMATIC) AND ERM (2024) (BLACK HATCH)

The ERM (2024) linework shown in **Figure 2-4** (i.e., area of black hatch generated from a 1:1,000 capture scale) depicts vegetation zone boundaries with consistent and accurate differentiation between woody vegetation and grassland vegetation using tree canopy driplines, whereas the SVTM is variable and inconsistent. SVTM inconsistency across areas of similar tree density is self-evident, as indicated by SVTM polygons that:

- Separate individual trees or small patches of trees from the surrounding unclassified vegetation. This is an example of fine scale mapping where condition states are more accurately defined in the ERM (2024) mapping; and
- Exhibit a combination of woody and grassland vegetation. This is an example of coarse scale mapping where at least two different condition states are present. Separating these condition states are important for both Project design purposes and calculating condition across larger areas.

The ERM (2024) vegetation zone mapping provides a reliable basis for locating the disturbance footprint to maximise the avoidance and/or minimisation of the Projects impacts on biodiversity values. The granular vegetation mapping aids the Project design team to:

- Avoid impacts by excluding individual trees or small patches of trees (e.g., areas of CEEC);
- Minimise impacts by preferentially utilising smaller patches of native vegetation over larger patches; or
- Minimising impacts on corridors widths.

Coarser mapping limits the effectiveness of the design process to locate the disturbance in a manner that can effectively avoid and/or minimise impacts on biodiversity values.

Other important benefits generated by the granular mapping include:

- Survey design (i.e., placement of transects and BAM plots to measure condition); and
- The delineation of vegetation zones, as required by the BAM, to properly characterise condition state variation across PCTs.

The mapping approach adopted in this assessment is supported by the variation in condition states observed by Benson and Ashby (2000) throughout similar parts of the New England Tablelands, as stated below:

"Many native grass and forb species have declined under high grazing pressure because of their growth habit or palatability. In extreme cases the natural ground cover has been completely altered through ploughing and sowing of exotic species creating an appearance of a manicured park (Fig. 38). Both Whalley et al. (1978) and McIntyre et al. (1993) report that stock grazing has produced a shift from tall tussocky grass species, such as *Themeda australis* and *Sorghum leiocladum*, to more prostrate, shorter species".

2.5 LIMITATIONS

The following limitations have been identified in this assessment.

2.5.1 MAPPING

Scale and resolution differences between available desktop resources and the mapping scale required for biodiversity assessment reports has the potential to increase inaccuracy in land categorisation assessments. Such inaccuracies can have perverse impacts on the 'no net loss' standard established in the BAM. Efforts to remedy this include the use of vegetation mapping at a capture scale of 1:1,000 or less, as required by the BAM.

Canopy dripline mapping, with c113 (1)(g) of the LLS Regulation, has been adopted in this assessment to improve the separation of woody vegetation from groundcover vegetation that is subject to agricultural activity.

2.5.2 NATIVE VEGETATION COVER ESTIMATES

The Project, being linear, intersects several properties over a large area of agricultural land. As independently owned and operated farms, each of these properties are likely to have different land use practices. This factor may introduce variation in vegetation condition spatially and temporally, meaning additional sample replicates should be used to evaluate groundcover conditions.

A robust sampling design has been adopted in this assessment using stratification by tenure, land use, draft NVR map units (i.e., category 1 and category 2 vegetation), woody extent, and PCT/condition state mapping (i.e., vegetation zones). This sampling approach has minimised the effect of land use on sampling units, with high sample replication within each stratification unit further minimising any effect from land use impacts.

Excluding the effect of woody vegetation and higher condition state non-woody vegetation on sampling design (i.e., generally excluded from sampling), the quantum of LCA transects performed (n=208; 20.8 km) for a project linear length of ~220 km represents 1 metre interval point intercept sample coverage for approximately 10% of the Project.

3. RESULTS

3.1 DESKTOP ANALYSIS

3.1.1 DRAFT NATIVE VEGETATION REGULATORY MAP

The draft NVR map for the Subject land, as shown in **Figure 1-2**, identifies draft Category 1 - Exempt Land and Category 2 - Regulated Land extent. In force elements of the draft NVR map have also been identified and carried through this assessment without amendment, this being restricted to Category 2 - Regulated Land (Vulnerable). There is no area of Category 2 - Regulated Land (Sensitive) within the Subject Land.

Areas of Category 1 - Exempt Land or Category 2 - Regulated Land, in draft, have been further considered in this assessment. The desktop analysis has included consideration of:

- Land zoning;
- Land use;
- Historical imagery;
- Spatial data published by the State of NSW; and
- Satellite imagery.

3.1.2 LAND ZONING

With the exception of road reserve on the outskirts of Walcha, all of the Subject Land qualifies for inclusion in the draft NVR map as it is zoned rural (RU1 – Primary Production), as shown in **Figure 3-1.**

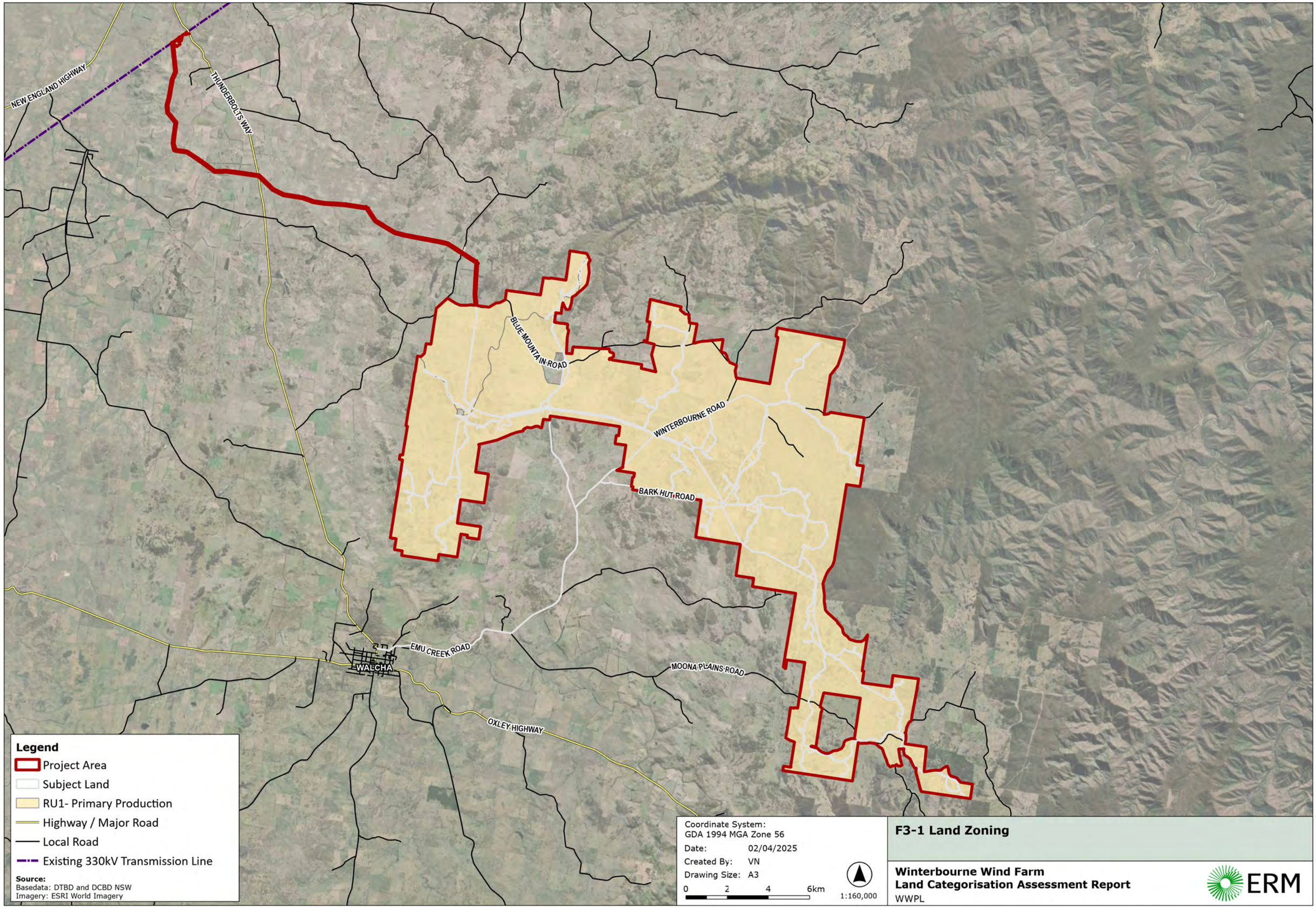
3.1.3 LAND USE MAPPING

The 2017 land use mapping captures how the landscape in NSW is being used for food production, forestry, nature conservation, infrastructure and urban development. It is used to monitor changes in the landscape and identify impacts to biodiversity and ecosystems. In this assessment, it is used to distinguish between grassland systems that are substantially disturbed (e.g., cropping)/modified (i.e., modified pastures) from unmodified systems where minimal floristic change has likely occurred (i.e., unimproved native grasslands used for livestock grazing).

The statewide land use data is a compilation of the best available land use information for NSW that was available in August 2017. For the New England Tablelands region, land use mapping was undertaken in 2017 at a 1:10,000 scale using 2013 SPOT 5 satellite imagery and ADS digital aerial imagery covering rural-zoned agricultural areas.

The Subject Land is included in the statewide land use map as shown in **Figure 3-2**. This mapping identifies the following land uses/types in the Subject Land:

- Grazing native vegetation;
- Grazing modified pastures;
- Cropping;
- Residential and farm infrastructure;
- Services; and
- River.



F3-1 Land Zoning

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

NEW ENGLAND HIGHWAY

THUNDERBOLTS WAY

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- 2.1.0 Grazing native vegetation
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 5.7.0 Transport and communication
- 6.3.0 River

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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1:55,000

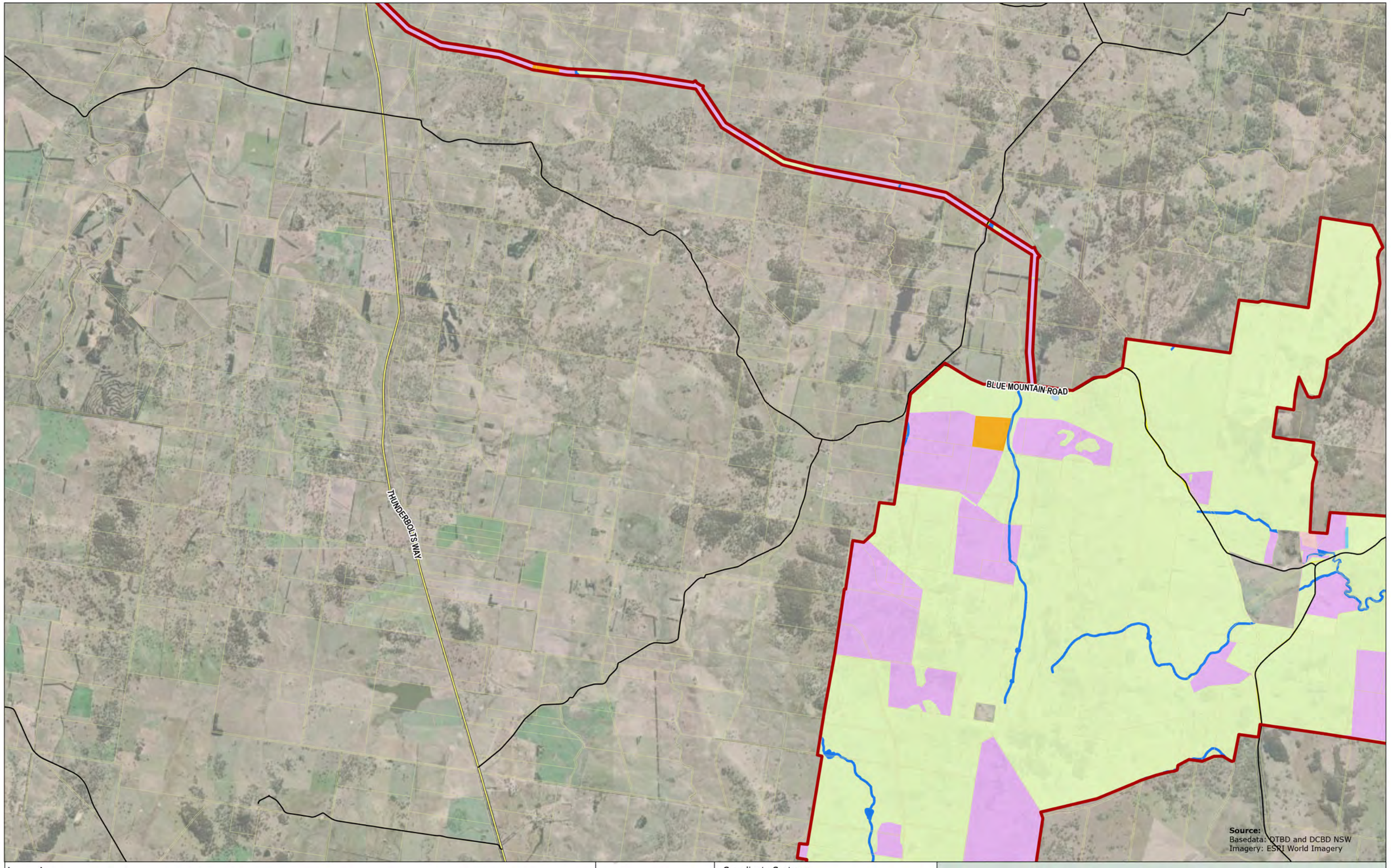
F3-2 Land Use Mapping

Map 1 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

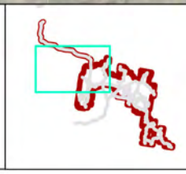
ERM

0760651_WWF_LCA_R1.aprx



Legend

- Project Area
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- 1.2.0 Managed resource protection
- 2.1.0 Grazing native vegetation
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 5.4.0 Residential and farm infrastructure
- 5.7.0 Transport and communication
- 6.2.0 Reservoir/dam
- 6.3.0 River



Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:55,000

F3-2 Land Use Mapping

Map 2 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

BILLIE MOUNTAIN ROAD

WINTERBOURNE ROAD

THUNDERBOLTS WAY

DERBY STREET

EMU CREEK ROAD

OXLEY HIGHWAY

MOONA PLAINS ROAD

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- 2.1.0 Grazing native vegetation
- 3.2.0 Grazing modified pastures
- 6.3.0 River

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:55,000

F3-2 Land Use Mapping

Map 3 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 5.2.0 Intensive animal production
- 5.4.0 Residential and farm infrastructure
- 5.7.0 Transport and communication
- 6.3.0 River

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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1:55,000

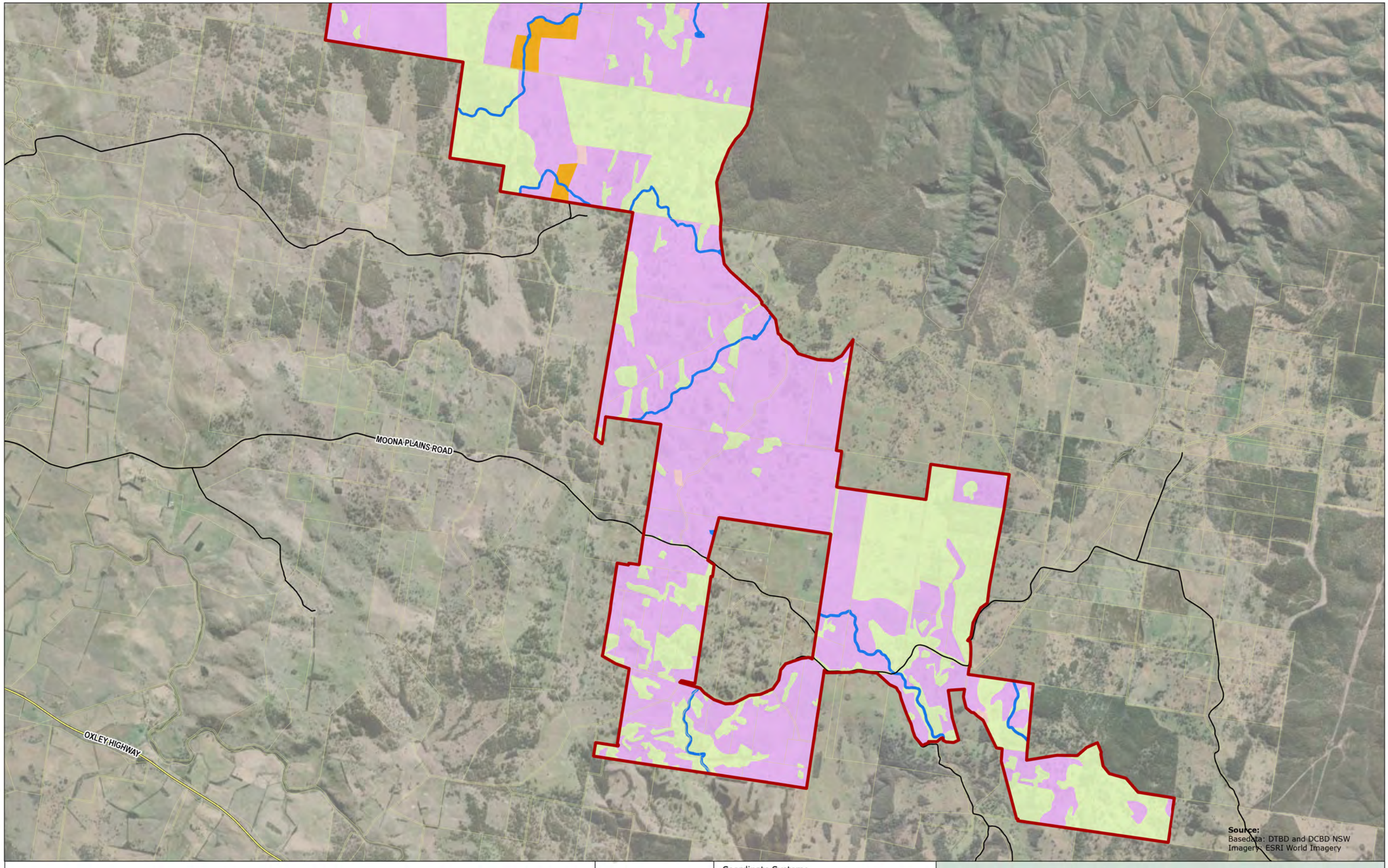
F3-2 Land Use Mapping

Map 4 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- 1.1.0 Nature conservation
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 5.4.0 Residential and farm infrastructure
- 5.7.0 Transport and communication
- 6.3.0 River

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:55,000

F3-2 Land Use Mapping

Map 5 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Lands identified as 'cropping' and 'Residential and farm infrastructure' are likely to automatically classify as Category 1 - Exempt Land. These areas have been modified and are therefore likely to be substantially disturbed and degraded.

Areas mapped as river are non-native and are Category 1 - Exempt Land unless otherwise mapped as Category 2 - Regulated Land (Vulnerable). Descriptions of the first three land use categories are provided as follows.

3.1.3.1 GRAZING NATIVE VEGETATION

This class includes land that is subject to relatively low levels of intervention. The land may not be used more intensively for agriculture because of its limited capability. The structure of the native vegetation generally remains intact despite deliberate use, although the floristics of the vegetation may have changed markedly. Where the native vegetation structure is, for example, open woodland or grassland, the land may be grazed (The Australian Land Use and Management (ALUM) Classification Version 7, May 2010).

This is a land use based on grazing by domestic stock on native vegetation with limited or no deliberate attempt at pasture modification. Some change in species composition may have occurred. For land use mapping purposes, this class is used when there is greater than 50 per cent native species cover (The Australian Land Use and Management (ALUM) Classification Version 7, May 2010).

Modification of these areas is likely to have occurred without being detected through remotely sensed data. Thus, areas of grazing within native vegetation require detailed site investigation to properly consider their classification. Lands with this classification are likely to be native vegetation unless otherwise determined by site assessment.

LCA transects are required to test for per cent native vegetation cover under transitional arrangements before these areas can be considered Category 1 - Exempt Land. If needed, a review of BAM Plot data may be required to examine plant species composition. The latter is particularly relevant for lands coincident with landscape that may comprise CEECs.

Where native grasses have been deliberately and extensively replaced with improved species, the land use should be treated under class 3, 'grazed modified pastures' or 'cropping', as outlined in **Section 3.1.3.2** and **Section 3.1.3.3**. The designation of Category 1 - Exempt Land to these areas is almost certain for this reason.

3.1.3.2 GRAZING MODIFIED PASTURES

The mapping of pasture and forage production, both annual and perennial, is based on significant active modification or replacement of species from the original native vegetation. For mapping purposes, this class is used when there is greater than 50 per cent exotic species cover (The Australian Land Use and Management (ALUM) Classification Version 7, May 2010).

This is a land use under pasture observable at the time of mapping and may be in a rotation system, so that at another time the same area may be, for example, under cropping. Land in a rotation system should be classified according to the land use at the time of mapping (The Australian Land Use and Management (ALUM) Classification Version 7, May 2010). In these circumstances, it is possible that some lands that are rotationally cropped may be classified as 'grazing modified pastures'. Historical imagery analysis and LCA data may assist in identifying this circumstance.

Areas mapped as 'grazing modified pastures' are likely to classify as Category 1 - Exempt Land, which appears to be the case in the draft NVR map as shown **Figure 1-2**. LCA transects are likely to verify this mapping by showing low native vegetation per cent cover.

3.1.3.3 CROPPING

Land under cropping at the time of mapping may be in a rotation system, so that at another time the same area may be, for example, under pasture. Land in a rotation system should be classified according to the land use at the time of mapping. Cropping can vary markedly over relatively short distances in response to changes in the nature of the land and the preferences of the land manager. It may also change over time in response to market conditions. Production of fodder, such as lucerne hay, is considered cropping as there is no harvesting by stock (The Australian Land Use and Management (ALUM) Classification Version 7, May 2010).

Areas mapped as 'cropping' are likely to classify as Category 1 - Exempt Land. This is evident in the draft NVR map as shown **Figure 1-2** as there is considerable alignment between the two. LCA transects are likely to verify this mapping by showing low native vegetation per cent cover.

3.1.4 HISTORIC IMAGERY

Historic aerial imagery was used to review the extent of clearing, modification and disturbance evident in the Subject Land at 1990 and any change thereafter through to August 2017. Images were sourced from the Historical Imagery Viewer and the Public NSW Imagery (MapServer), provided by the NSW Government.

A complete imagery dataset is limited for the Subject Land. Images from 1991 were used to approximate the 1990 extent of woody vegetation cover and comprise the best imagery available to provide a reasonable indication of what clearing had occurred on the Subject Land prior to 1990. This is shown in **Figure 3-3**. The next most suitable imagery set was captured in 2011, which is available in orthorectified digital form and is shown in **Figure 3-4**.

The historical aerial images reveal the general absence of pre-European landcovers (i.e., woodlands and forests) with widespread into grasslands, pasture and cropping lands. Much of the Subject Land now comprises non-woody vegetation (i.e., grasslands) with historical imagery indicating that agricultural activity has been sustained over a period of 12 months or more between 1991 and 2011.

These native and non-native grasslands are currently used for cropping and livestock grazing and coincide with rural infrastructure such as fencing and farm dams. The harvesting and storage of water in the Subject Land has likely been used to support livestock grazing (i.e., water points) and will have altered the natural hydrology of the land.

3.1.5 WOODY VEGETATION

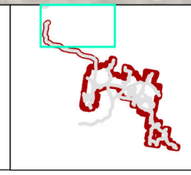
The Subject Land comprised native vegetation characterised by open forest to woodland structure prior to European settlement, meaning that most of this area would have been woody vegetation. Only small areas would have been classed as non-woody vegetation (e.g., Carex fen/bog and natural grassland vegetation in areas of low relief (Benson and Ashby 2000)).

NEW ENGLAND HIGHWAY

THUNDERBOLTS WAY

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Highway / Major Road
- Local Road



Coordinate System:
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Date: 03/04/2025
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F3-3 1991 Historical Aerial Imagery

Map 1 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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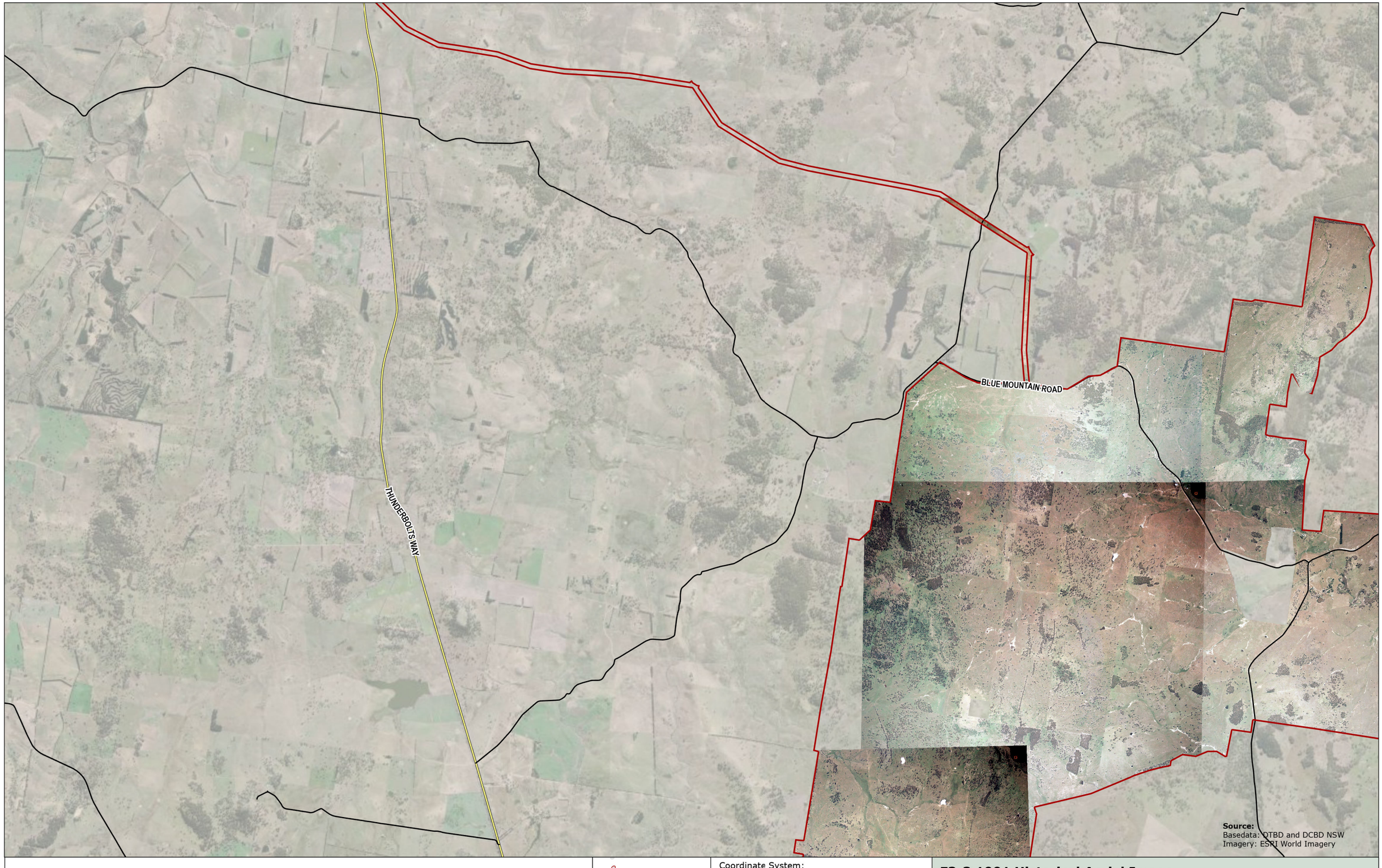
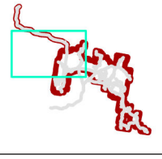


Legend
- Project Area
- Highway / Major Road
- Local Road



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F3-3 1991 Historical Aerial Imagery

Map 2 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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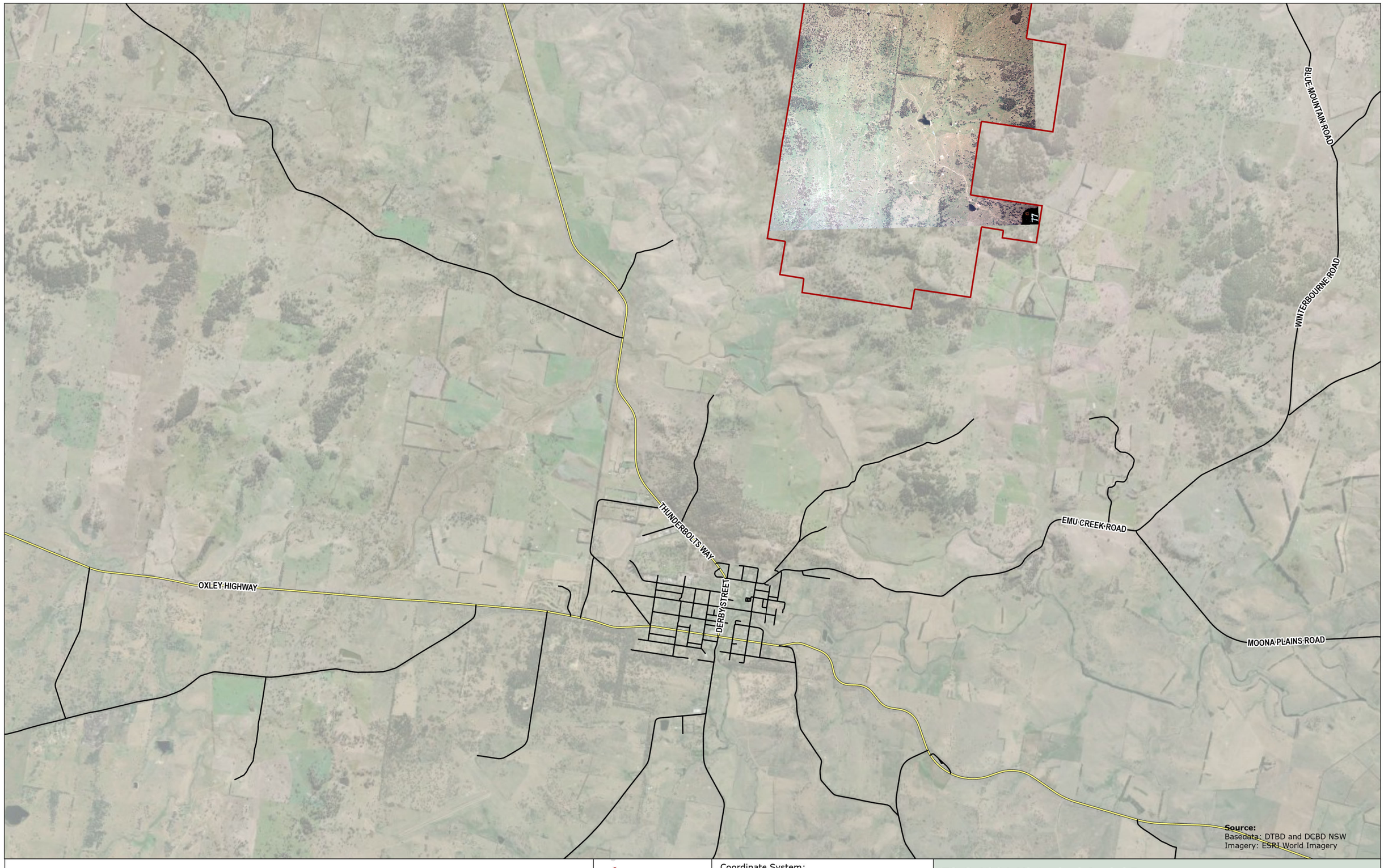

Source:
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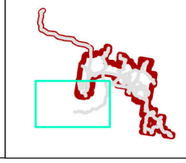
Imagery: ESRI World Imagery

Legend
- Project Area
- Highway / Major Road
- Local Road



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F3-3 1991 Historical Aerial Imagery

Map 3 of 5

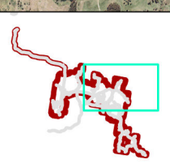
Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Highway / Major Road
- Local Road



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F3-3 1991 Historical Aerial Imagery

Map 4 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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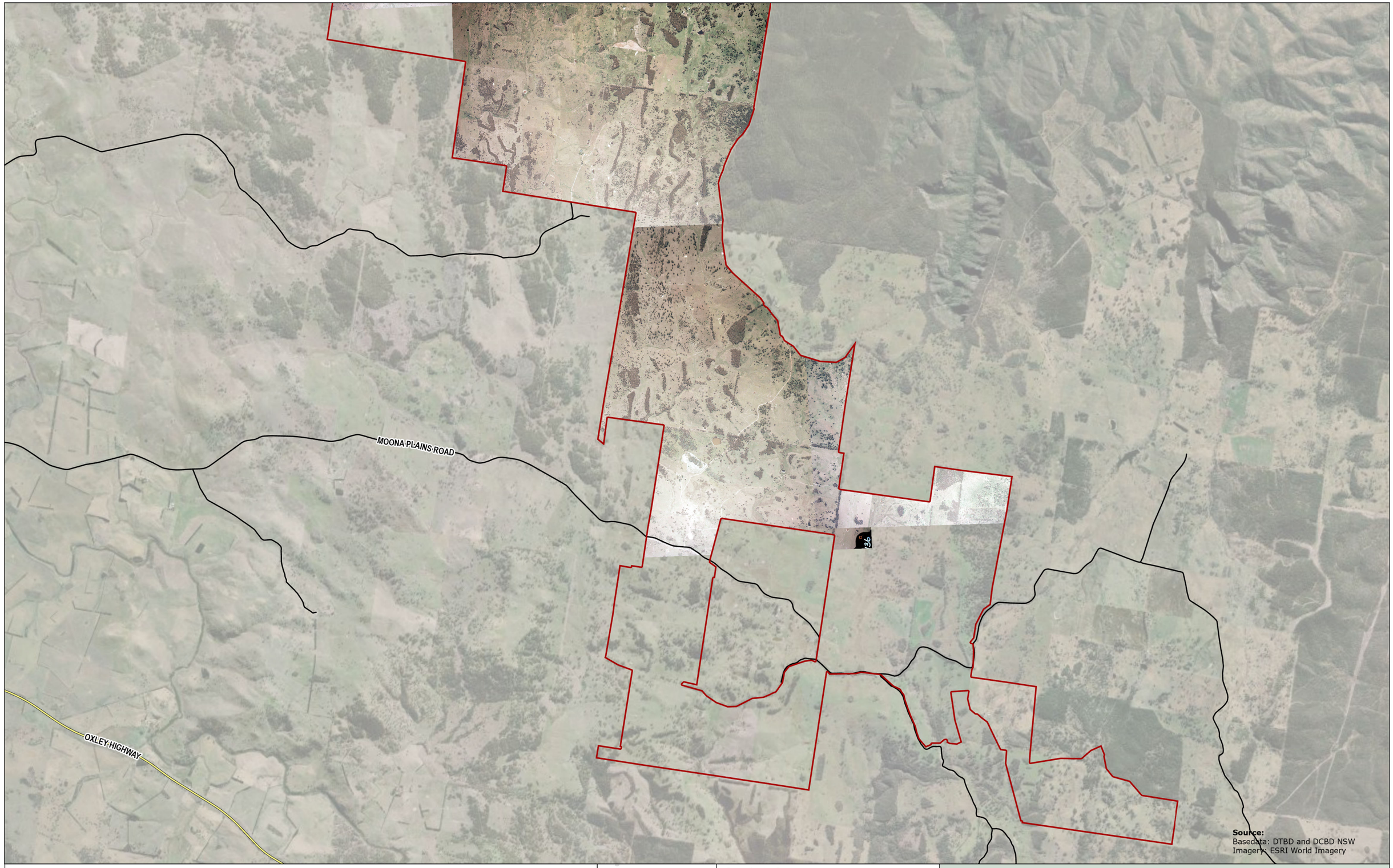

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 03/04/2025
Created By: VN
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F3-3 1991 Historical Aerial Imagery

Map 5 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

NEW ENGLAND HIGHWAY

THUNDERBOLTS WAY

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:55,000

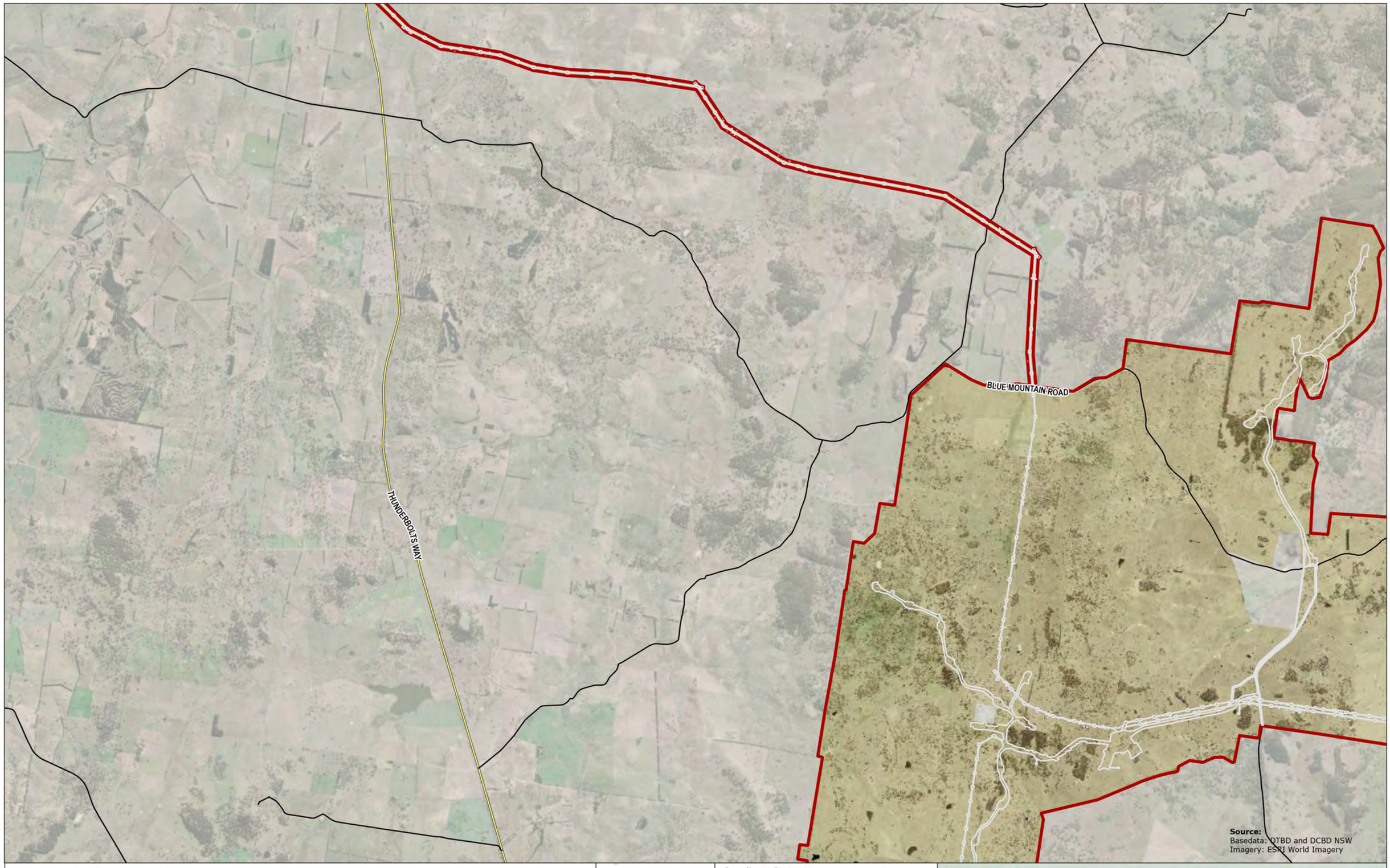
F3-4 2011 Historical Aerial Imagery

Map 1 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 02/04/2025

Created By: VN

Drawing Size: A3

0 500 1,000 1,500m

1:55,000

F3-4 2011 Historical Aerial Imagery

Map 2 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report

WWPL

ERM

0760651_WWF_LCA_R1.aprx

BLUE MOUNTAIN ROAD

WINTERBOURNE ROAD

THUNDERBOLTS WAY

DERBY STREET

EMU CREEK ROAD

OXLEY HIGHWAY

MOONA PLAINS ROAD

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
1:55,000

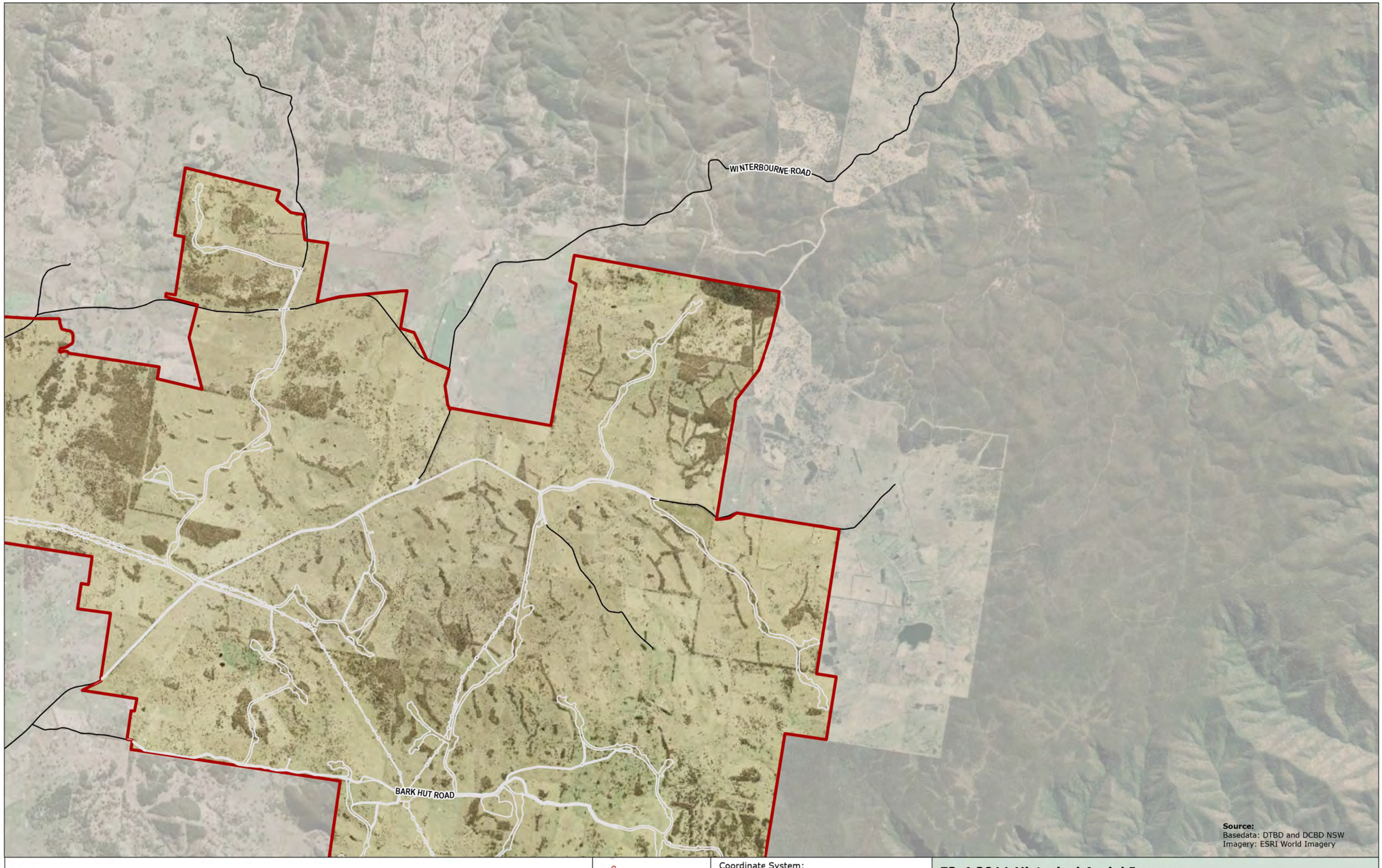
F3-4 2011 Historical Aerial Imagery

Map 3 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
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F3-4 2011 Historical Aerial Imagery

Map 4 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

MOONA PLAINS ROAD

OXLEY HIGHWAY

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 02/04/2025
Created By: VN
Drawing Size: A3
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F3-4 2011 Historical Aerial Imagery

Map 5 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

The change in woody vegetation cover post European settlement is plainly evident in the 1991 historical imagery. Residual woody vegetation within the Subject Land is sparse and generally found in less arable areas such as ridgelines and steep sided hillsides. Scattered trees predominate in the flatter country where land clearing and disturbance/modification for grazing is most prominent.

The 2011 extent of woody vegetation cover is estimated to be ~ 104.3 ha as shown in **Figure** 3-5, which is ~12% of the Subject Land. This exemplifies the substantial loss of woody vegetation cover since European settlement and is relatively indifferent to the 1991 imagery. This indicates land use continuity across lands cleared of woody vegetation (e.g., livestock grazing and cropping).

3.1.6 STATE VEGETATION TYPE MAP

The NSW State Vegetation Type Map (SVTM) is a map of PCTs for the entire State. PCTs are the finest level of classification in the NSW vegetation classification hierarchy. They identify and describe recurring patterns of native plant species assemblages in relation to environmental conditions; that is, sets of species that commonly occur together in association with combinations of soil, temperature, moisture and other factors (State of NSW and Department of Planning and Environment 2022).

The SVTM is designed for regional-scale planning and management actions. More detailed site verification is required for local or property-scale projects. The amount of field survey information and the quality of geospatial datasets used to predict PCTS dictate that some areas, and some PCTs, will be mapped with higher confidence than others. For the Subject Land, there was very little prior field survey data available to support the SVTM.

SVTM mapped PCTs within the Subject Land are shown in **Figure 3-6** and include:

- 3254 – Northern Hinterland Tallowwood-Forest Oak Grassy Forest;
- 3281 – Guyra Granitoids Gum-Messmate Forest;
- 3286 – Northern Escarpment Blackbutt Cool Moist Forest;
- 3287 – Northern Escarpment Messmate Cool Wet Forest;
- 3288 – Northern Escarpment Messmate Moist Grassy Forest;
- 3344 – New England Ribbon Gum Grassy Forest;
- 3345 – New England Snow Gum-Black Sally Woodland;
- 3351 – Armidale Creekflat Snow Gum Woodland-Scrub;
- 3352 – Armidale Quartz Hills Stringybark Forest;
- 3353 – Guyra Silvertop Stringybark Moist Forest;
- 3359 - New England Hills Stringybark-Box Woodland;
- 3427 – Northern Hinterland Hills Bloodwood-Red Gum Grassy Forest;
- 3461 – Macleay Gorges Stringybark-Red Gum Grassy Forest;
- 3723 – Western New England Panic-Wiregrass Grassland;
- 3725 – Western New England Ranges Orange Gum-Blackbutt Forest; and
- 3944 – New England Tableland Carex Fens.

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Woody Vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
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F3-5 Woody Vegetation Extent
Map 1 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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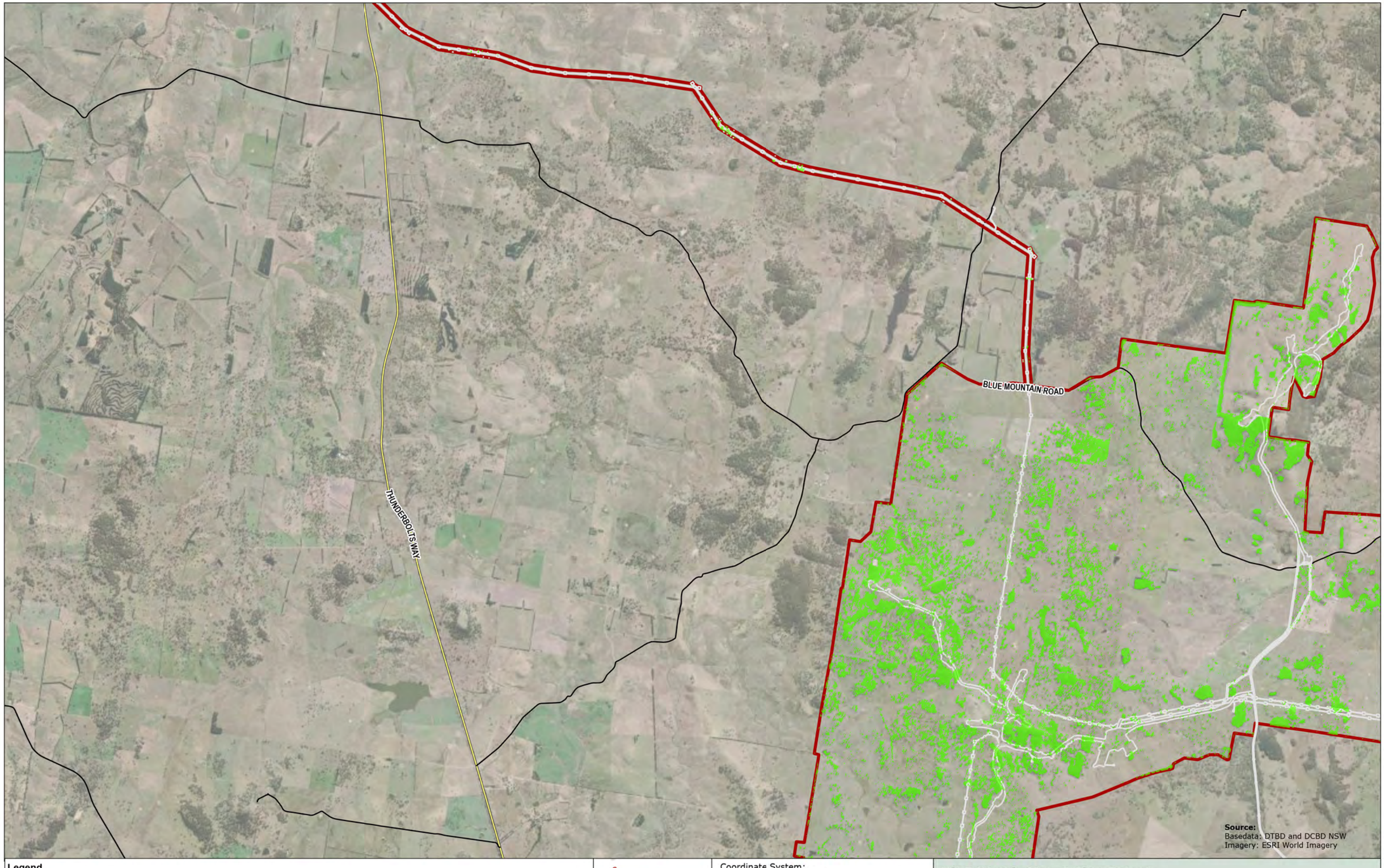

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Woody Vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025

Created By: VN

Drawing Size: A3

0 500 1,000 1,500m

1:55,000

F3-5 Woody Vegetation Extent

Map 2 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
THUNDERBOLTS WAY
EMU CREEK ROAD
DERBY STREET
OXLEY HIGHWAY
MOONA PLAINS ROAD

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Woody Vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m
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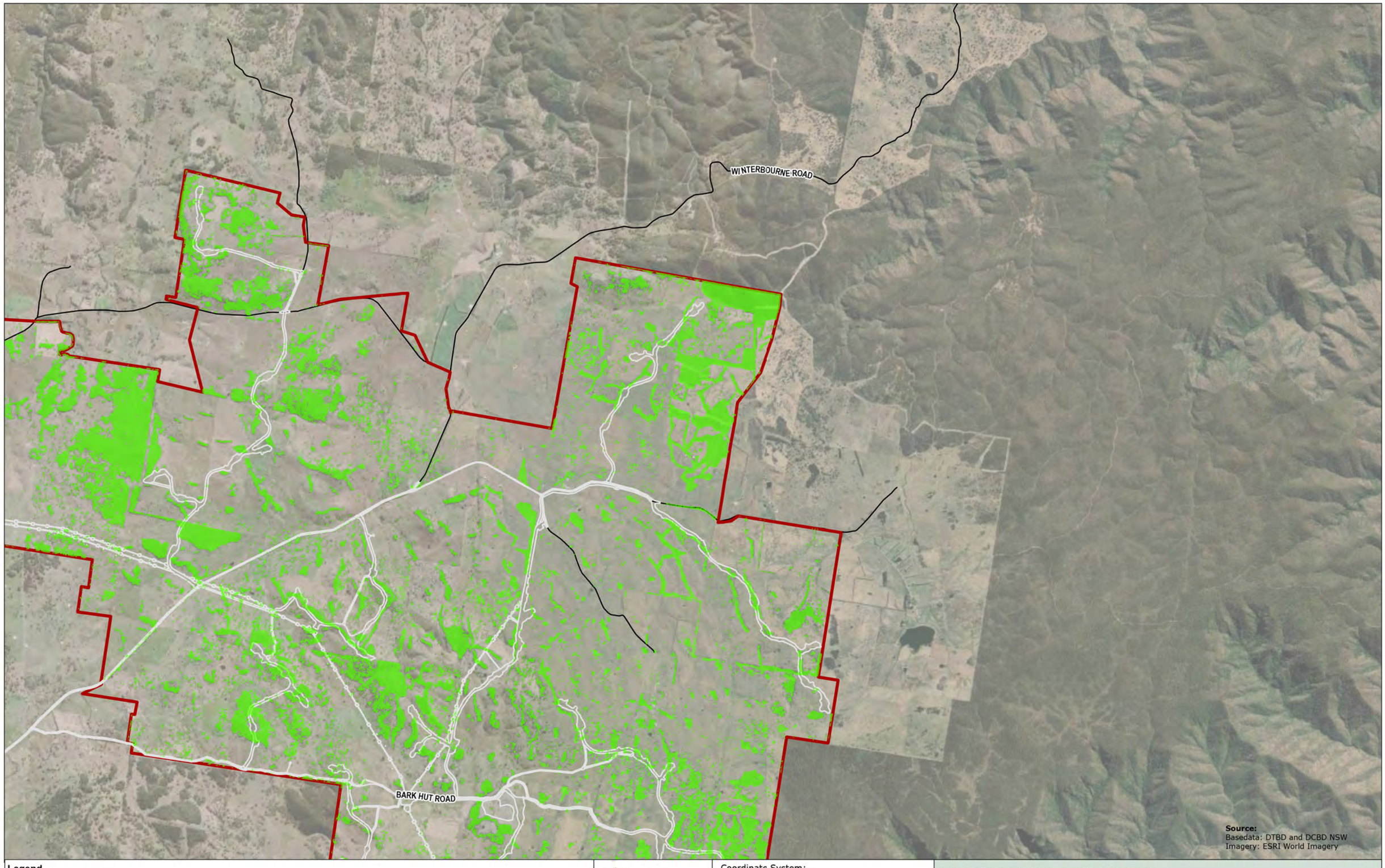
F3-5 Woody Vegetation Extent

Map 3 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Woody Vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
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1:55,000

F3-5 Woody Vegetation Extent
Map 4 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

MOONA PLAINS ROAD

OXLEY HIGHWAY

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend
- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Woody Vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
0 500 1,000 1,500m

1:55,000

F3-5 Woody Vegetation Extent

Map 5 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Existing 330kV Transmission Line
- Not classified
- 3344,New England Ribbon Gum Grassy Forest
- 3353,Guyra Silvertop Stringybark Moist Forest
- 3359,New England Hills Stringybark-Box Woodland
- 3723,Western New England Panic-Wiregrass Grassland
- 3725,Western New England Ranges Orange Gum-Blackbutt Forest

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23/04/2025
Created By: VN
Drawing Size: A3

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1:55,000

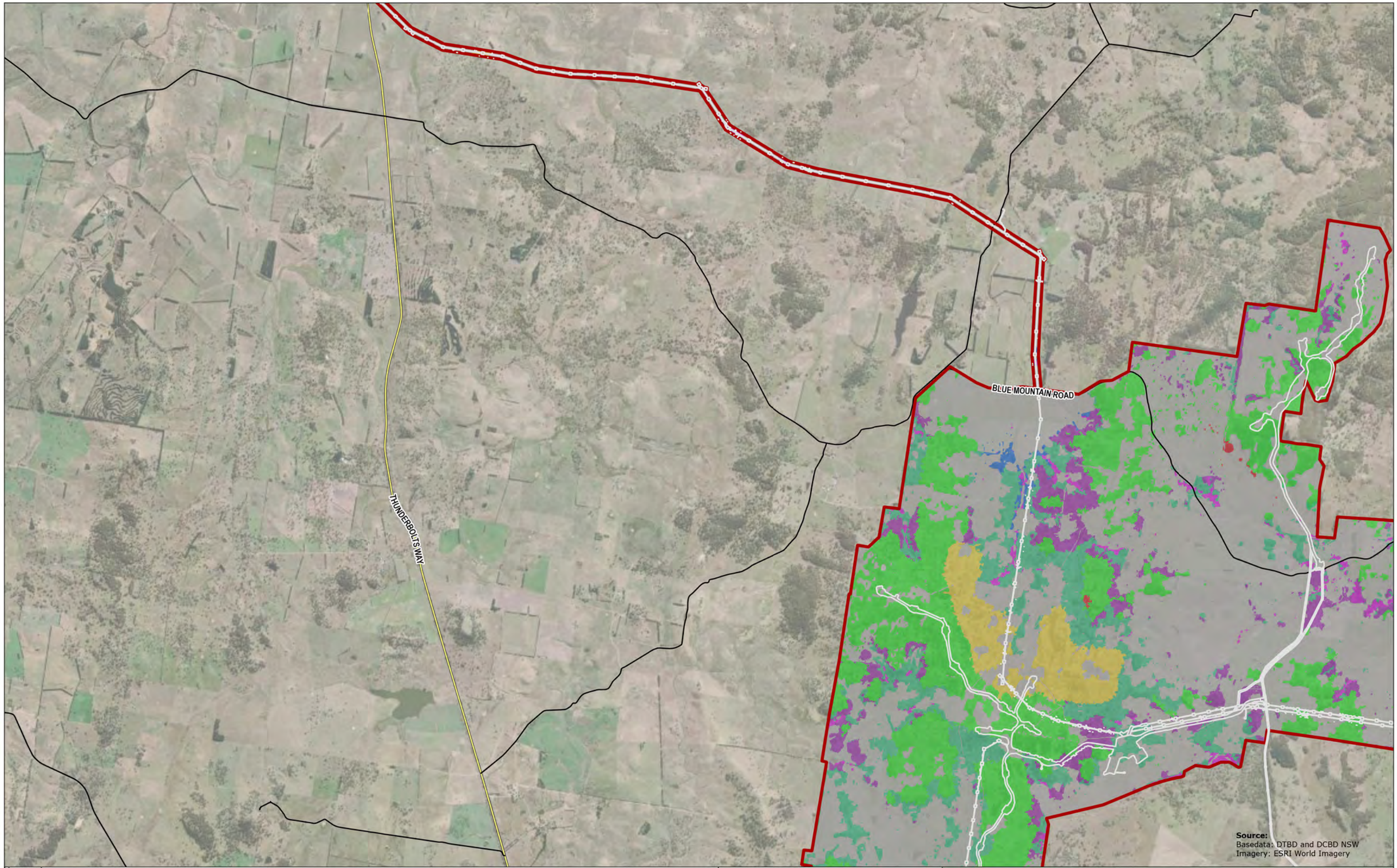
F3-6 NSW State Vegetation Type Map

Map 1 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Not classified
- 3281,Guyra Granitoids Gum-Messmate Forest
- 3344,New England Ribbon Gum Grassy Forest
- 3345,New England Snow Gum-Black Sally Woodland
- 3351,Armidale Creekflat Snow Gum Woodland-Scrub
- 3352,Armidale Quartz Hills Stringybark Forest
- 3353,Guyra Silvertop Stringybark Moist Forest
- 3359,New England Hills Stringybark-Box Woodland
- 3461,Macleay Gorges Stringybark-Red Gum Grassy Forest
- 3723,Western New England Panic-Wiregrass Grassland

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
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F3-6 NSW State Vegetation Type Map

Map 2 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
EMU CREEK ROAD
THUNDERBOLTS WAY
DERBY STREET
OXLEY HIGHWAY
MOONA PLAINS ROAD

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Not classified
- 3281,Guyra Granitoids Gum-Messmate Forest
- 3344,New England Ribbon Gum Grassy Forest
- 3351,Armidale Creekflat Snow Gum Woodland-Scrub
- 3352,Armidale Quartz Hills Stringybark Forest
- 3359,New England Hills Stringybark-Box Woodland
- 3427,Northern Hinterland Hills Bloodwood-Red Gum Grassy Forest

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
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F3-6 NSW State Vegetation Type Map

Map 3 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Not classified
- 3286,Northern Escarpment Blackbutt Cool Moist Forest
- 3288,Northern Escarpment Messmate Moist Grassy Forest
- 3344,New England Ribbon Gum Grassy Forest
- 3351,Armidale Creekflat Snow Gum Woodland-Scrub
- 3352,Armidale Quartz Hills Stringybark Forest
- 3359,New England Hills Stringybark-Box Woodland
- 3461,Macleay Gorges Stringybark-Red Gum Grassy Forest

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
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1:55,000

F3-6 NSW State Vegetation Type Map

Map 4 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

MOONA PLAINS ROAD

OXLEY HIGHWAY

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Not classified
- 3254,Northern Hinterland Tallowwood-Forest Oak Grassy Forest
- 3281,Guyra Granitoids Gum-Messmate Forest
- 3287,Northern Escarpment Messmate Cool Wet Forest
- 3288,Northern Escarpment Messmate Moist Grassy Forest
- 3344,New England Ribbon Gum Grassy Forest
- 3345,New England Snow Gum-Black Sally Woodland
- 3351,Armidale Creekflat Snow Gum Woodland-Scrub
- 3352,Armidale Quartz Hills Stringybark Forest
- 3359,New England Hills Stringybark-Box Woodland
- 3944,New England Tableland Carex Fens

Coordinate System:
GDA 1994 MGA Zone 56
Date: 23/04/2025
Created By: VN
Drawing Size: A3
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F3-6 NSW State Vegetation Type Map

Map 5 of 5

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

SVTM accuracy across the Subject Land has been adversely influenced by scale/resolution (see **Section 3.1.6**) and the limited number of representative systematic flora plot data available for PCT mapping in this area. Locally, the SVTM has used up to approximately 21 systematic flora plots included in the BioNet vegetation database, with 16 of these being data obtained for the Project (i.e., NGH plot data). Most of this plot data is obtained from partly cleared and grazed patches of native vegetation, which has further confounded PCT identification (i.e., introduction of disturbance influences).

3.1.7 PCT MAPPING FOR THE SUBJECT LAND

ERM (2024) prepared a PCT map for the Subject Land, which was based on site investigations involving several hundred field observation points. ERM (2024) noted that a strong classification showing clear compositional and structural differences is not likely to be readily produced from this vegetation data (i.e., BAM plots, rapid data points and transects) as the Subject Land is highly disturbed from long term agricultural activity.

Several anthropogenic factors have limited the prospects for an optimal classification of vegetation into PCTs at this location, as indicated in Benson and Ashby (2000), such as:

- The degradation effect of past and ongoing disturbance. Naturally occurring PCTs in these circumstances are likely to lose key indicator plant species from clearing and land use. There is also the likelihood for increased influence from non-indicator disturbance tolerant/pioneer species and/or exotic species;
- Spatial limitations on collecting representative floristic samples. BAM plot sampling was often restricted to available vegetation within the Subject Land such as small patches, thus compromising sound sampling principles; and
- The influence of edges on vegetation cover.

These limitations are likely amplified by natural sources of floristic variation that operate across the Subject Land such as:

- Natural ecotones;
- Altitudinal variation;
- Topographic variation from west to east;
- Varying influence of cold air drainage from west to east; and
- Decreasing rainfall gradient from east to west.

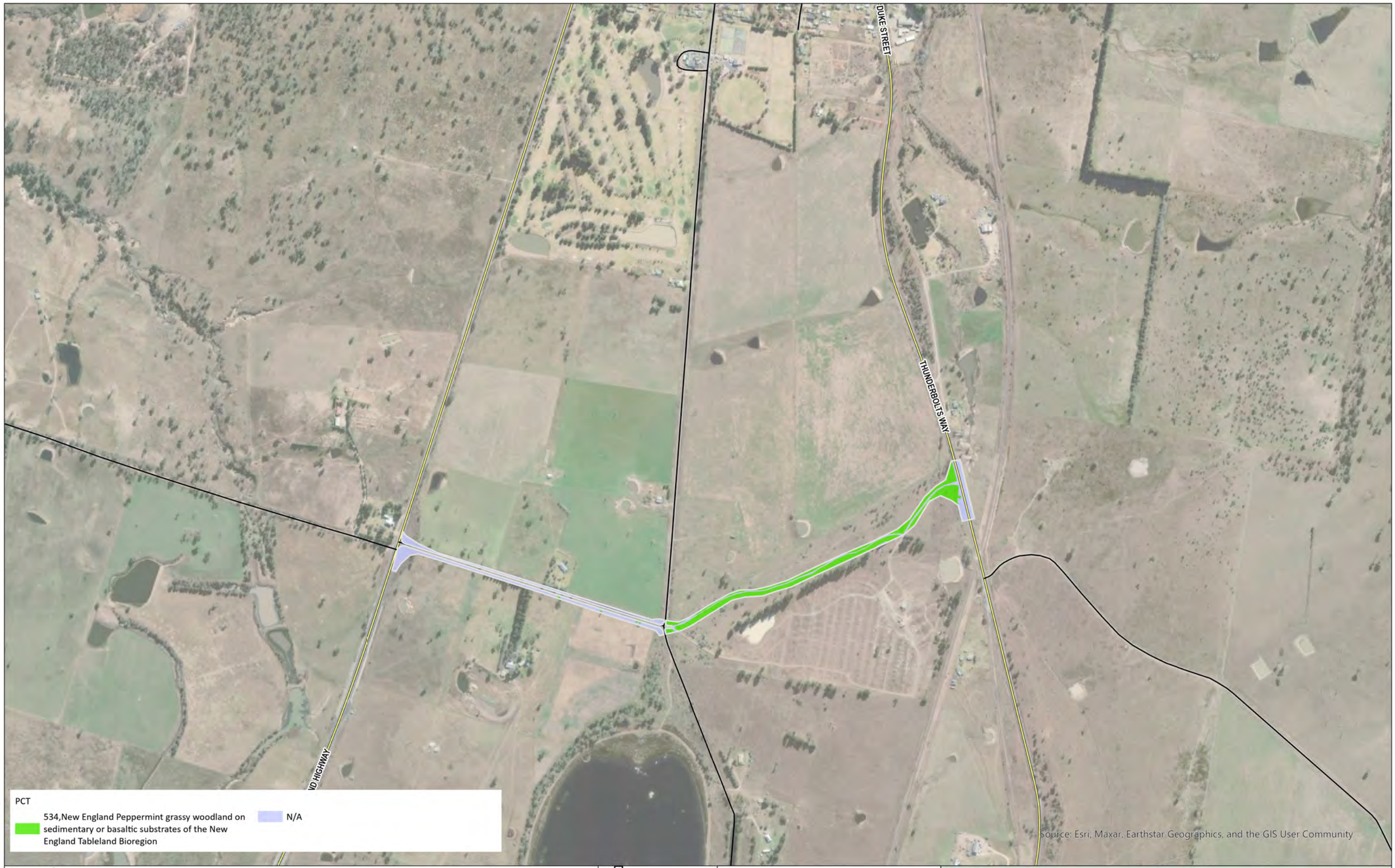
The vegetation classification produced therefore required cognitive oversight to evaluate the effect of the above factors.

3.1.7.1 PCT EXTENT

The ERM (2024) mapped extent of PCTs is presented in **Table 3-1** and shown in **Figure 3-7**. This mapping was used as the basis for designing the sampling program for non-woody vegetation cover in this assessment across the Subject Land (i.e., transect placement and number of transects required to sample the mapped units).

TABLE 3-1 ERM (2024) PCTS IDENTIFIED WITHIN THE SUBJECT LAND

PCT ID	PCT name	Approximate area in Subject Land (ha)
501	Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	7.18
510	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	68.53
533	New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	0.62
534	New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	96.88
565	Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	7.67
567	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	126.37
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	214.56
571	Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	45.46
766	Carex sedgeland of the slopes and tablelands	1.58
965	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	133.02
967	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	130.25
1192	Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	17.34
1194	Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	4.52



Legend

- Subject Land
- Project Area
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-7 PCTs of the Subject Land (ERM 2024)

Map 1 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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THUNDERBOLTS WAY

Maxar

PCT

510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion

Legend

- Subject Land
- Project Area
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

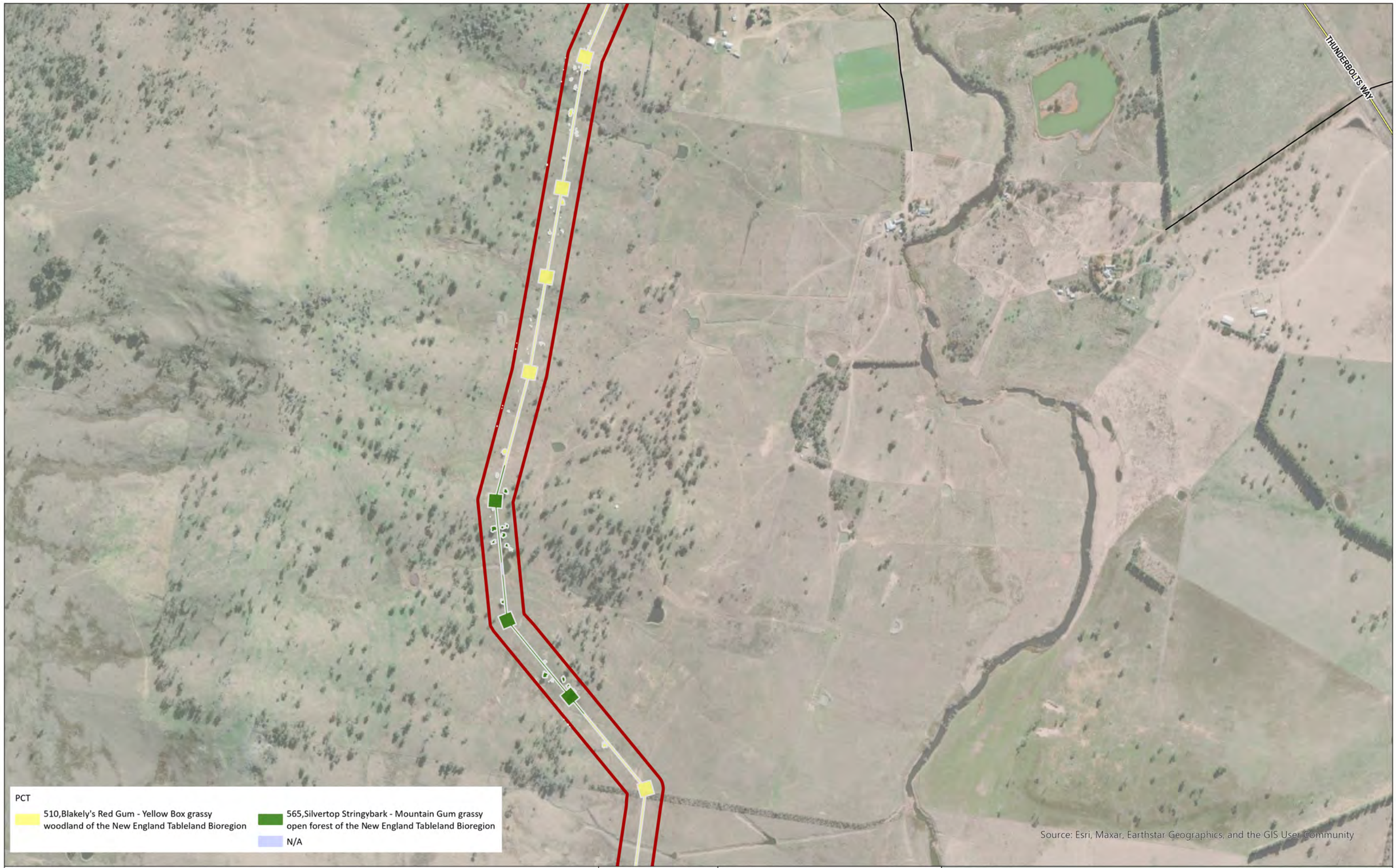
F3-7 PCTs of the Subject Land (ERM 2024)

Map 2 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 3 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- Non-indigenous vegetation cover
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Highway / Major Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-7 PCTs of the Subject Land (ERM 2024)

Map 4 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

THUNDERBOLTS WAY

PCT

510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

N/A

Maxar

Legend

Subject Land

Project Area

Highway / Major Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 5 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- N/A

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 6 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

766,Carex sedgeland of the slopes and tablelands

N/A

Maxar

Legend

Subject Land

Project Area

Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 7 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 8 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 533,New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 9 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 533,New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England; 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F3-7 PCTs of the Subject Land (ERM 2024)

Map 10 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England; 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
- N/A

Legend

- Subject Land
- Project Area

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-7 PCTs of the Subject Land (ERM 2024)

Map 11 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 565,Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England; 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-7 PCTs of the Subject Land (ERM 2024)

Map 12 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

N/A

Maxar

Legend

Subject Land

Project Area

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 13 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Maxar

Legend

Subject Land

Project Area

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 14 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-7 PCTs of the Subject Land (ERM 2024)

Map 15 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BLUE MOUNTAIN ROAD

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 16 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BLUE MOUNTAIN ROAD

PCT

- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England; 571,Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 17 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 18 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F3-7 PCTs of the Subject Land (ERM 2024)

Map 19 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

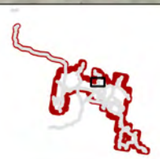
N/A

Maxar

Legend

Subject Land

Project Area



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Date: 20/05/2025

Created By: VN

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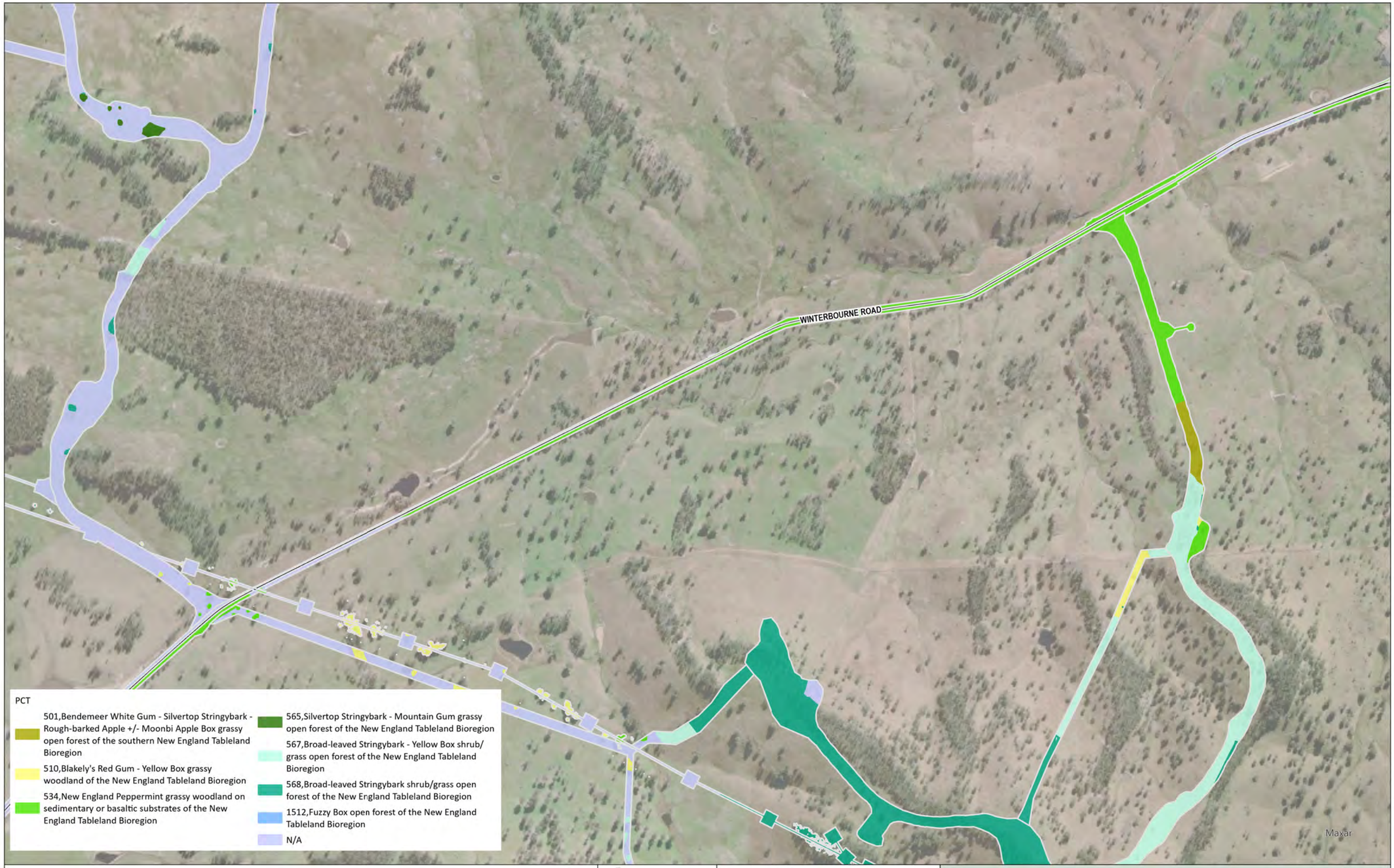
F3-7 PCTs of the Subject Land (ERM 2024)

Map 20 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 21 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

Maxar

PCT

- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 1512,Fuzzy Box open forest of the New England Tableland Bioregion
- N/A

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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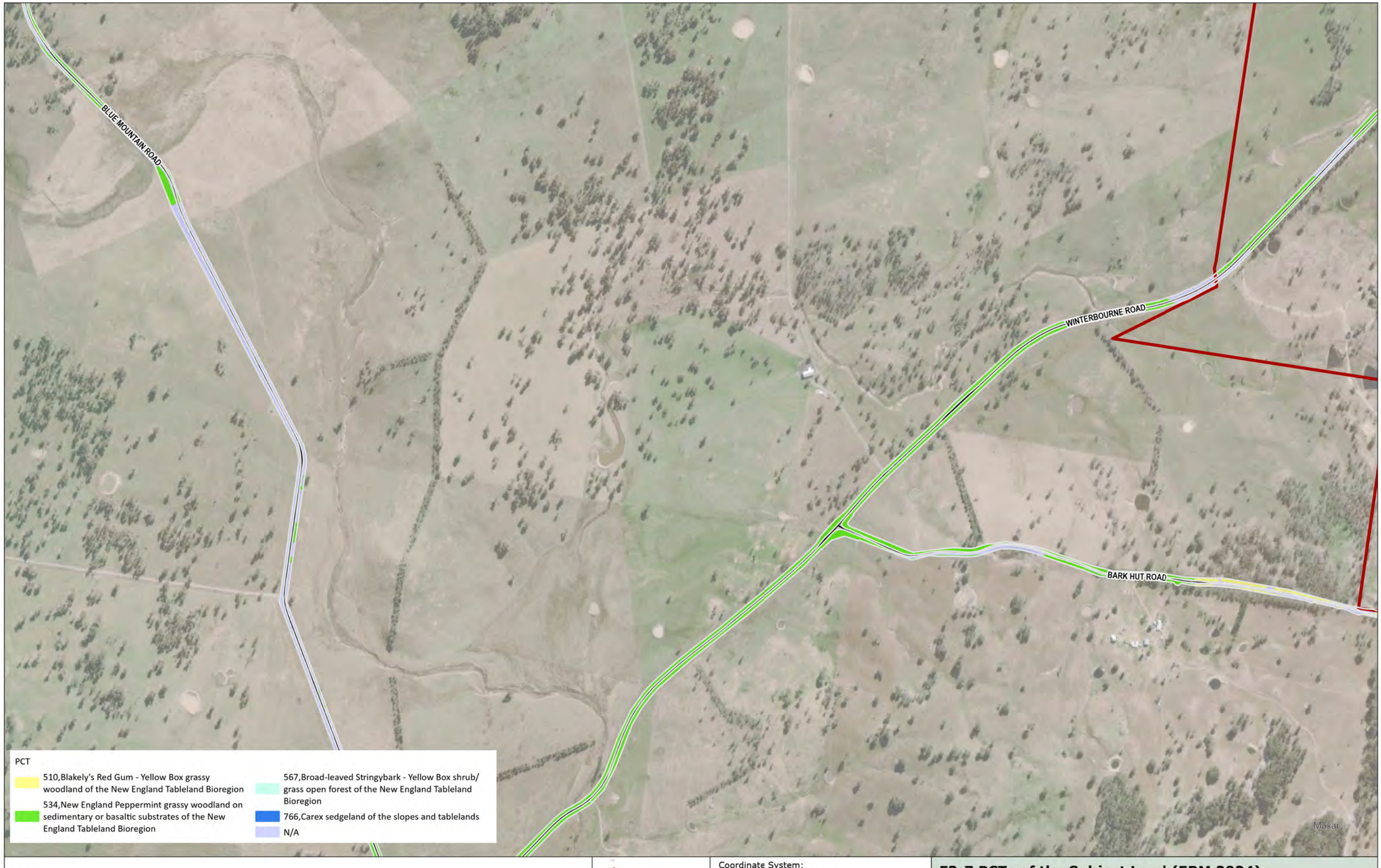
F3-7 PCTs of the Subject Land (ERM 2024)

Map 22 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 23 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

Maxar

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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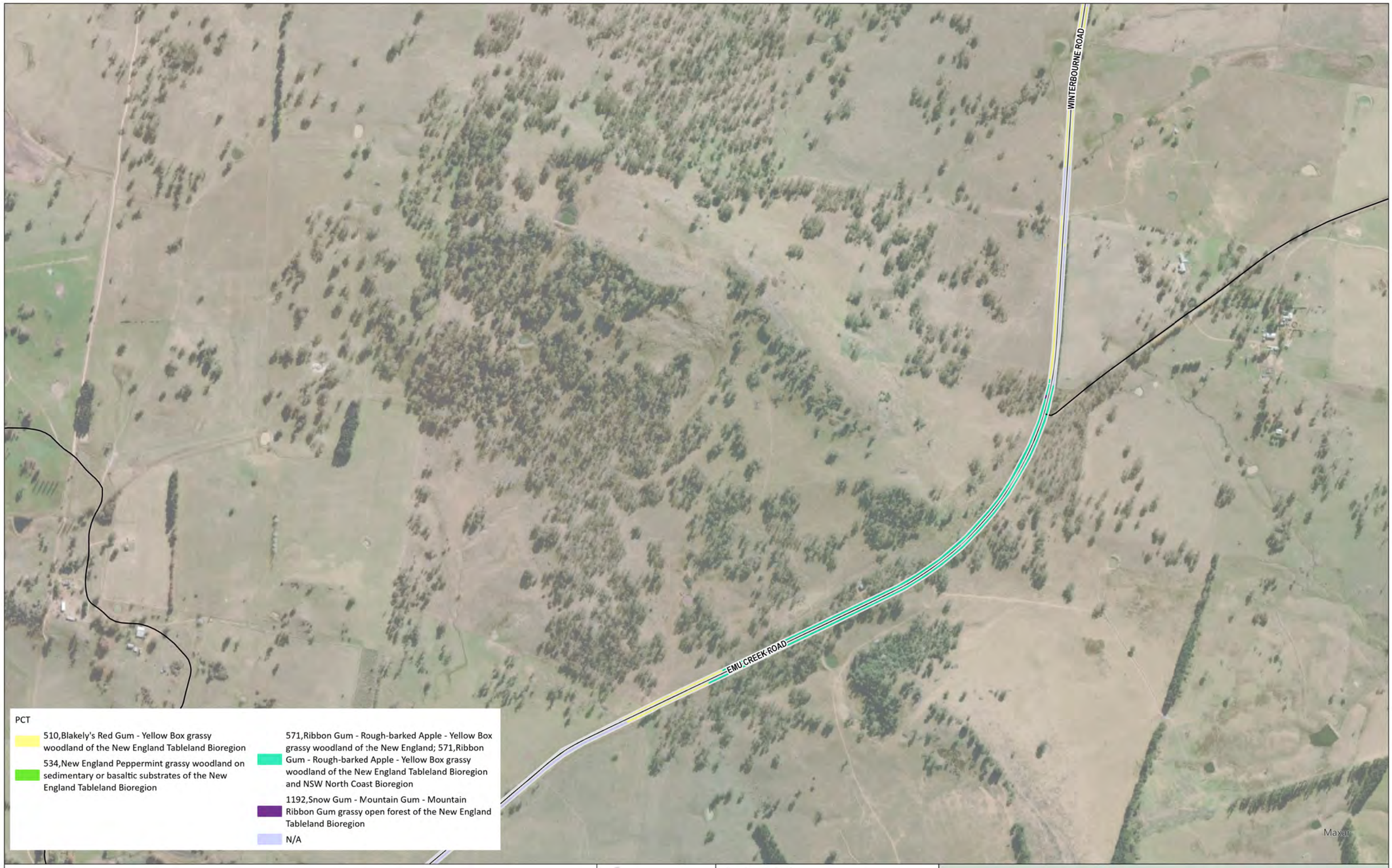
F3-7 PCTs of the Subject Land (ERM 2024)

Map 24 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 25 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

EMU CREEK ROAD

MOONA PLAINS ROAD

Maxar

PCT

534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

1192,Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion

Non-indigenous vegetation cover

N/A

Legend

Subject Land

Project Area

Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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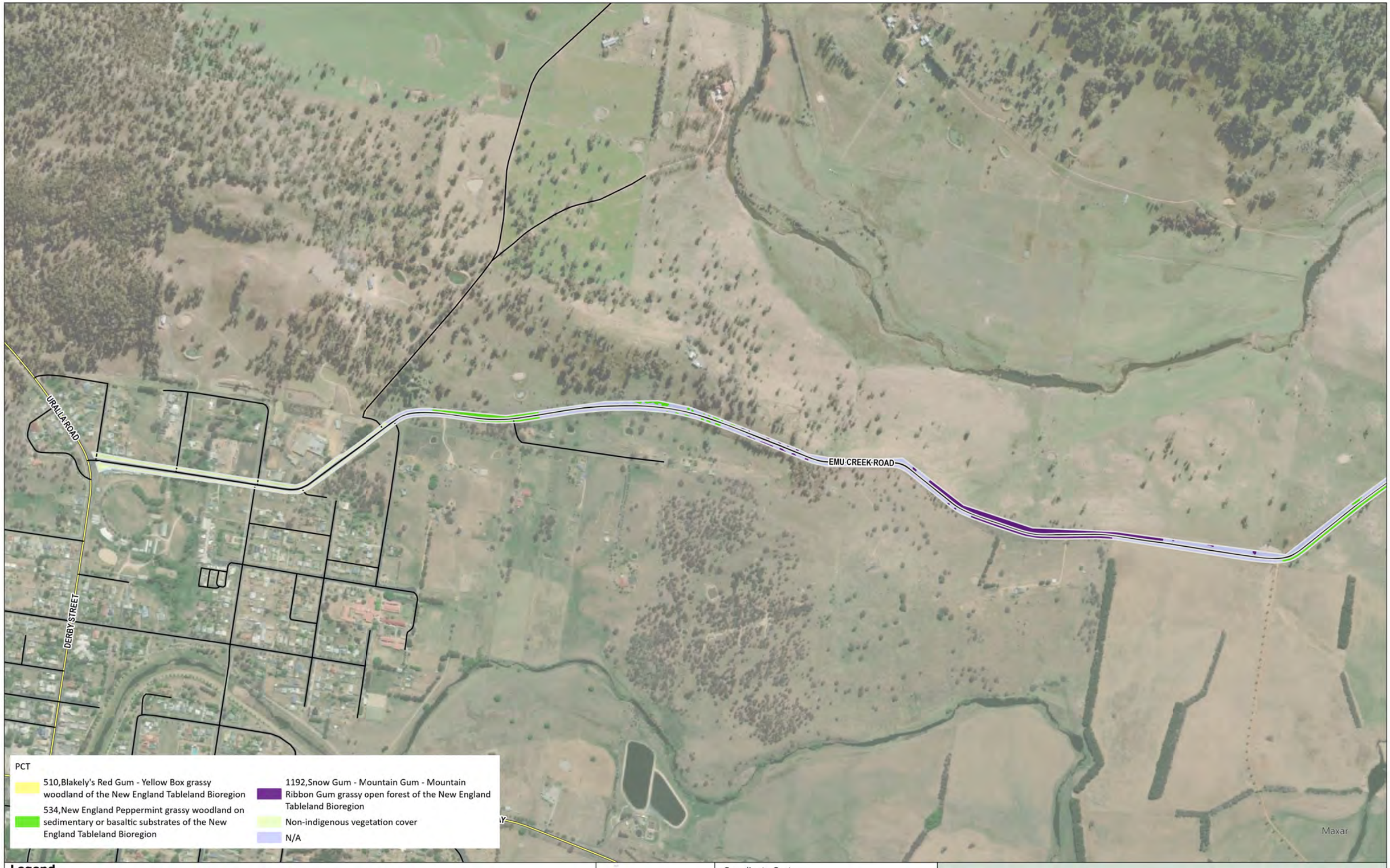
F3-7 PCTs of the Subject Land (ERM 2024)

Map 26 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 27 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 28 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

N/A

Maxar

Legend

Subject Land

Project Area

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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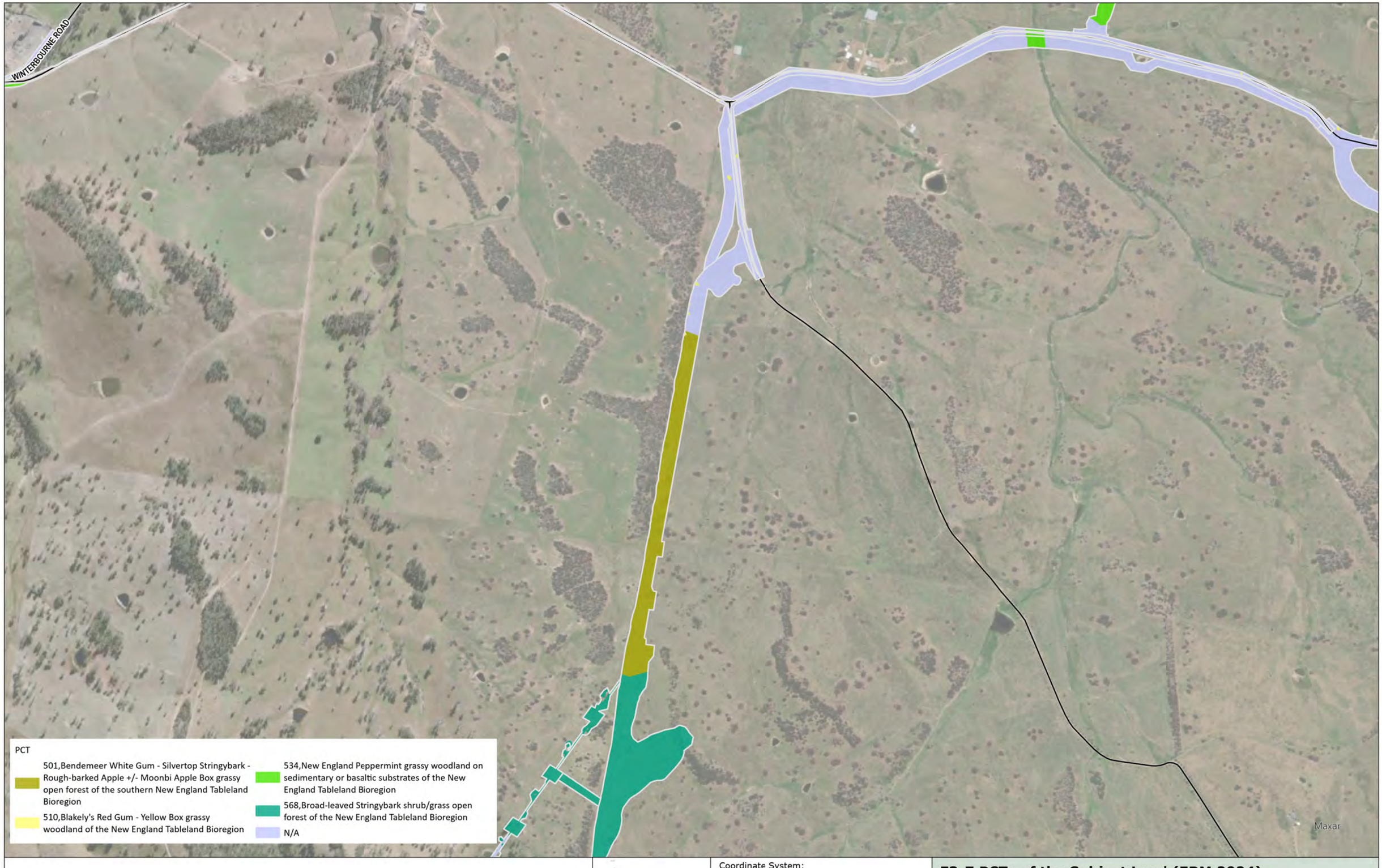
F3-7 PCTs of the Subject Land (ERM 2024)

Map 29 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 30 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

N/A

Maxar

Legend

Subject Land

Project Area

Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 31 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 501,Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

BARK HUT ROAD

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 32 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 33 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BARK HUT ROAD

PCT

- 510,Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- 567,Broad-leaved Stringybark - Yellow Box shrub/ grass open forest of the New England Tableland Bioregion
- 568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- 766,Carex sedgeland of the slopes and tablelands
- Non-indigenous vegetation cover
- N/A

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 34 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 35 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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PCT

534,New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

568,Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

N/A

Maxar

Legend

Subject Land

Project Area

Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 36 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

N/A

Maxar

Legend

Subject Land

Project Area

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 37 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

N/A

PLAINS ROAD

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 38 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

- 766,Carex sedgeland of the slopes and tablelands
- 965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
- 970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- N/A

Maxar

Legend

- Subject Land
- Project Area

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 39 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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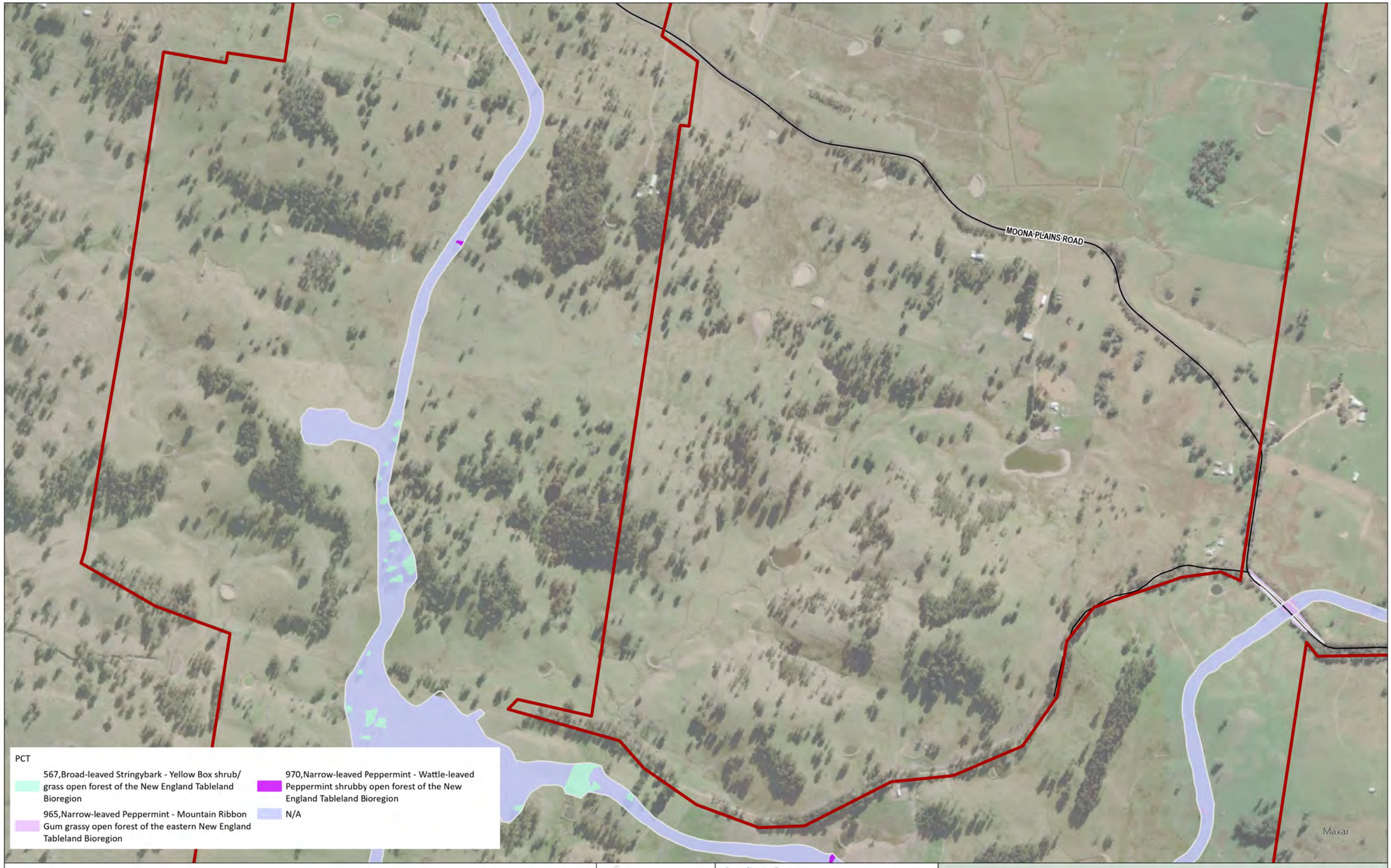

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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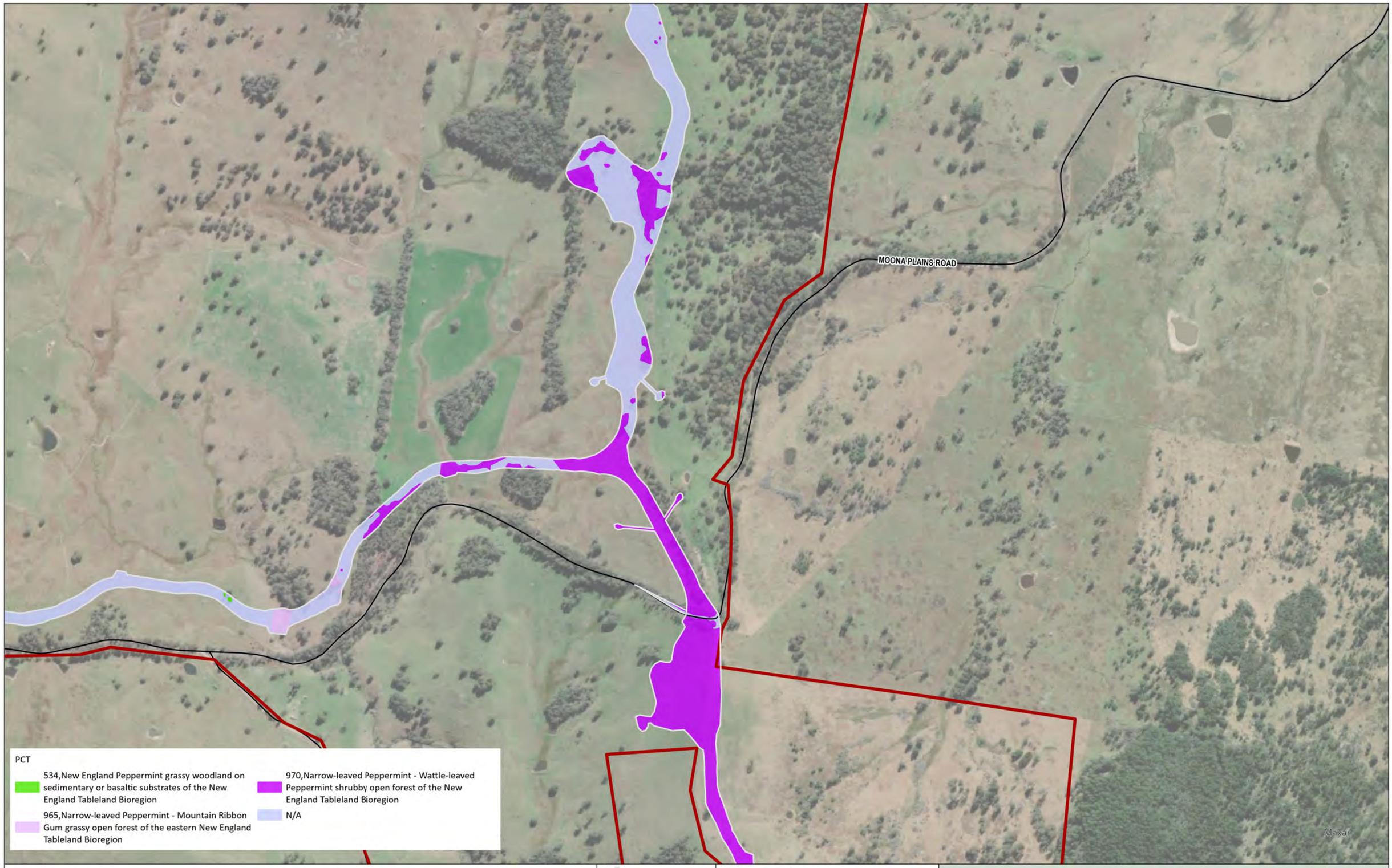
F3-7 PCTs of the Subject Land (ERM 2024)

Map 40 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 41 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

Subject Land

Project Area

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-7 PCTs of the Subject Land (ERM 2024)

Map 42 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

PCT

965,Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

970,Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

Maxar

Legend

- Subject Land
- Project Area
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-7 PCTs of the Subject Land (ERM 2024)

Map 43 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

3.1.7.2 VEGETATION ZONES

A total of 62 vegetation zones (VZs) were mapping in ERM (2024) for the Subject Land using floristics (i.e., PCTs) and vegetation structure as an important discriminator for condition (e.g., grasslands, open woodlands, woodlands and open forest). The ERM (2024) VZs of the Subject Land are summarised in **Table 3-2** together with the VIS calculated from the associated BAM plots. Those in bold have the potential to be designated as Category 1 - Exempt Land as they do not contain woody vegetation.

TABLE 3-2 ERM (2024) VEGETATION ZONES MAPPED WITHIN THE SUBJECT LAND

VZ	PCT	Condition/vegetation zone name	Area (ha)	VIS
1	510	DC_woodland	1.48	67.6
2	510	DC_openwoodland	0.49	50.9
3	**510**	**DC_mod_grassland**	**13.22**	**28.1**
4	**510**	**LRC_mod_grassland**	**5.47**	**31.4**
5	510	LRC_openwoodland	1.35	49.9
6	510	TL_canopy	1.29	62.5
7	533	DC_openwoodland	0.06	48.1
8	**533**	**DC_modgrassland**	**0.49**	**26**
9	533	TL_canopy	0.08	51.1
10	534	DC_woodland	1.2	59.2
11	534	DC_openwoodland	0.59	25.1
12	**534**	**DC_mod_grassland**	**13.7**	**29.9**
13	**534**	**LRC_mod_grassland**	**12.37**	**14.9**
14	534	LRC_openwoodland	3.25	68.1
15	534	LRC_canopy	1.26	56.1
16	565	DC_woodland	2.22	50.5
17	565	DC_openwoodland	0.12	15.3
18	**565**	**DC_mod_grassland**	**3.27**	**9.3**
19	567	DC_woodland	12.95	78.3
20	567	DC_openwoodland	0.71	19.3
21	**567**	**DC_mod_grassland**	**21.65**	**35.3**
22	567	LRC_woodland	0.77	86.4
23	**567**	**LRC_mod_grassland**	**3.26**	**24.4**
24	567	TL_canopy	1.49	70.3
25	568	DC_openforest	6.27	64.7
26	568	DC_woodland	30.47	61.5
27	568	DC_openwoodland	1.66	21.5
28	**568**	**DC_mod_grassland**	**60.95**	**25.3**

VZ	PCT	Condition/vegetation zone name	Area (ha)	VIS
29	568	TL_canopy	2.57	55.5
30	571	DC_open_forest	10.47	60.7
31	**571**	**DC_grassland**	**16.07**	**14.7**
32	766	DC_sedgeland	1.18	62.8
33	766	LRC_sedgeland	0.4	2.2
34	965	DC_openforest	2.18	56.5
35	965	DC_woodland	12.82	29.5
36	965	DC_shrubland	0.95	7.4
37	**965**	**DC_mod_grassland**	**4.29**	**8.6**
38	965	LRC_openforest	0.84	75.7
39	**965**	**LRC_mod_grassland**	**0.27**	**1**
40	965	TL_canopy	1.26	41.9
41	970	DC_openforest	4.86	74.6
42	970	DC_openwoodland	11.19	51
43	**970**	**DC_mod_grassland**	**24.29**	**13.3**
44	970	LRC_openwoodland	0.4	38.8
45	970	LRC_openforest	0.86	74.3
46	**970**	**LRC_mod_grassland**	**1.12**	**12.7**
47	970	TL_canopy	0.88	75.2
48	1192	DC_woodland	2.45	30.3
49	1192	LRC_woodland	0.82	34.6
50	1194	DC_openwoodland	0.93	48.2
51	**1194**	**DC_low_grassland**	**3.58**	**4.5**
52	501	DC_woodland	2.65	75
53	**501**	**DC_mod_grassland**	**4.53**	**24.6**
54	**510**	**low_grassland**	**45.22**	**9.5**
55	**534**	**low_grassland**	**64.51**	**11.4**
56	**565**	**low_grassland**	**2.06**	**10.5**
57	**567**	**low_grassland**	**85.54**	**11.6**
58	**568**	**low_grassland**	**112.65**	**10.8**
59	**571**	**low_grassland**	**18.92**	**10.9**
60	**965**	**low_grassland**	**110.41**	**3.2**
61	**970**	**low_grassland**	**86.65**	**7.4**
62	**1192**	**low_grassland**	**14.07**	**19.4**

3.1.8 THREATENED ECOLOGICAL COMMUNITIES

Land categorisation is affected by the presence and extent of CEECs. As mentioned in **Section 2.3.2**, CEECs occurring within the Subject Land include:

- Box Gum Woodland; and
- New England Peppermint Grassy Woodland.

CEEC mapping has generally considered the schematic landscape transect present in the Guyra 1:100,000 map sheet (Benson and Ashby 2000) as reproduced below.

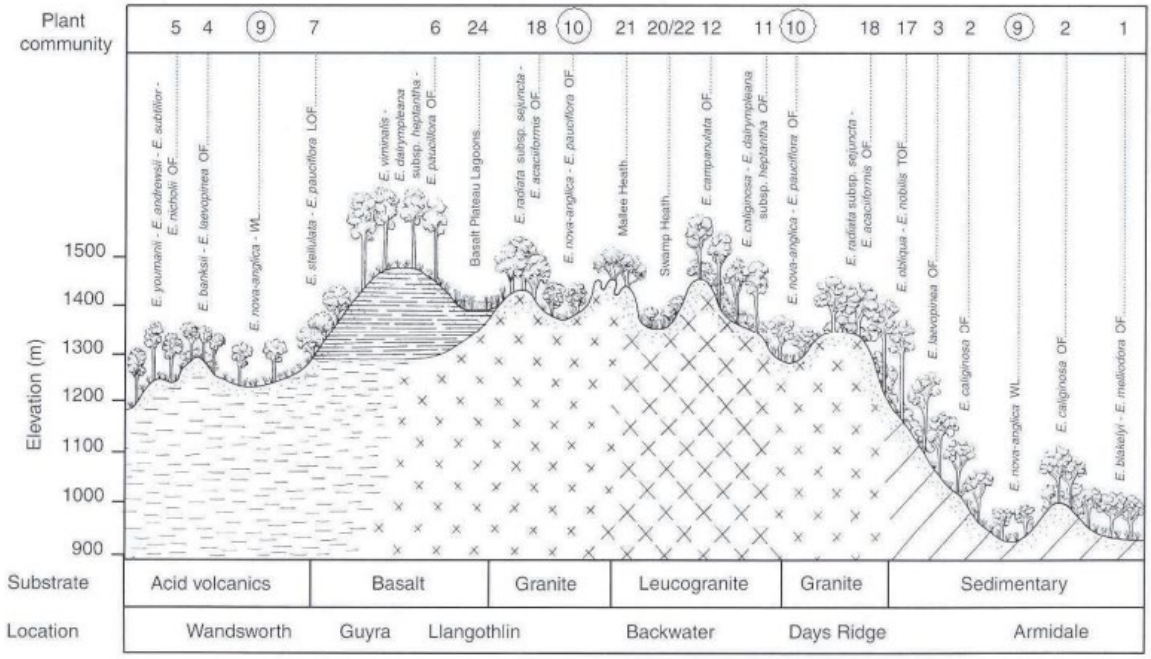

Fig. 1. Schematic transect of the landscapes present in the area covered by the Guyra 1: 100 000 map sheet showing the relationship between topographic position, elevation, substrate and plant communities. OF = Open-Forest, WL = Woodland, LOF = Low Open-Forest, TOF = Tall Open-Forest (after Walker and Hopkins (1990)). Reproduced with permission, from Benson and Ashby (2000). Plant communities 9 and 10, circled, are components of the national ecological community.

Characteristically, New England Peppermint Grassy Woodlands typically occur in high altitude areas of low relief (i.e. frost hollows and areas of cold air drainage). Occurrences of Box Gum Woodland are generally on gentle gradients on soils of medium fertility upslope of the frost hollows. These lower parts of the landscape are the most arable parts of the Subject Land and have been cleared across the New England Tablelands for agricultural purposes.

The following sections provide additional detail with respect to the CEECs found within the Subject Land.

3.1.8.1 NEW ENGLAND PEPPERMINT GRASSY WOODLANDS

The community is described as a temperate grassy eucalypt woodland to open forest where *Eucalyptus nova-anglica* is dominant or co-dominant, generally occurring on valley flats and lower slopes. The canopy layer may occur as a pure stand of *Eucalyptus nova-anglica* or may include other eucalypt species such as *Eucalyptus pauciflora*, *E. stellulata*, *E. dalrympleana* subsp. *heptantha*, *E. blakelyi*, *E. radiata* subsp. *sejuncta* and *E. rubida*.

The shrub layer is normally absent or sparse and may include *Leucopogon fraseri, Melichrus urceolatus, Lissanthe strigosa, Rubus parvifolius* and *Bursaria spinosa*. The ground cover is usually dense with *Asperula conferta*, *Poa sieberiana*, *Themeda australis*, *Juncus filicaulis*, *Dichondra repens*, *Carex inversa*, *Rumex brownii*, *Acaena ovina* and *Desmodium varians* common. There is some variation in the structure due to different stages of regrowth after clearing or dieback (Benson and Ashby 2000; TSSC 2011; NSW TSSC 2013).

To be considered part of the BC Act listed TEC patches must meet the key characteristics described in **Table 3-3**, as per DECCW NSW 2010.

TABLE 3-3 DIAGNOSTIC CHARACTERISTICS FOR NEW ENGLAND PEPPERMINT GRASSY WOODLAND

Key Diagnostic Characteristic	Response
Is the site in the New England Tableland Bioregion?	Yes
Is the vegetation an open grassy forest or woodland with sparse or no shrubs?	PCTs 533 and 534 mapped within the Subject Land have this characteristic
Is the vegetation primarily in valley flats subject to cold air drainage	PCTs 533 and 534 mapped within the Subject Land have this characteristic
Does the tree layer contain mainly New England Peppermint?	PCTs 533 and 534 mapped within the Subject Land have this characteristic
Outcome	**Patches of PCT 533 and 534 meet the key diagnostic criteria for inclusion within the threatened ecological community**

The extent of New England Peppermint Grassy Woodland also includes some of the secondary grasslands present within the Subject Land.

3.1.8.2 BOX GUM WOODLAND

The community generally presents as a woodland with a canopy foliage cover of less than 30% consisting of one or more of the canopy dominants being *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and/or *Eucalyptus blakelyi* (Blakely's Red Gum). In some cases the grey boxes *Eucalyptus microcarpa* and *E. moluccana* can occur as co-dominants. A shrub layer is generally absent but can include *Acacia, Bursaria, Cassinia, Hibbertia, Lissanthe* and *Templetonia* species (TSSC 2023; NSW TSSC, 2020).

The ground cover is dominated by tussock grasses, especially *Themeda triandra* (Kangaroo Grass) and *Poa sieberiana* (Snow Grass), along with species of *Austrostipa, Aristida, Chloris, Cymbopogon, Dichanthium, Microlaena* and *Rytidosperma*. Between the tussocks there may be bare ground or a range of forbs from genera such as *Bulbine, Chrysocephalum, Dianella, Geranium, Goodenia, Lomandra, Pimelea* and *Stackhousia* (TSSC 2023; NSW TSSC 2020).

To be considered part of the BC Act listed TEC patches must meet the key characteristics described in **Table 3-4**, as per DECCW NSW, 2010.

TABLE 3-4 KEY DIAGNOSTIC CHARACTERISTICS FOR BOX-GUM GRASSY WOODLAND

Question	Response
Is the site on the tablelands or western slopes of NSW?	Yes – the Subject Land is on the New England Tablelands
Does the site contain, or would the site have recently been likely to contain, White Box, Yellow Box or Blakely's Red Gum as a dominant species?	PCT 510 is characterised in this way (i.e., Yellow Box and Blakely's Redgum). BioNet describes the adjoining upslope vegetation on steeper slopes (i.e., PCT 567) as having Yellow Box and/or Blakely's Redgum as an associate species but not dominant. Ecotonal areas with the adjoining vegetation type have been included in the mapped occurrence of PCT 510 to conservatively account for the extent of this TEC.
Is the ground layer mainly grassy?	Yes – PCT 510 is predominantly grassy.
If the site has been degraded, is there potential for assisted natural regeneration of the tree layer or the understorey (e.g. by removing grazing, weeds, etc.)?	Generally. There are occurrences of the PCT 510 that have low native plant species composition where past and present land use has favoured exotic/cosmopolitan species and increase abundance of unpalatable grass species. The application of phosphorus and other soil ameliorants to improve pastures for livestock has likely altered the soil biome thus diminished the potential for assisted natural regeneration.
Determination of Presence	**Present. Occurrences of grassland vegetation in a low condition state are likely reflective of heavily modified environments where the potential for assisted natural regeneration is considered low.**

The extent of Box-Gum Grassy Woodland also includes some areas of secondary grasslands where clearing for agriculture has removed the trees of this community. In these situations, the vegetation does not part of the CEEC where it comprises low species diversity with those species that do occur being cosmopolitan and commonly found across many ecological communities. This is consistent with TSSC (2023) where condition thresholds exclude patches that have a ground layer that is not predominantly native (i.e., at least 50% of the perennial vegetation cover in the ground layer is made up of native species).

Instead, these are highly modified lands requiring considerable restorative efforts to reverse historical and ongoing impacts as the lack of tree cover, low groundcover species richness and ongoing effects of livestock grazing (inclusive of pasture management practices) are substantial barriers to overcome (Dorrough *et. al.* 2006).

3.2 SITE ASSESSMENT

3.2.1 INDIGENOUS VEGETATION COVER

LCA transects were performed to determine the per cent indigenous vegetation cover for areas of non-woody vegetation throughout the Subject Land (see **Appendix B**). Under the transitional arrangements, 'low conservation value grasslands' were identified where the per cent indigenous vegetation cover is <50%. The transect results are summarised thematically in **Figure 3-8** as follows:

- Red for LCA transects with <50% indigenous vegetation cover ; and
- Green for LCA transects with ≥50% indigenous vegetation cover.

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

144

145

146

147

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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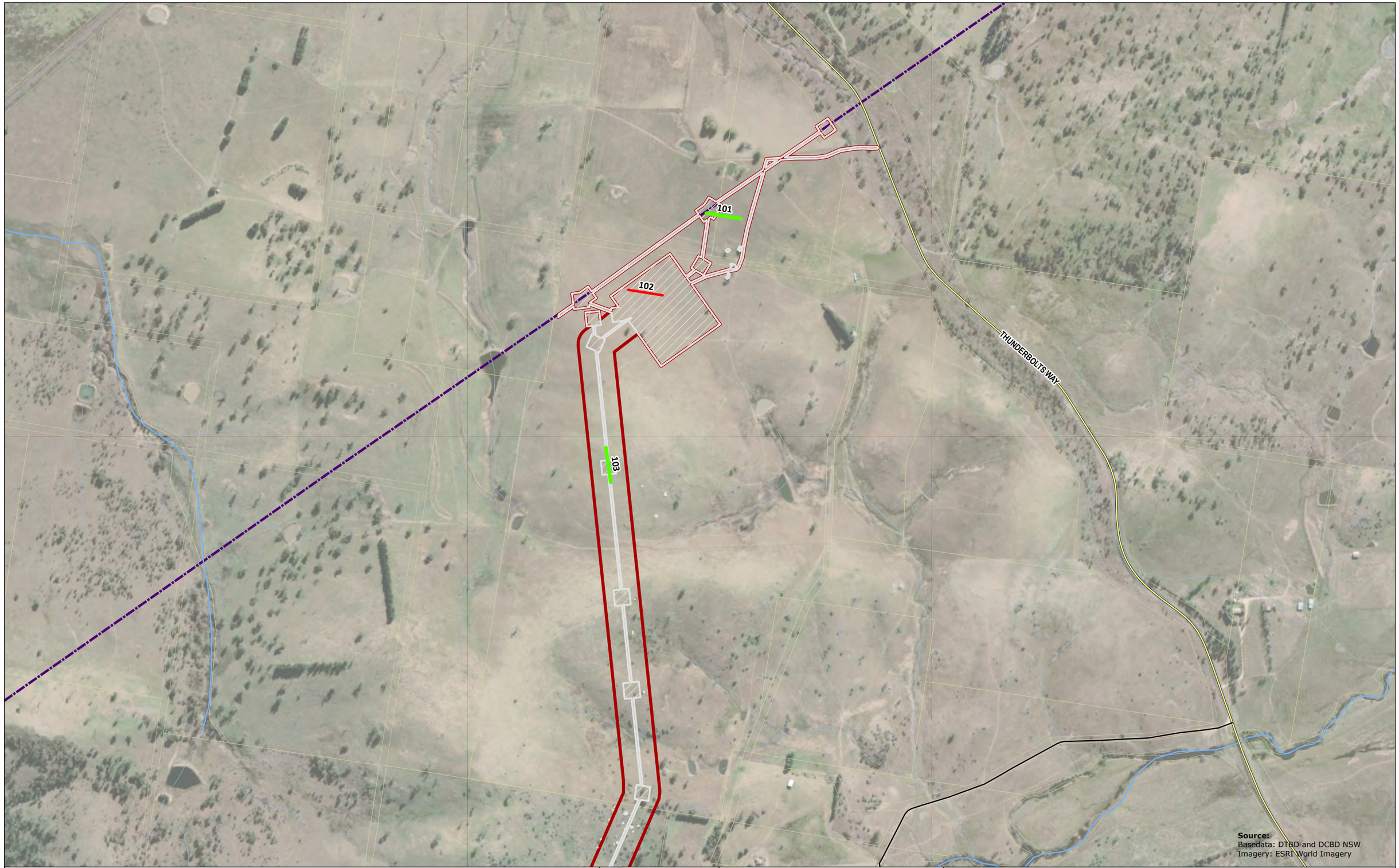
F3-8 LCA Transect Results (S60F(3))

Map 1 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
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0 100 200 300m

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F3-8 LCA Transect Results (S60F(3))

Map 2 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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F3-8 LCA Transect Results (S60F(3))

Map 3 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

SALISBURY WATERS

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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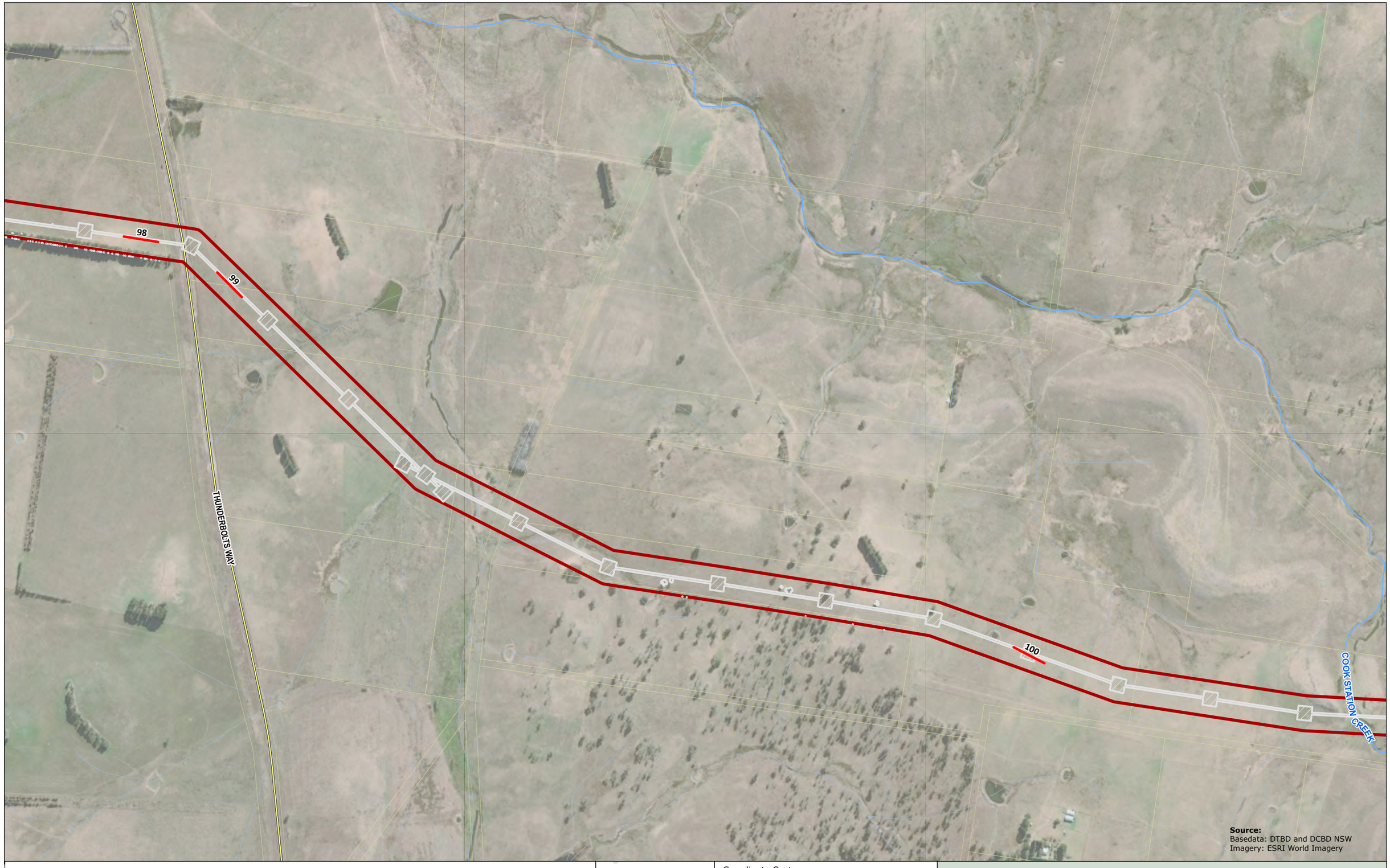
F3-8 LCA Transect Results (S60F(3))

Map 4 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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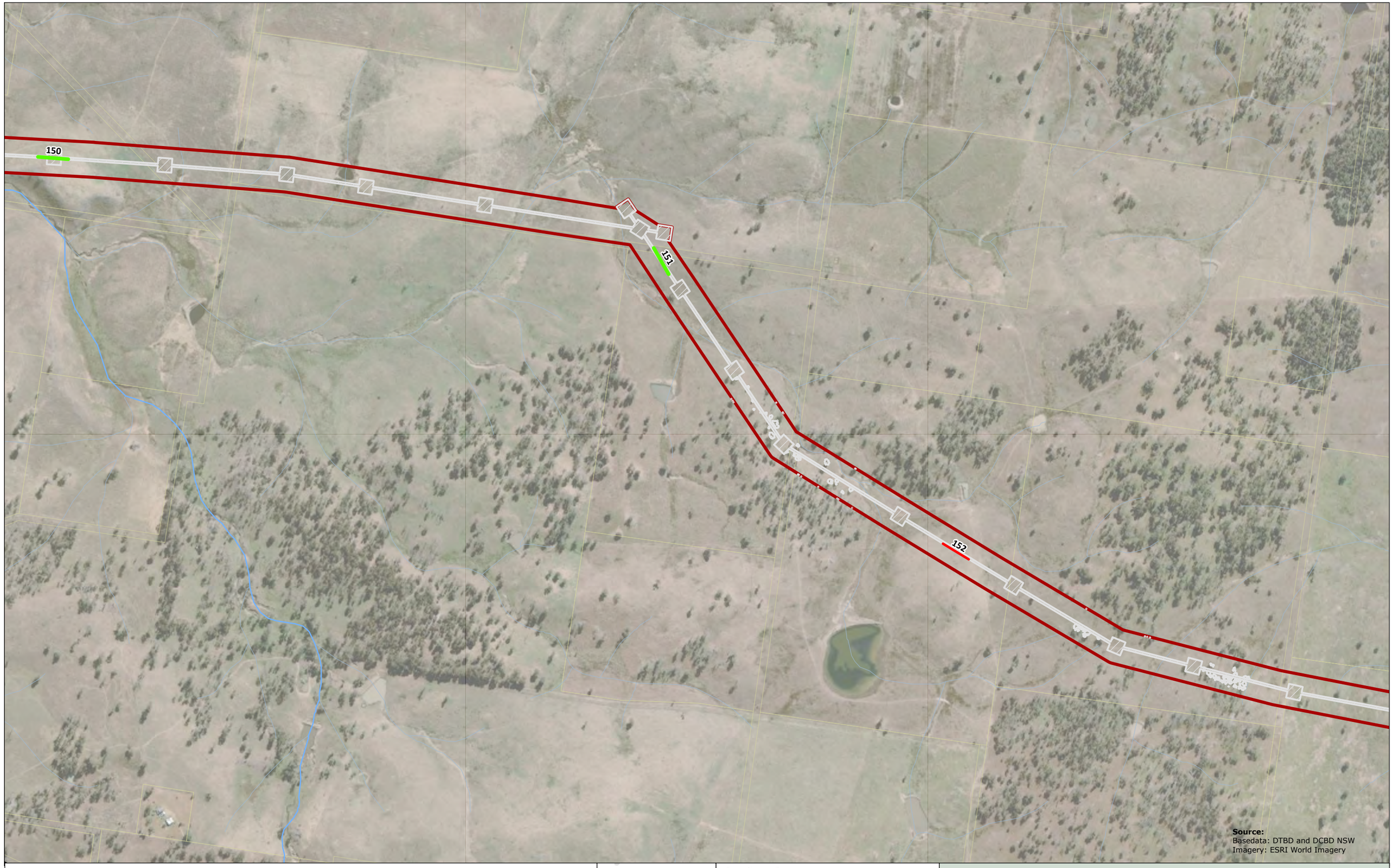
F3-8 LCA Transect Results (S60F(3))

Map 5 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-8 LCA Transect Results (S60F(3))

Map 6 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

MIHI CREEK

JACKS CREEK

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-8 LCA Transect Results (S60F(3))

Map 7 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 8 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

JACKS CREEK

82

83

MIHI CREEK

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 9 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

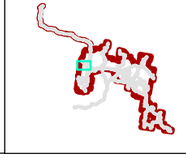
0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation



Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

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1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 10 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

GROSE CREEK

69

68

70

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 11 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 12 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

Project Area
Subject Land
Watercourse
Other Waterways

Transect

Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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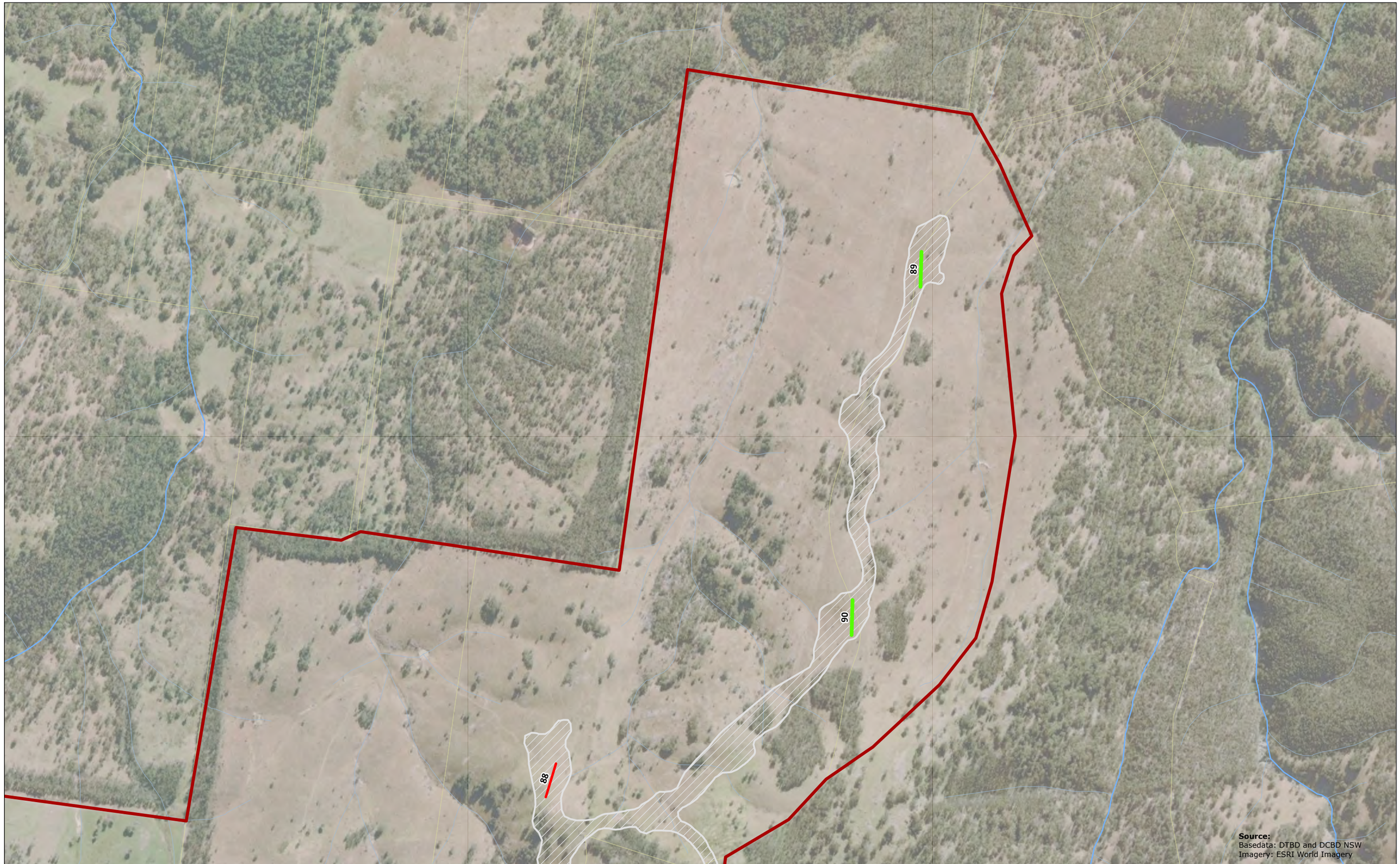
F3-8 LCA Transect Results (S60F(3))

Map 13 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 14 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BLUE MOUNTAIN ROAD

87

86

62

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

Project Area
Subject Land
Local Road
Other Waterways

Transect

Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
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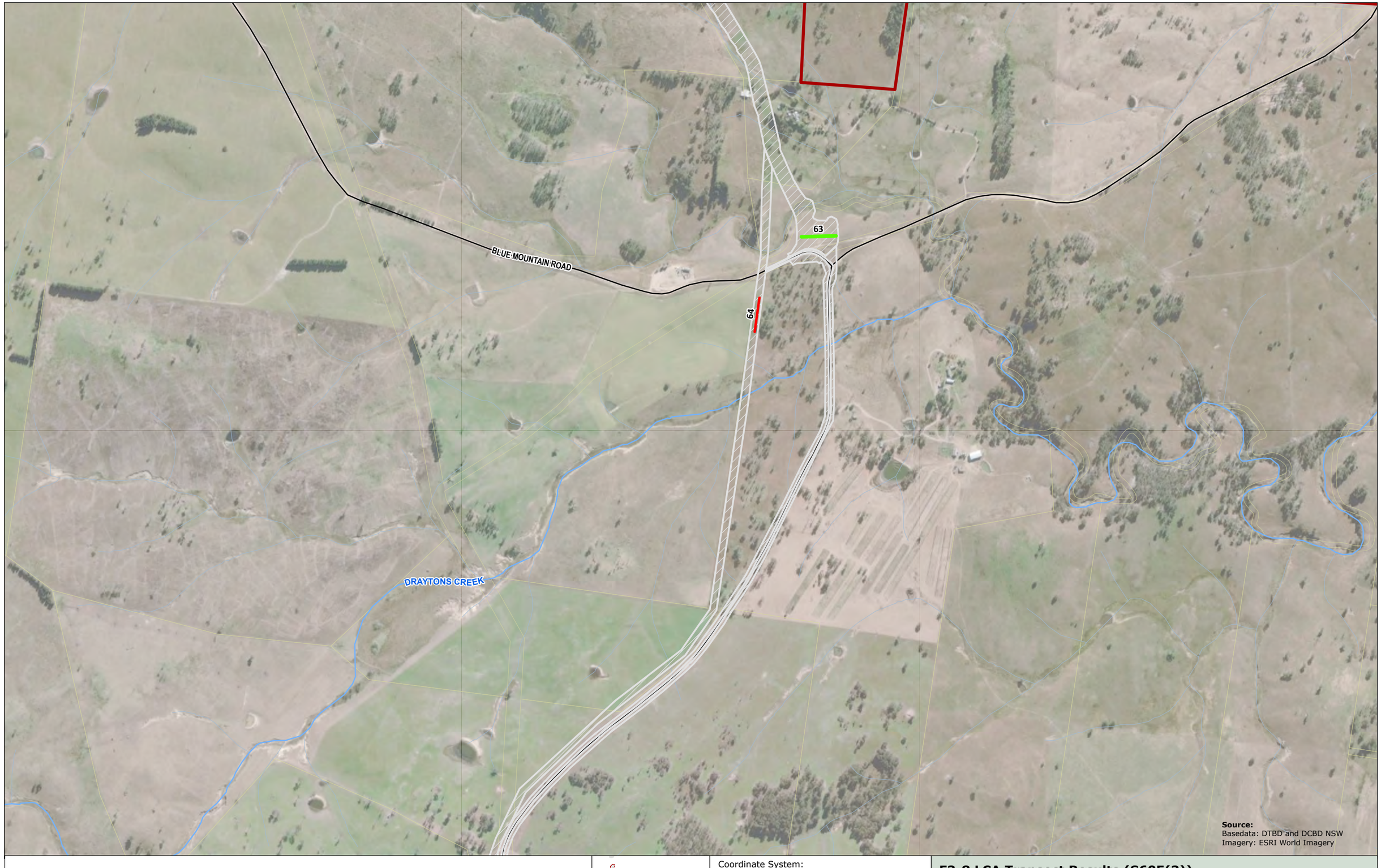
F3-8 LCA Transect Results (S60F(3))

Map 15 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

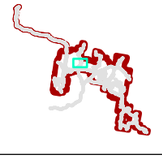
0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation



Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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F3-8 LCA Transect Results (S60F(3))

Map 16 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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F3-8 LCA Transect Results (S60F(3))

Map 17 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

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F3-8 LCA Transect Results (S60F(3))

Map 18 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WASHPOOL CREEK

207

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 19 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

59

61

60

SCRUBBY CREEK

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-8 LCA Transect Results (S60F(3))

Map 20 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 21 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

BARK HUT ROAD

171

197

196

94

139

141

140

125

142

92

195

124

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

Project Area
Subject Land
Local Road
Other Waterways

Transect

Non-Indigenous Vegetation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F3-8 LCA Transect Results (S60F(3))

Map 22 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-8 LCA Transect Results (S60F(3))

Map 23 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

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1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 24 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

EMU CREEK ROAD

132

131

129

130

128

127

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

Project Area
Subject Land
Local Road
Other Waterways

Transect

Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
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1:10,000

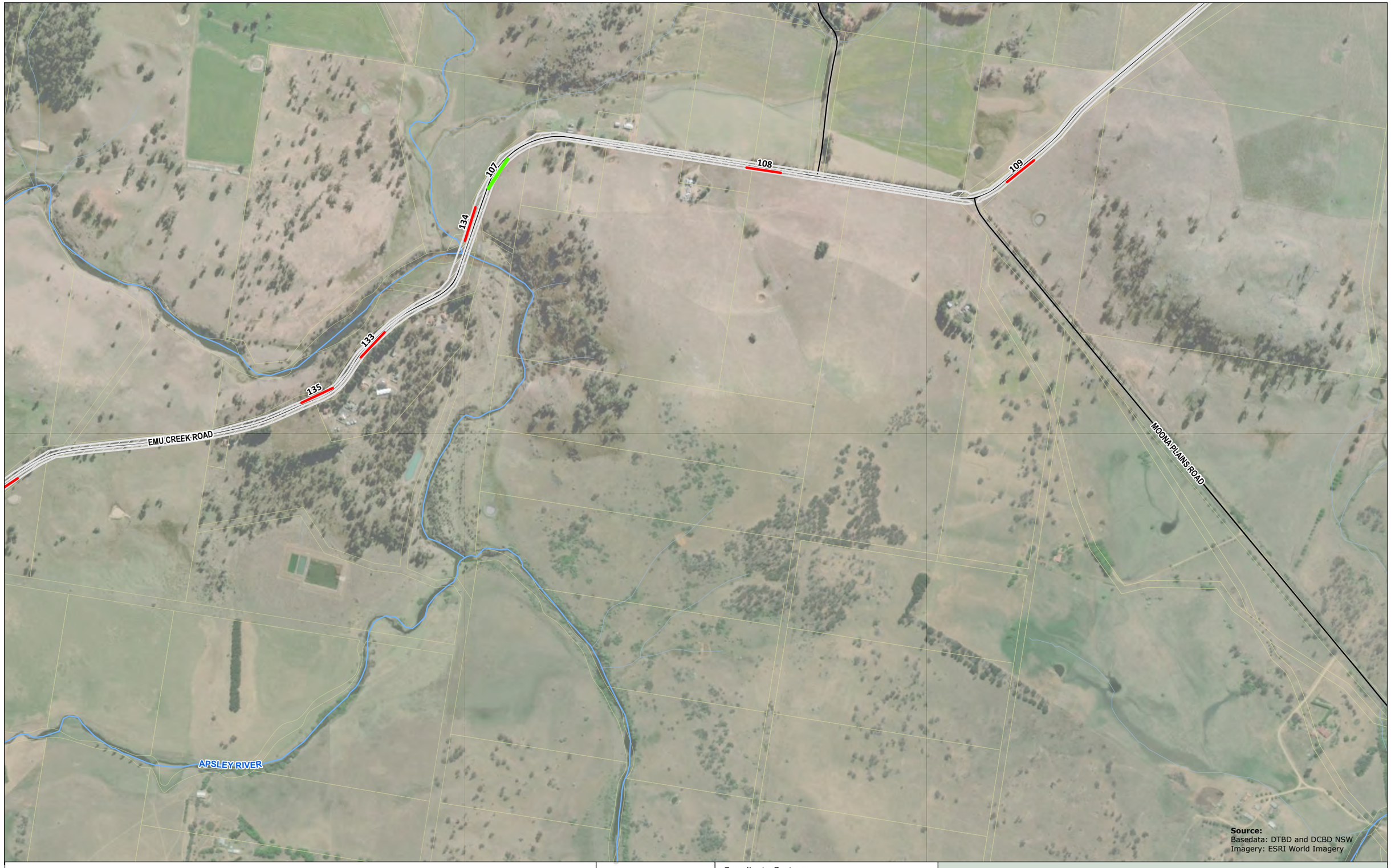
F3-8 LCA Transect Results (S60F(3))

Map 25 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

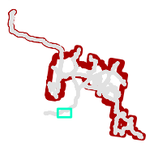
ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation



Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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F3-8 LCA Transect Results (S60F(3))

Map 26 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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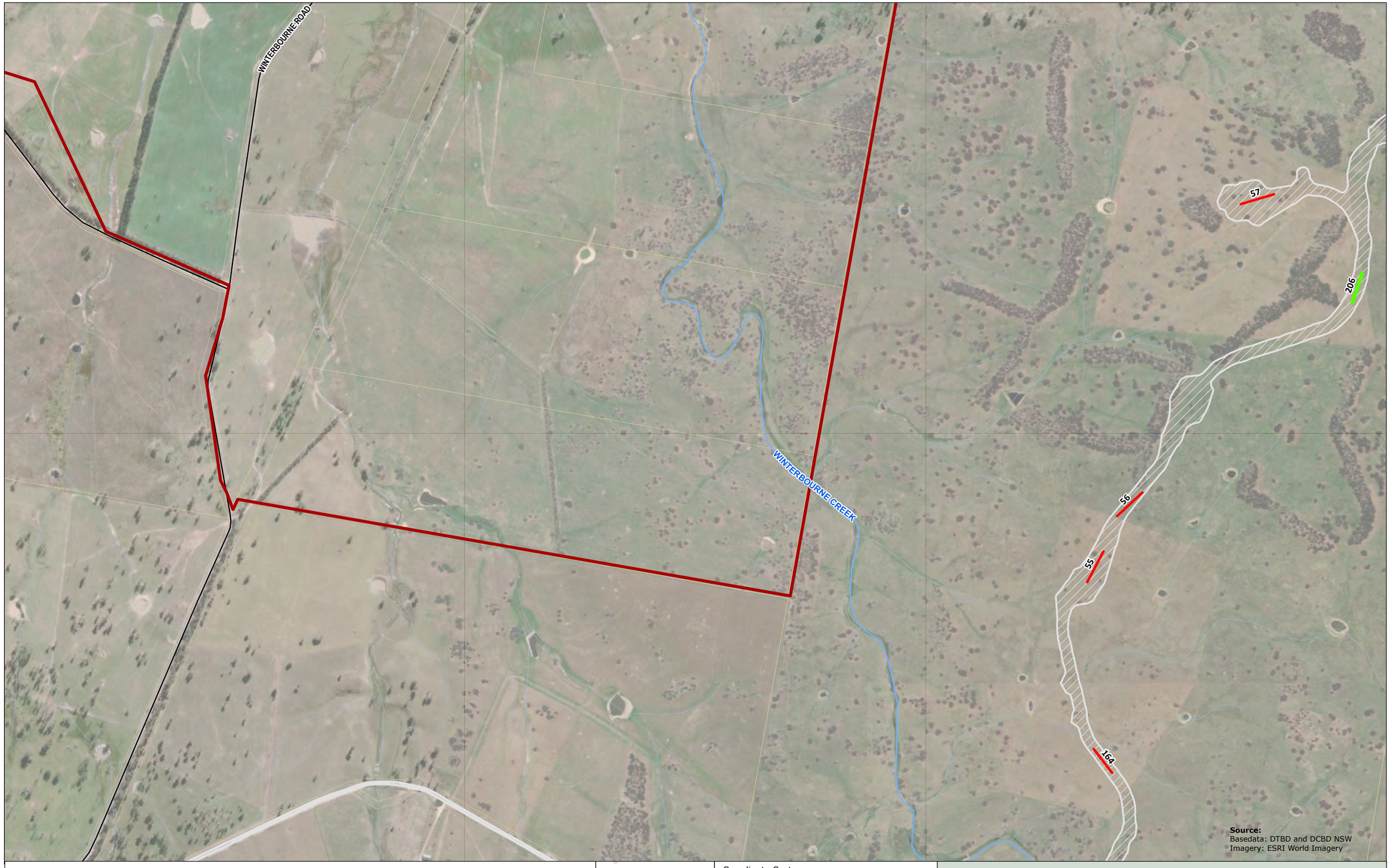
F3-8 LCA Transect Results (S60F(3))

Map 27 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 28 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

NICHOLS GULLY

EAGLE GULLY

58

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

Project Area
Subject Land
Watercourse
Other Waterways

Transect

Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
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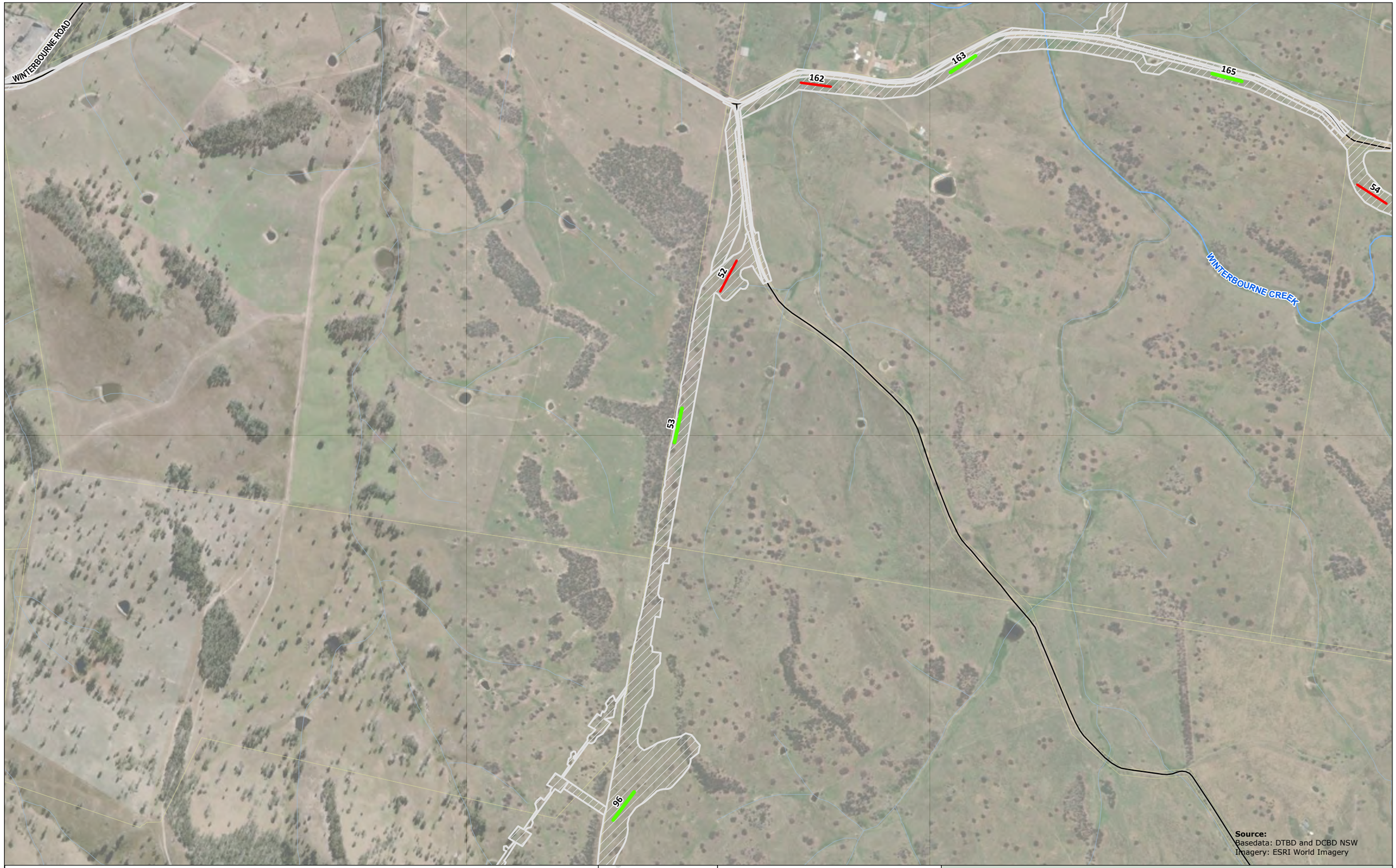
F3-8 LCA Transect Results (S60F(3))

Map 29 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

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F3-8 LCA Transect Results (S60F(3))

Map 30 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE CREEK

188

HOLE CREEK

189

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

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1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 31 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

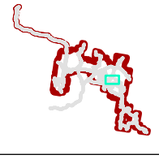
ERM

0760651_WWF_LCA_R3.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation



Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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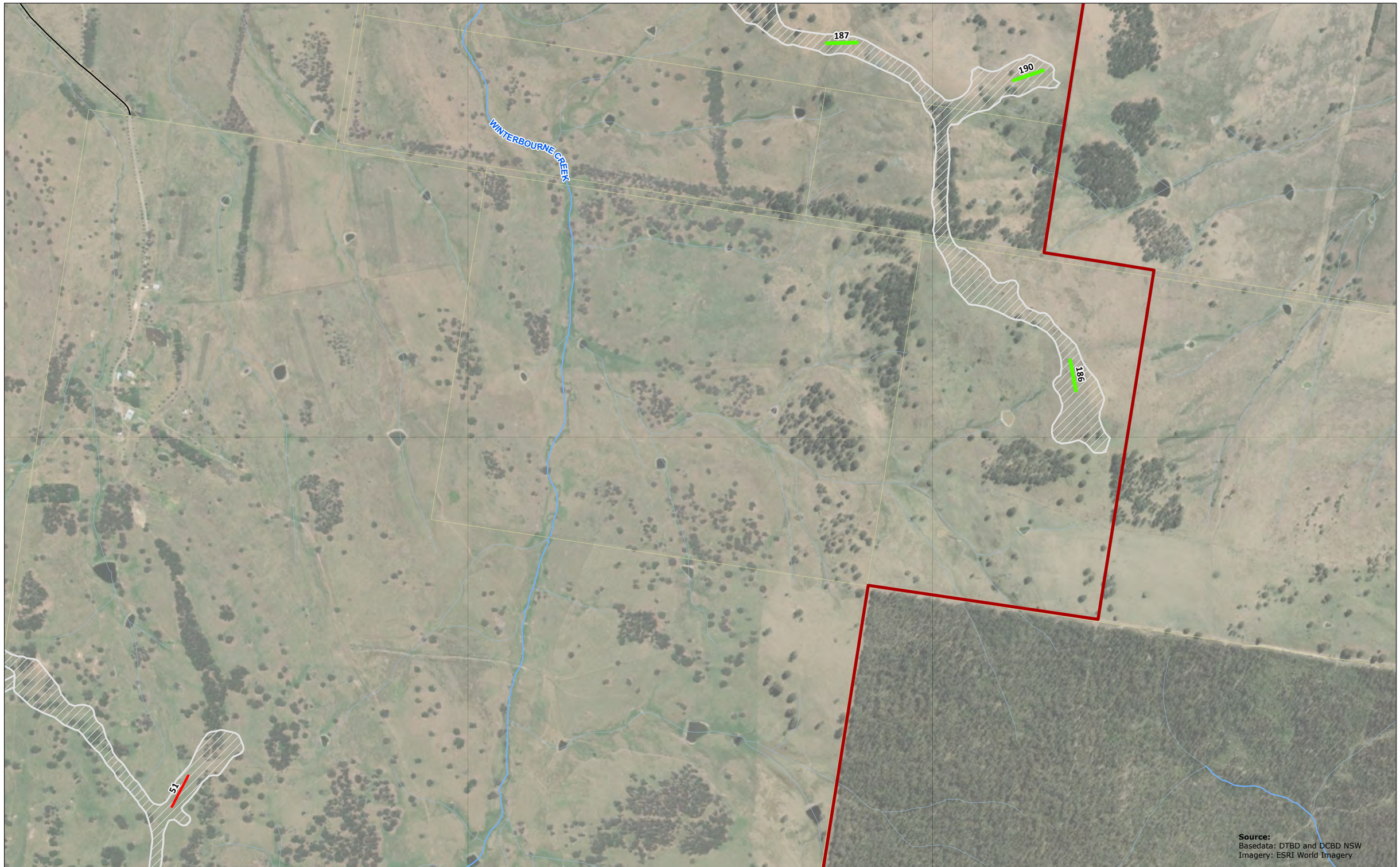
F3-8 LCA Transect Results (S60F(3))

Map 32 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

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1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 33 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

DOG TRAP CREEK

BARK HUT ROAD

191

48

179

49

45

44

178

193

194

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 34 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 35 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

SNAKE CREEK

39

37

36

BROOKMOUNT CREEK

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 36 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BROOKMOUNT CREEK

BOUNDARY CREEK

35

34

177

32

33

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

Project Area
Subject Land
Watercourse
Other Waterways

Transect

Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 37 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BOUNDARY CREEK

MOONA PLAINS ROAD

176

175

26

24

25

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 38 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

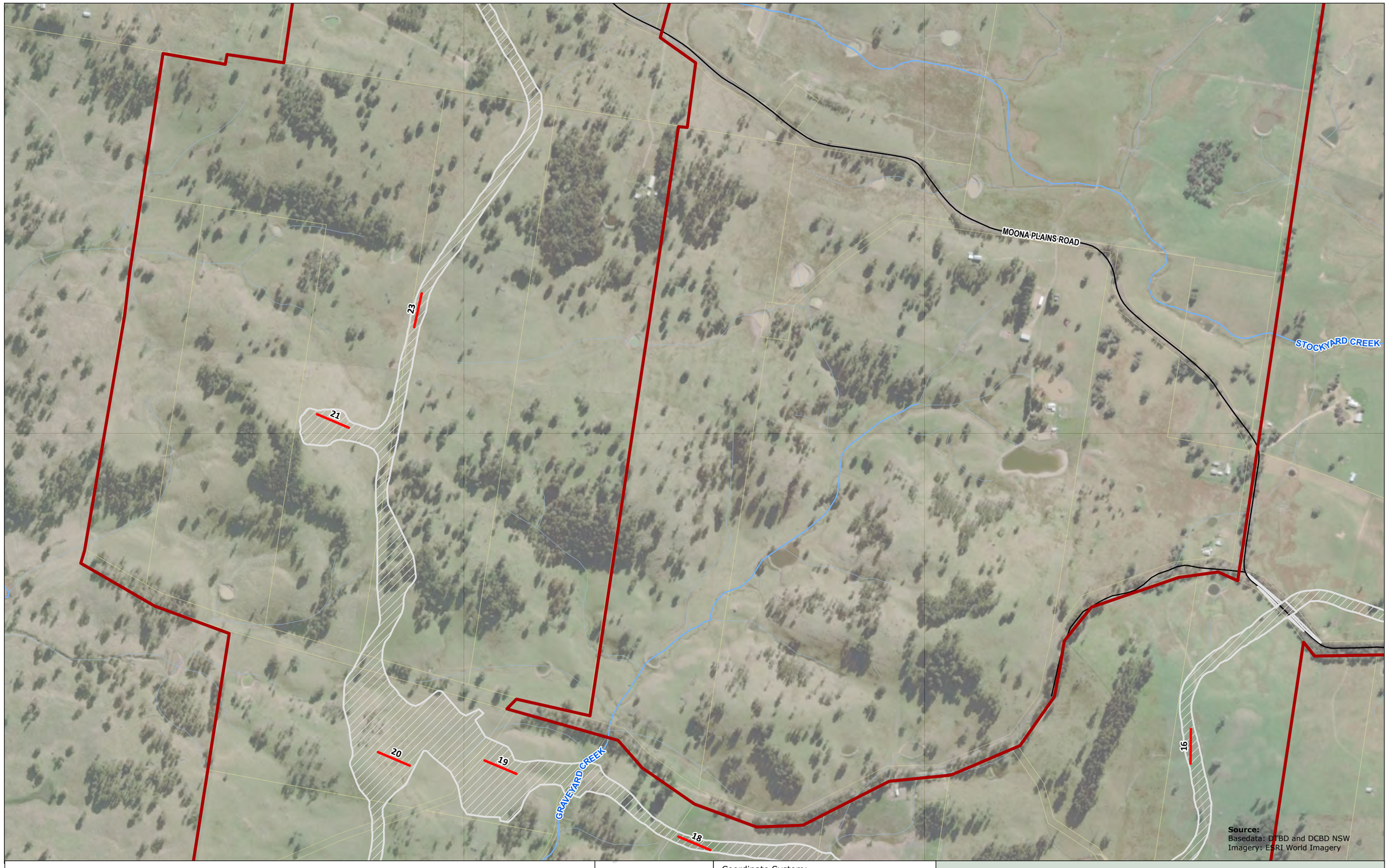
F3-8 LCA Transect Results (S60F(3))

Map 39 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

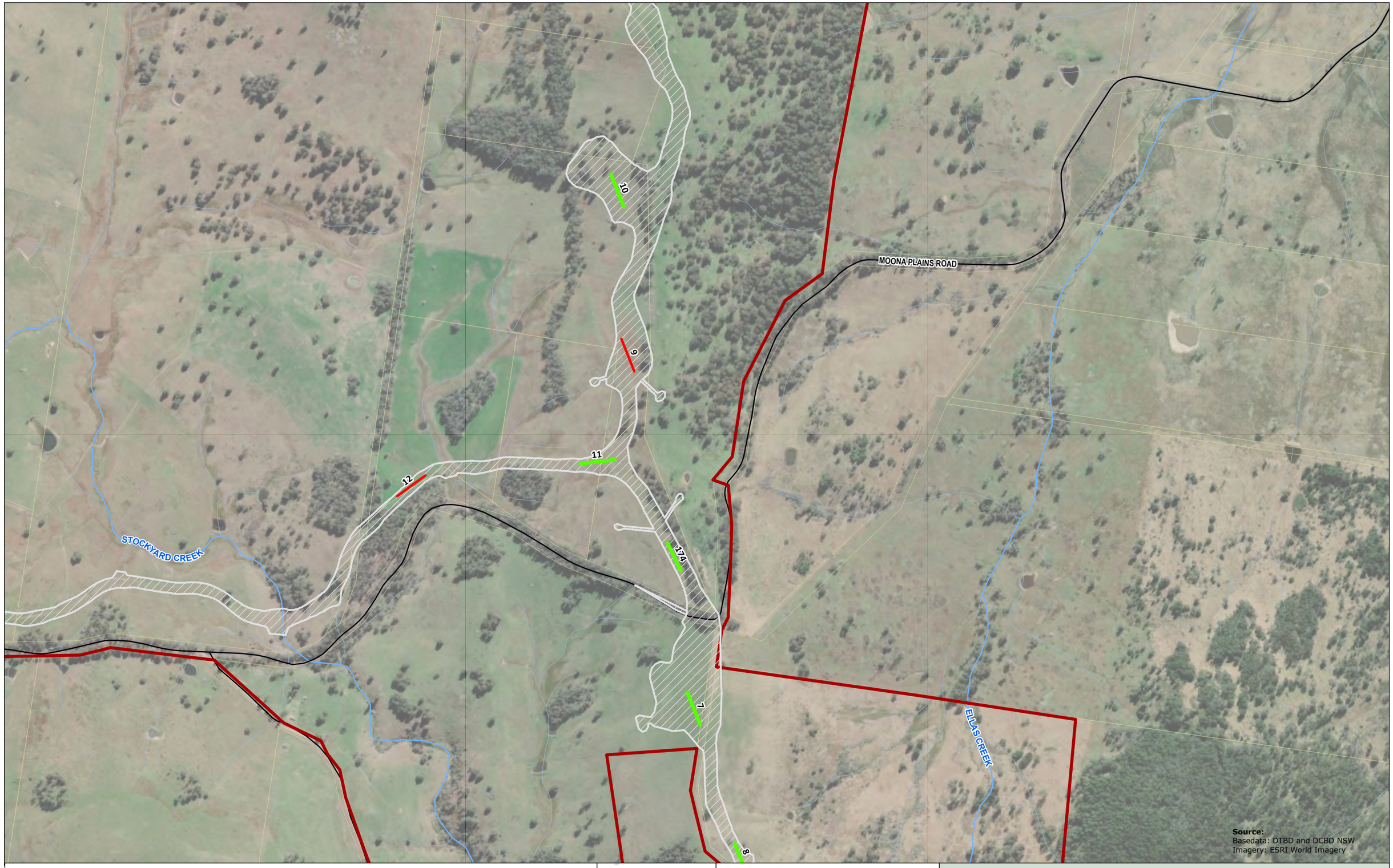
F3-8 LCA Transect Results (S60F(3))

Map 40 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 41 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Watercourse
- Other Waterways

Transect

- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 42 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

ELLAS CREEK

173

6

4

5

3

2

1

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Legend

- Project Area
- Subject Land
- Local Road
- Watercourse
- Other Waterways
- **Transect**
- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-8 LCA Transect Results (S60F(3))

Map 43 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Of the 208 LCA transects performed, 90 comprised indigenous vegetation cover that was equal to or greater than 50% (i.e., is native vegetation), with the remaining 118 LCA transects having less than 50% cover (i.e., 'low conservation value grasslands'). Summary statistics for these transects by group assignment are provided in **Table 3-5**.

TABLE 3-5 LCA TRANSECT SUMMARY BY 'NATIVE' OR 'NON-NATIVE' ASSIGNMENT (S60F(3) LLS ACT)

Variable	Average % cover for transects with ≥50% indigenous vegetation cover (n=90)	Average % cover for transects with <50% indigenous vegetation cover (n=118)
Native	71.38	23.62
Exotic Perennial	14.47	55.51
Exotic Annual	10.33	15.08
Bare	2.41	2.68
Litter	1.41	3.13

The utility of categorising LCA transect into two groups using the 50% threshold specified in the transitional arrangements (i.e., s60F(3) of the LLS Act), as summarised in Of the 208 LCA transects performed, 90 comprised indigenous vegetation cover that was equal to or greater than 50% (i.e., is native vegetation), with the remaining 118 LCA transects having less than 50% cover (i.e., 'low conservation value grasslands'). Summary statistics for these transects by group assignment are provided in **Table 3-5**, was evaluated via a two-sample t-test for other measures obtained (i.e., perennial exotic, annual exotic, litter and bare earth). The statistically significant differences outlined below indicate that the categorisation of LCA transects using the transitional arrangements in meaningful for determining the difference between groundcover vegetation that is native or exotic dominated:

- Mean 'perennial exotic' per cent cover is significantly greater for LCA transects that comprise <50% indigenous vegetation cover (M = 57.9, SD = 22.8) than LCA transects with ≥50% indigenous vegetation cover (M = 13.8, SD = 12.4) ; t(206) = [t-16.56], p = [p- 4.9^{e40}]; and
- Mean 'annual exotic' per cent cover for is significantly less for LCA transects that comprise ≥50% indigenous vegetation cover (M = 10.2, SD = 10.3) than LCA transects with <50% indigenous vegetation cover (M = 15.3, SD = 14.1); t(206) = [t-2.89], p = [p- 0.002].

These results show that any patch of groundcover vegetation with perennial exotic cover of ~25% or more is likely to be dominated by exotic groundcover vegetation, hence supportive of a Category 1 - Exempt Land designation. While significantly different, mean annual exotic cover is not likely to be a diagnostic measure for land categorisation. However, the 5% difference in mean annual exotic species per cent cover indicates that the time of sampling has had minimal effect on survey results overall (i.e., annual exotic per cent cover has not adversely impacted the estimation of indigenous vegetation cover).

Mean native vegetation cover by land use mapping was also calculated to evaluate its utility in identifying Category 1 - Exempt Land. These results, as shown in **Table 3-6**, offer general support for land use mapping as a reasonable approximation of low conservation value grasslands, as the mean per cent indigenous vegetation cover for each land use category is less than 50%.

TABLE 3-6 SUMMARY STATISTICS FOR LCA TRANSECTS BY LAND USE MAPPING

Land Use Mapping	Number of transects (#)	Average per cent cover of native vegetation (%)
Grazing native vegetation	122	46.39
Grazing modified pastures	85	40.70
Cropping	10	25.70

These results suggest that all non-woody groundcover vegetation mapped within the Subject land would qualify for classification as 'low conservation value grasslands' under s60F (3) of the LLS Act (excluding consideration of s60I (2) of the LLS Act). However, there was no significant difference in per cent indigenous vegetation cover between the 'Grazing native vegetation' or 'Grazing modified pastures' land use map units, indicating variability within and between these groups thus diminishing the utility of this approach. This is not unexpected as temporal variation across these land use map units is likely to influence the groundcover composition and structure over time (see **Section 3.1.3**).

Analysis by VZ provides a more contemporary and granular assessment of indigenous vegetation cover in the groundcover stratum, as this approach involves transect sampling within areas of relatively homogenous plant species composition and structure. These areas were identified through aerial photography interpretation and floristic analysis. The results are shown in **Table 3-7**, with rows emphasised in bold identifying VZs with a VIS of <15 (i.e., no offset liability) as this score falls below offset thresholds (ERM 2024).

TABLE 3-7 SUMMARY STATISTICS FOR LCA TRANSECTS BY ERM (2024) VEGETATION ZONE

VZ	Area (ha)	LCA transects (#)	Minimum LCA Transects (#)	Average native vegetation cover (%)	VIS (value between 0 and 100)	Result (s60F(3) LLS Act)
0	**38.40**	**6**	**4**	**15.7**	**N/A**	**Low conservation value grassland**
3	13.22	4	3	46.3	28.1	Low conservation value grassland
4	5.47	5	3	53.6	31.4	Native
8	0.49	0	1	-	26.0	Assumed native
12	13.70	3	3	53.0	29.9	Native
13	**12.37**	9	**3**	33.6	**14.9**	**Low conservation value grassland**
18	**3.27**	**2**	**2**	**63.0**	**9.3**	**Native**
21	21.65	2	4	56.5	35.3	Native
23	3.26	0	2	-	24.4	Assumed Native
28	60.93	7	5	76.3	25.3	Native
31	**16.07**	**2**	**3**	**78.0**	**14.7**	**Assumed Native**
37	**4.29**	**1**	**2**	**39**	**8.6**	**Low conservation value grassland**

VZ	Area (ha)	LCA transects (#)	Minimum LCA Transects (#)	Average native vegetation cover (%)	VIS (value between 0 and 100)	Result (s60F(3) LLS Act)
43	**24.29**	**8**	**4**	**56.6**	**13.3**	**Native**
46	**1.12**	**0**	**1**	**-**	**12.7**	**Assumed Native**
51	**3.58**	**0**	**2**	**-**	**4.5**	**Assumed Native**
53	4.53	2	2	32.0	24.6	Low conservation value grassland
54	**45.22**	**24**	**4**	**39.5**	**9.5**	**Low conservation value grassland**
55	**64.51**	**31**	**5**	**28.1**	**11.4**	**Low conservation value grassland**
56	**2.06**	**1**	**2**	**18.0**	**10.5**	**Low conservation value grassland**
57	**85.54**	**13**	**5**	**38.3**	**11.6**	**Low conservation value grassland**
58	**112.65**	**27**	**6**	**54.3**	**10.8**	**Native**
59	**18.92**	**6**	**3**	**25.8**	**10.9**	**Low conservation value grassland**
60	**110.41**	**25**	**6**	**42.0**	**3.2**	**Low conservation value grassland**
61	**86.65**	**26**	**5**	**47.3**	**7.4**	**Low conservation value grassland**
62	14.07	4	3	60.5	19.4	Native

These data broadly verify the conservative condition state assignments in ERM (2024) (i.e., designation of moderate, low or exotic condition states).

Vegetation zone 0 (i.e., exotic) represents lands that have either been cropped or have been heavily modified for pasture. As expected, this zone has the lowest indigenous species per cent cover of all vegetation zones and verifies the designation as exotic in ERM (2024).

Nearly all low condition grassland vegetation zones identified in ERM (2024) have a per cent indigenous vegetation cover score of <50%. Two of the ERM (2024) 'low condition' grassland vegetation zones were above 50% indigenous vegetation cover (i.e., vegetation zones 58 and 62), with the former having a VIS less than the offset threshold (i.e., vegetation zone 58), which verifies the designation of 'low conservation value grasslands' in this assessment.

Thirty per cent of the ERM (2024) vegetation zones designated as 'moderate condition grasslands' are identified as 'low conservation value grasslands' in this assessment. This result shows that the ERM (2024) assessment was conservative in assigning condition states (i.e., precautionary). The additional datasets obtained as part of this assessment support the reclassification of these zones to a low conservation value grassland condition state (e.g., with groundcovers with <50% indigenous vegetation cover within the Subject Land are highly degraded as these grasslands typically have mean perennial exotic per cent cover of 57.9% ±22.8%).

3.2.2 FLORISTIC DIVERSITY

Separate to per cent cover, floristic composition can also provide insight into the condition state of a vegetation assemblage. Plant communities with the least amount of disturbance are likely to comprise a higher number of native species or, at least, a larger percentage of the expected species relative to an intact community in a benchmark state. Similarly, there is likely to be a more even abundance of flora species within an intact community, whereas a disturbed patch is likely to exhibit dominance by a few species.

Floristic diversity can be measured in its simplest form (i.e., species richness), or integrate other variables such as abundance (e.g., Shannon-Weiner Index) to give a more holistic view. These measures can indicate where a system is relatively biodiverse or provide evidence for degradation. Floristic measures obtained from BAM Plots (ERM 2024) are provided in **Table** 3-8 for each vegetation zone assessed in this report.

Mean species richness across all vegetation zones is 13.1 ±3.4, which is less than half of the non-woody groundcover species component of a PCT in benchmark condition (i.e., vegetation with minimal disturbance). No relationship between native species richness and VIS is apparent (see **Chart 3-1**), suggesting that species richness alone is not a reliable measure of diversity in degraded systems.

TABLE 3-8 SUMMARY DIVERSITY STATISTICS FOR NON-WOODY ERM (2024) VEGETATION ZONES

Vegetation Zone	Average Shannon-Weiner Index Value	VIS	Benchmark Native Species Richness (groundcover only)	BAM Plots (#)	Mean Native Species Richness (range)	Mean Exotic Species Richness (range)
61	0.86	7.4	31	5	15.6 (10-24)	12 (5-18)
43	1.07	13.3	31	4	21.0 (9-32)	9.3 (5-15)
31	1.09	14.7	30	4	14.35 (12-16)	9.5 (8-10)
57	1.14	11.6	30	5	9.6 (5-15)	9.2 (6-11)
58	1.17	10.8	31	6	20.2 (11-27)	10.2 (5-13)
13	1.21	14.9	33	4	9.3 (4-12)	7.4 (6-9)
37	1.26	8.6	31	2	8.5 (8-9)	7.0 (5-9)
62	1.23	19.4	31	3	12.3 (3-20)	9.7 (7-11)
56	1.30	10.5	31	2	9.5 (7-12)	16.0 (15-17)
3	1.31	28.1	30	3	12.0 (9-14)	11.0 (9-12)
60	1.33	3.2	31	5	9.6 (5-20	6.8 (4-10)
55	1.33	11.4	33	5	11.2 (4-17)	9.6 (8-12)
54	1.36	9.5	30	10	10.3 (3-17)	6.1 (1-9)
18	1.40	9.3	31	2	15.0 (14-16)	8.0 (7-9)
21	1.44	35.3	30	4	13.0 (10-17)	6.3 (4-9)
12	1.44	29.9	33	3	13.3 (10-16)	6.7 (6-7)
59	1.47	10.9	30	5	13.0 (3-21)	6.2 (4-7)
53	1.51	24.6	30	2	12.5 (10-15)	5.5 (5-6)
4	1.51	31.4	30	3	15.3 (7-24)	8.0 (8)
28	1.71	25.3	31	5	17.2 (15-19)	6.8 (3-10)

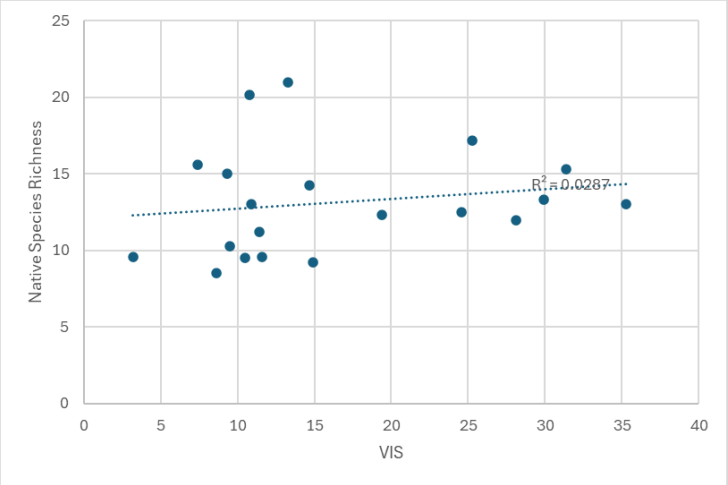


CHART 3-1 MEAN NATIVE SPECIES RICHNESS VERSUS VIS BY VEGETATION ZONE

Mean Shannon-Weiner Index values are similarly low across all vegetation zones with only three vegetation zones recording a value above 1.5 (i.e., VZs 4, 28 and 53). Unlike the species richness measure for diversity, a positive linear relationship exists between mean Shannon-Weiner Index values and VIS by vegetation zone as shown in **CHART 3-2** (i.e., diversity measured by species richness and abundance increases with increasing VIS).

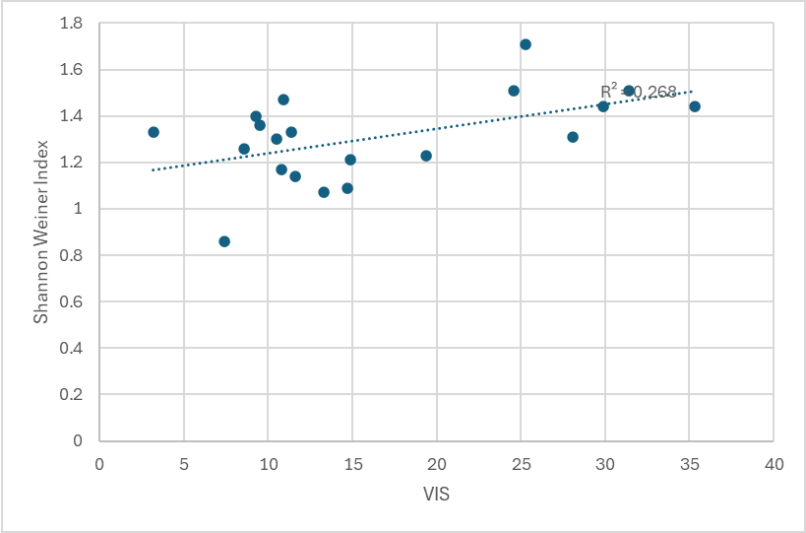


CHART 3-2 MEAN SHANNON-WEINER INDEX VALUES VERSUS VIS BY VEGETATION ZONE

A diversity index that combines the use of species richness and abundance increases the sensitivity of detecting variation that may occur in a system (e.g., distinguish between degrees of disturbance). In this assessment, a low Shannon-Weiner Index value (i.e., < 1.5) is likely to identify groundcover vegetation with species abundance imbalance (e.g., overabundance of native grass species). More diverse grasslands are likely to have a higher Shannon-Weiner Index value (i.e., relatively even abundances between species).

A negative linear relationship exists between mean Shannon-Weiner Index values and exotic species richness by vegetation zone as shown in **Chart 3-3**.

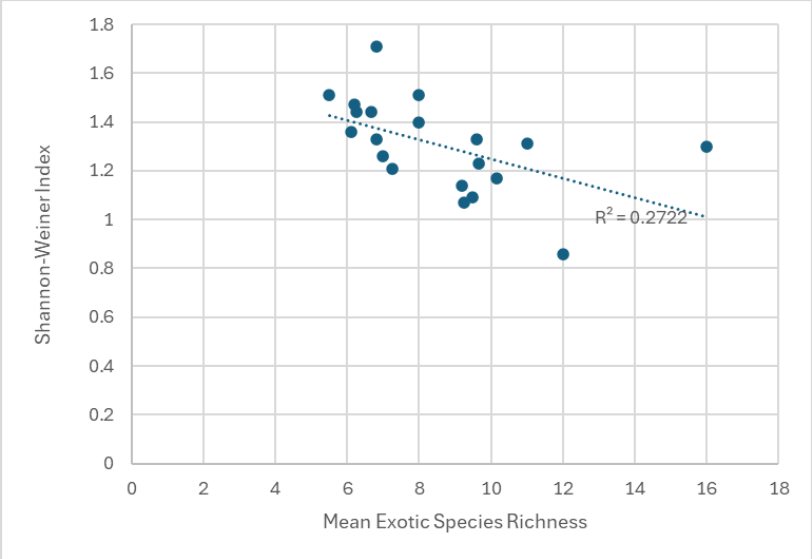


CHART 3-3 MEAN SHANNON-WEINER INDEX VALUES VERSUS EXOTIC SPECIES RICHNESS BY VEGETATION ZONE

This makes sense, as increased exotic species in a system will have the effect of displacing indigenous species, thus driving down native species diversity. Nearly all LCA transects with <50% indigenous species cover has >25% perennial exotic species cover, with at least half of these having >50% perennial exotic species cover.

3.2.3 FLORA COMPOSITION AND STRUCTURE

BAM plots located within areas identified as being low conservation value grasslands in **Table** 3-7 were screened to evaluate their flora composition and structure, thus verify their degraded state. A total of 18 BAM plots were examined in detail for this purpose.

None of the flora assemblages associated with lands identified as low conservation value grasslands are assignable to a PCT, as the native species component of these grasslands are not diagnostic.

Nearly half the BAM plots (n=8) comprise vegetation dominated by Cocksfoot Grass (*Dactylis glomerata**), which according to the NSW Department of Primary Industries is *a tussocky perennial grass suited to low fertility soils.* Other exotic species co-occurring with Cocksfoot Grass include Clover (*Trifolium* spp.) and Ryegrass (*Lolium* spp.). These species are all indicative of modified pastures and are identified in the final determination as weeds that invade the community and result in the loss of the native understory (NSW Scientific Committee 2013).

Other pasture types also occur. One type is dominated by perennial brome grasses *(Bromus* spp.), which is cultivated for grazing, hay and silage. Another is dominated by Silver Grass (*Vulpia myuros**), which is a weedy grass species capable of overtaking pastures and displacing productive plant species. Both these species are identified in the final determination as weeds that invade the community and result in the loss of the native understory (NSW Scientific Committee 2013). A widely cultivated native, Common Couch (*Cynodon dactylon*) co-occurs with Silver Grass throughout the Subject Land. Few native species occur in either of these pasture types.

Some patches of non-woody groundcover vegetation are characterized by an assemblage comprising *Juncus australis* (a native), Yorkshire Fog (*Holcus lanatus**), Flat weed (*Hypochaeris radicata**) and Sweet Vernal Grass (*Anthoxanthum odoratum*). The latter three weed species are identified in the final determination as weeds that invade the community and result in the loss of the native understory (NSW Scientific Committee 2013). These lands also comprise common native grasses typically found in livestock grazed pastures such as *Bothriochloa macra*, *Microlaena stipoides* and *Eragrostis leptostachya*. However, these native species are never dominant and are common in many grassy woodland PCTs.

3.2.4 SPECIES ACCUMULATION

Differences in species richness between land categories provides insight into the degree of degradation present, which can be understood by reviewing 'species accumulation plots' by land category (i.e., comparing the number of species cumulatively observed in each land category by counting additional species observed in each consecutive sample). Species accumulation plots have been prepared for the following three mapped areas to examine the degree of degradation occurring across the Subject Land:

- Category 2 - Regulated Land: Woody vegetation (i.e., BAM plots with woody vegetation n=79 BAM plots);
- Category 2 - Regulated Land: Non-woody vegetation (i.e., BAM plots with non-woody vegetation with >50% native vegetation cover n=69 BAM plots); and
- Category 1 - Exempt Land: Non-woody vegetation (i.e., BAM plots with non-woody vegetation with <50% native vegetation cover n=18 BAM plots).

These plots are presented in **Charts 3-4** to **3-6** and are agnostic to whether a species is native or exotic.

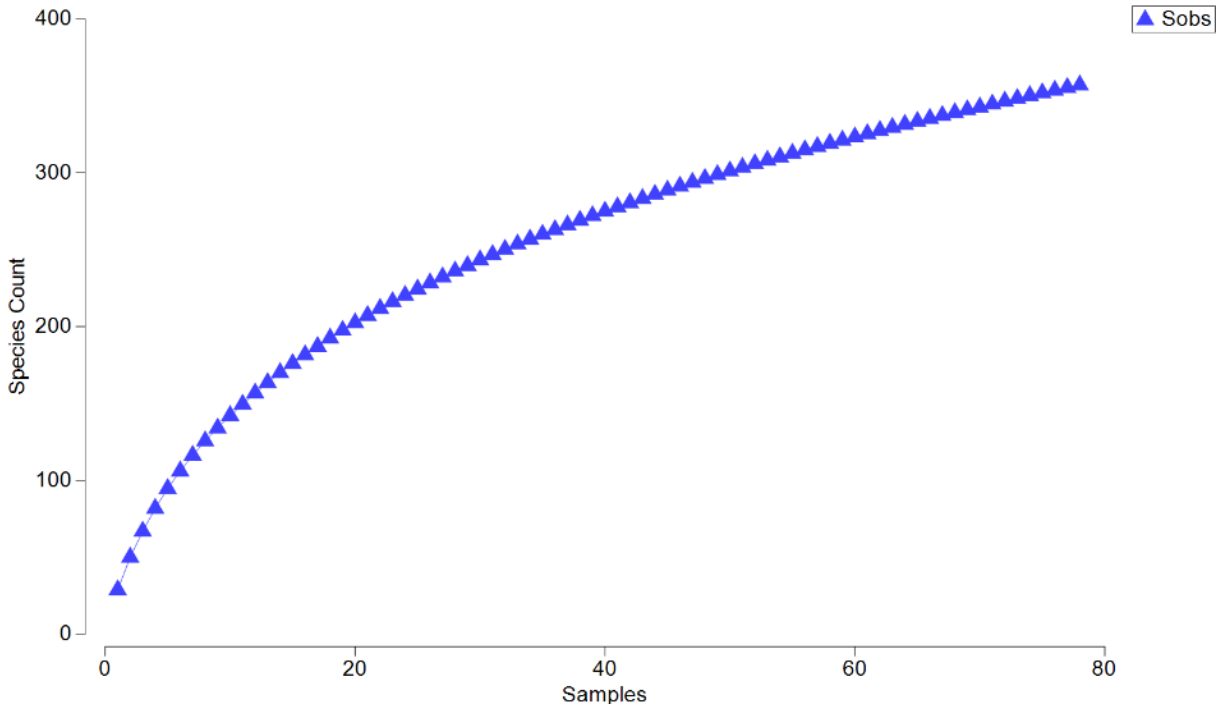


CHART 3-4 SPECIES ACCUMULATION CURVE: CATEGORY 2 - REGULATED LAND WOODY VEGETATION

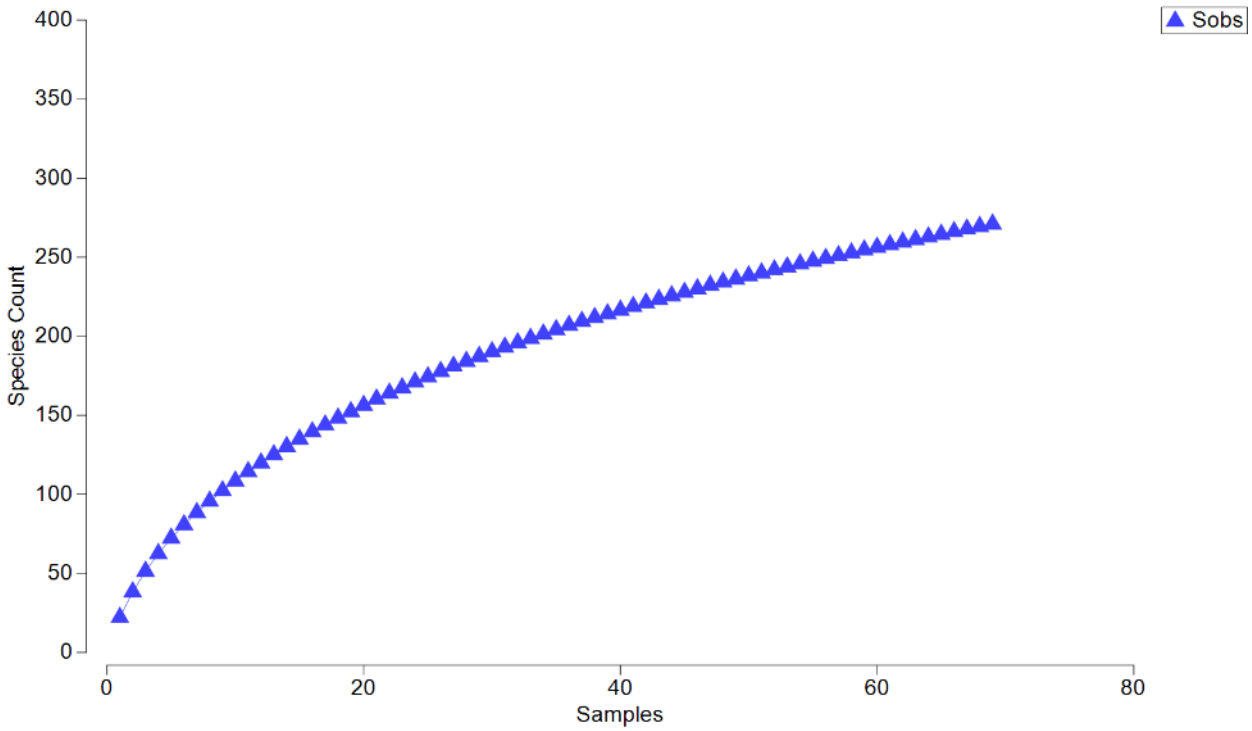


CHART 3-5 SPECIES ACCUMULATION CURVE: CATEGORY 2 - REGULATED LAND NON WOODY VEGETATION

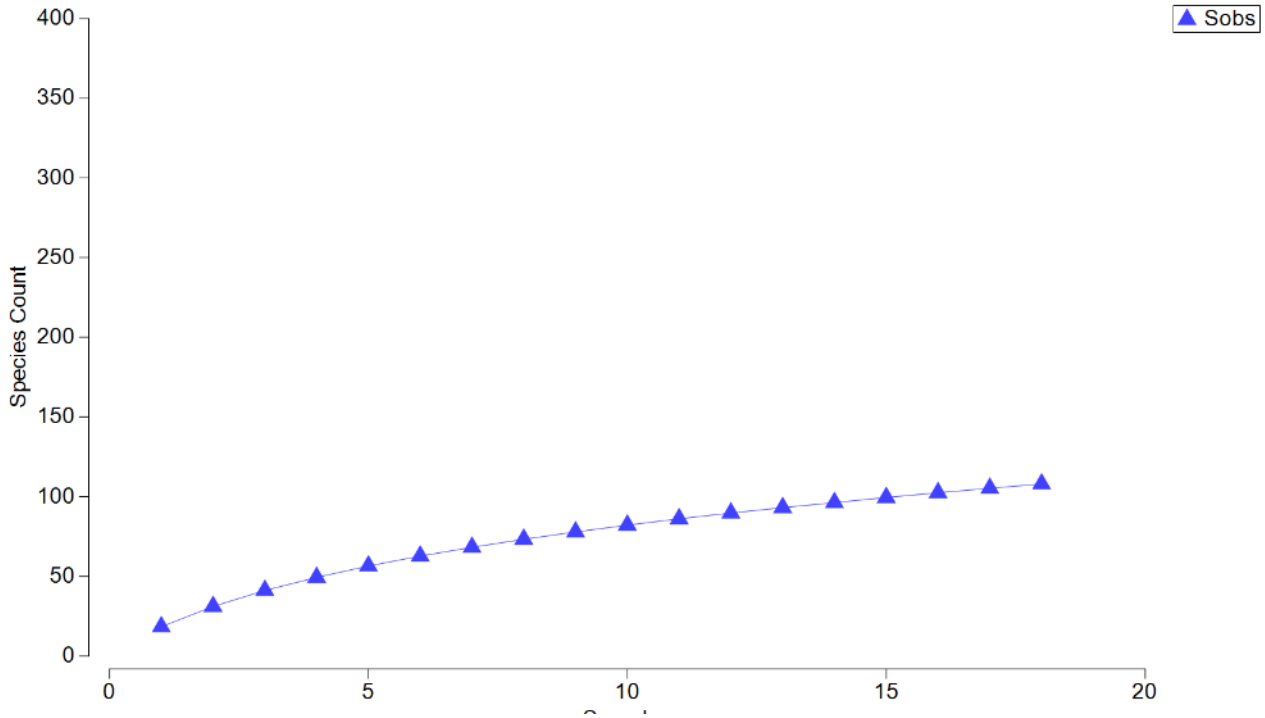


CHART 3-6 SPECIES ACCUMULATION CURVE: CATEGORY 1 - EXEMPT LAND NON WOODY VEGETATION

The numerical differences in species accumulation charts for the three map units are summarised in **Table 3-9**. For comparative purposes, the number of species observed in 18 BAM plots is reported to equivocate between mapped areas with an unequal number of representative BAM plots.

TABLE 3-9 DIFFERENCES IN SPECIES ACCUMULATION RATES BETWEEN MAPPED LAND UNITS FOR THE SUBJECT LAND

Mapped Unit	Total species Observed	Total species observed in 18 BAM plots	Total Box Gum Woodland species observed	Total New England Peppermint Grassy Woodland species observed
Category 2 - Regulated Land: Woody vegetation (n=79 BAM plots)	355 Native: 256 Exotic: 99	192±12	76	67
Category 2 - Regulated Land: Non-woody vegetation (n = 69 BAM plots)	270 Native: 187 Exotic: 83	148±11	57	54
Category 1 - Exempt Land: Non-woody vegetation (n = 18 BAM plots)	116 Native: 77 Exotic: 40	116	27	27

This analysis clearly demonstrates that the lands mapped as low conservation value grasslands (i.e., Category 1 - Exempt Land) are in a very low condition state. Compared to Category 2 - Regulated Land, they are hallmarked by:

- The lowest native species richness and highest exotic species richness; and
- Over half to a third the number of CEEC characteristic species.

This analysis supports the Shannon-Wiener Index values generated for grassland vegetation zones reported in **Table 3-8** where candidate Category 1 - Exempt Land had a value less than 1.5.

3.2.5 CEEC EXTENT

The Subject Land comprises vegetation cover of varying condition, with areas prospective for the presence of CEECs typically being degraded and modified through agricultural activity. Some areas of intact native vegetation cover exist (i.e., woody) and are readily identified for this reason. Areas of groundcover vegetation are less easy to distinguish, and thus require more detailed site investigation to evaluate. A combination of techniques have been used to review the extent of CEECS within the Subject Land as outlined in the following sections.

3.2.5.1 RAPID DATA POINTS

Lands that form part of a CEEC listing are to be designated as Category 2 - Regulated Land. The results of the targeted CEEC rapid data points survey are shown in **Figure 3-9**. These results have been considered as part of a wider evaluation of condition states across the Subject Land as outlined in the following sections.

3.2.5.2 ANALYSIS OF BAM PLOT DATA

Overall, the BAM plot dataset obtained for the BDAR assessment has identified a total of 90 of the Box Gum Woodland CEEC species listed in the final determination as occurring within the Subject Land. A total of 73 of the New England Peppermint CEEC species listed in the final determination have been identified within the Subject land.

The number of species occurring with an individual plot is always less (i.e., a sample of the total vegetation area), however, these samples provide important insight into whether the vegetation is part of a CEEC or not.

The 18 BAM plots identified in Section 3.2.3 for low conservation value grasslands were reviewed against the characteristics species listed in the final determinations for both CEECs known to occur within the Subject Land. The results are presented in **Table 3-10**.

TABLE 3-10 SUMMARY OF CEEC CHARACTERISTIC SPECIES FOR BAM PLOTS LOCATED WITHIN LOW CONSERVATION VALUE GRASSLANDS (CATEGORY 1 - EXEMPT LAND)

CEEC	Species count per BAM Plot		Subject Land	
	Benchmark condition	Subject Land (Mean)	Total count of CEEC characteristic species across all BAM plots	Species incidence in BAM Plots PCT = 0 (%)
Box Gum Woodland	39	4.1±2.4	90	~5%
New England Peppermint Woodland	40	4.8±2.8	73	~7%

The flora assemblages found within areas mapped as low conservation value grasslands are typical of highly degraded systems. The three native species listed below were repeatedly observed in BAM plots located within low conservation value grasslands and are ubiquitous species across grassy woodlands and grazing landscapes:

- *Bothriochloa macra*;
- *Geranium solanderi*; and
- *Microlaena stipoides*.

None of the lands mapped as low conservation value grasslands comprise a eucalypt canopy, which is an important indicator of a higher condition state that is part of the CEEC listing.

3.2.5.3 GROUND LAYER VEGETATION COVER

Areas identified as low conservation value grasslands include non-woody vegetation with <50% native vegetation cover. However, these grasslands may still form part of a listed CEEC where sufficient species diversity and/or native vegetation cover is present despite the absence of one or more of the characteristic dominant overstory species being absent.

For the NSW listed CEECs, the final determinations identify the suite of species that comprise the CEEC (i.e., Part 2 of each listing). The number of species found in the geographic range of these CEECs and total number observed within the Subject Land is as follows:

- Box Gum Woodland: 124 species with 90 being recorded in the Subject Land; and
- New England Grassy Woodland CEEC: 101 species with 73 being recorded in the Subject Land.

An analysis of the number of native species observed in the differing vegetation structural states for the Subject land is provided in **Table 3-11**.

TABLE 3-11 MEAN CEEC CHARACTERISTIC SPECIES BY PCT AND VEGETATION STRUCTURAL STATE

Structural State	Mean Characteristic CEEC species count by BAM Plot			
	PCT 0	PCT 510	PCT 533	PCT 534
Low conservation value grassland[3]	4.8 (n=18)	N/A	N/A	N/A
Low condition grassland[4]	N/A	4.8[5] (n=4)	N/A	6.9[5] (n=10)
Moderate condition grassland[4]	N/A	8.6 (n=7)	7.0 (n=2)	9.7 (n=3)
Open woodland[4]	N/A	10.5 (n=2)	12.0 (n=1)	8 (n=1)
Woodland[4]	N/A	11.7 (n=7)	12.0 (n=1)	13.1 (n=9)

This data shows a positive relationship between the number of CEEC characteristic native species observed and improved vegetation structure where CEEC characteristic species count increases with progressive improvement in vegetation structure (i.e., grassland to woodland). This is trend is expected as higher condition state vegetation will more than likely contain a greater number of native species including the proportion of CEEC characteristic species.

With respect lands classified as 'Low conservation value grassland' and mean number of CEEC characteristic native species, it is important to note that 18 BAM plots were required to determine this value. By comparison:

- Only four BAM plots were required to register the same mean count of CEEC characteristic native species for low condition grasslands in PCT 510. This vegetation has low biodiversity value not attracting an offset liability as the VIS is less than 15 for this vegetation; and
- Only one BAM plot was required to register 12 CEEC characteristic native species for PCT 533 in woodland structural state.

Additionally, differences among structural states are small and start from low levels; this reflective of the widespread degradation of native vegetation from agricultural activity involving cropping and/or moderate to high intensity grazing (Benson and Ashby 2000; Dorrough et al 2006). For example, high condition examples of these CEECs locally would comprise a greater count of characteristic native species that would be approaching benchmark levels (i.e., 39 species for Box Gum Woodland and 40 species for New England Peppermint Grassy Woodland). This is not the case within the Subject Land, with all structural states having a third or less of the CEEC characteristic species.

In the Commonwealth listing for both CEECs have condition classes that signify the inclusion of a patch in the listing. For Box Gum Woodland, these are:

- Class A: Good quality understorey with mature overstorey both present;
- Class B: Good quality understorey present. Characteristic trees may be absent; and
- Class C: Lower diversity understorey in areas where there is regeneration and/or tree density may be relatively dense.

[3] Category 1 - Exempt Land
[4] Category 2 - Regulated Land
[5] VIS of less than 15 – low biodiversity value with no offset liability associated with this vegetation

For New England Peppermint Grassy Woodland these are:

- Patch size is at least 0.5 ha;
- Groundcover is predominantly native; and
- At least 10 native trees per patch.

In all condition state classes, it is stated that ground layer for both CEECs must be predominantly native (i.e., at least 50% of the perennial vegetation cover in the ground layer is made up of native species). All LCA transects with >50% native vegetation cover have been designated as Category 2 - Regulated Land thus are not considered for classification as Category 1 - Exempt Land. A PCT and CEEC status must be determined for these in the BDAR.

For the 118 LCA transect data deemed to be low conservation value grasslands (i.e., transects with less than 50% native vegetation cover), 22 transects were found to have native vegetation cover that exceeded the perennial exotic vegetation cover. Seven of these transects were located within landscapes suitable for the occurrence of either CEEC, with three of these transects qualifying for inclusion in the New England Peppermint Grassy Woodland CEEC listing. All other LCA transects were excluded as they had either very low species diversity and/or the native component of the ground layer comprises more annuals than perennial.

3.2.5.4 REVISED MAPPING

A revised CEEC extent is shown in **Figure 3-10**. Over half of the ERM (2024) mapped extent of CEEC in a grassland condition state (i.e., 84.29 ha of 154.98 ha) has been excluded from being part of a CEEC. These areas, which are now assigned a PCT 0 code, do not contain native vegetation cover with floristics that conform to a CEEC (i.e., Category 1 - Exempt Land). Exclusion is based on:

- Absence of dominant eucalypt canopy species;
- Low native vegetation cover;
- Low incidence and abundance of characteristic CEEC species; and
- High presence of exotic species, particularly perennial exotic species.

A summary of the revision updates relative to ERM (2024) mapping is provided in **Table 3-12**.

TABLE 3-12 SUMMARY OF PCT/VEGETATION ZONE REVISIONS FOR CEEC MAPPING

CEEC and Condition State	ERM (2024) (ha)	Revised Area (ha)	Change (ha)
Box Gum Woodland			
Moderate condition grassland VZ 3 VZ 4	 13.22 5.47	 8.72 2.40	 -4.50 -3.07
Low condition grassland VZ 5 (was VZ 54)	 45.22	 14.27	 -30.95
New England Peppermint Grassy Woodland			
Moderate condition grassland VZ 9 (was VZ 8) VZ 13 (was VZ 12) VZ 14 (now low condition)	 0.49 13.70 12.37	 0.52 12.88 0	 +0.03 - 0.82 -12.37
Low condition grassland VZ 55 (now VZ 14)	 64.51	 31.84	 -32.67

BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
NICHOLS GULLY
DRAYTONS CREEK
MIHI CREEK
GROSE CREEK
EMU CREEK
LAMBING FLAT CREEK
HOLE CREEK
BARK HUT ROAD
DOG TRAP CREEK
SNAKE CREEK
WINTERBOURNE CREEK
EMU CREEK ROAD
BOUNDARY CREEK
MOONA PLAINS ROAD
APSLEY RIVER
OXLEY HIGHWAY
WALCHA

Legend

- Box Gum Woodland CEEC (grassland)
- New England Peppermint Grassy Woodland CEEC (EPBC Act buffer only)
- New England Peppermint Grassy Woodland CEEC (grassland)
- New England Peppermint Grassy Woodland CEEC (low condition grassland)
- New England Peppermint Grassy Woodland CEEC (moderate to high condition grassland)
- Ribbon gum - mountain gum - snow gum grassy forest/woodland of the New England Tableland Bioregion EEC (grassland)
- Not CEEC
- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Watercourse
- Other Waterways

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56
Date: 03/04/2025
Created By: VN
Drawing Size: A3
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F3-9 CEEC Rapid Data Point Assessment Results

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 1 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

THUNDERBOLTS WAY

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-10 CEEC Extent

Map 2 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 3 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-10 CEEC Extent

Map 4 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

THUNDERBOLTS WAY

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-10 CEEC Extent

Map 5 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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F3-10 CEEC Extent

Map 6 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-10 CEEC Extent

Map 7 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BLUE MOUNTAIN ROAD

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System: GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-10 CEEC Extent

Map 8 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

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F3-10 CEEC Extent

Map 9 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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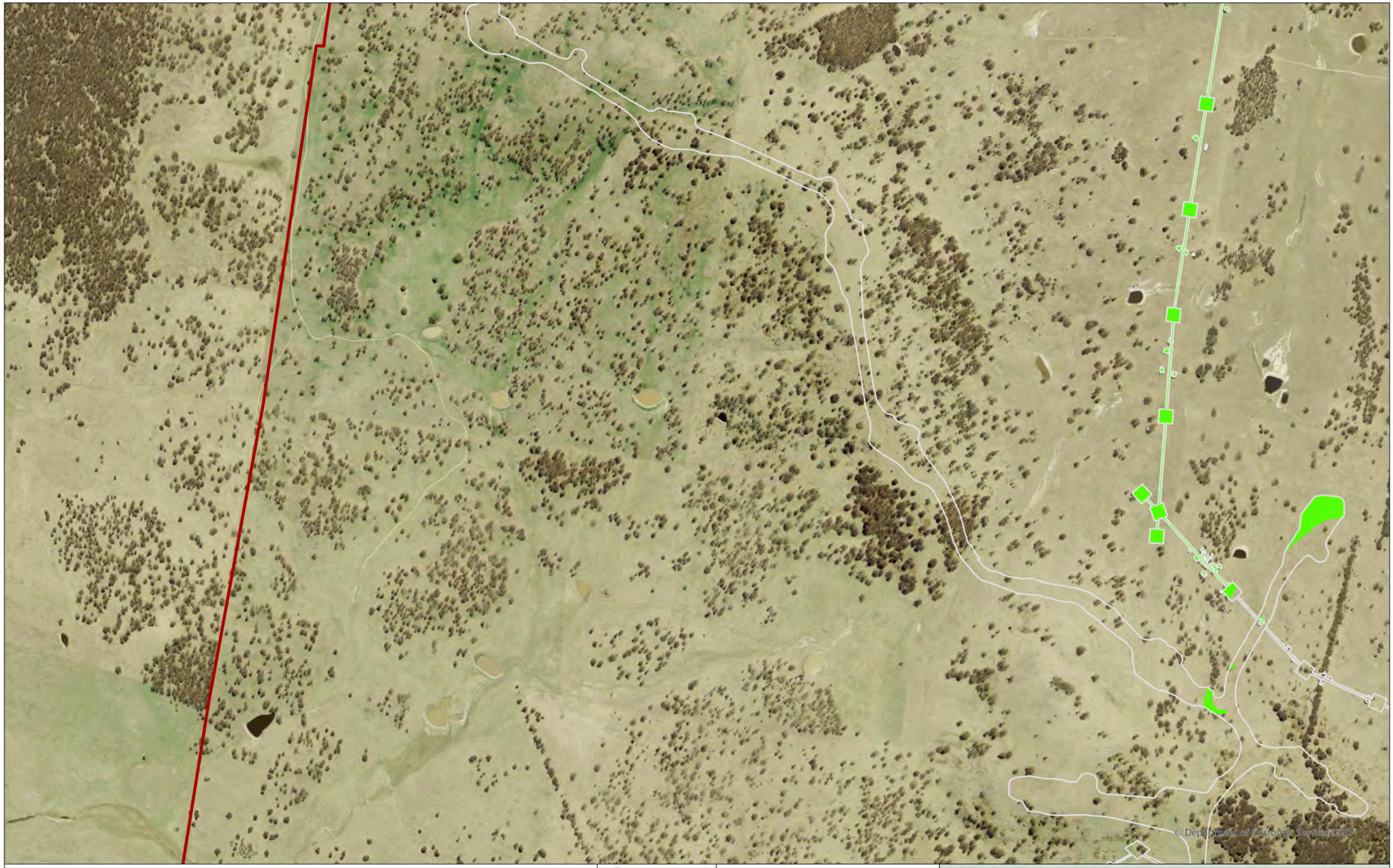

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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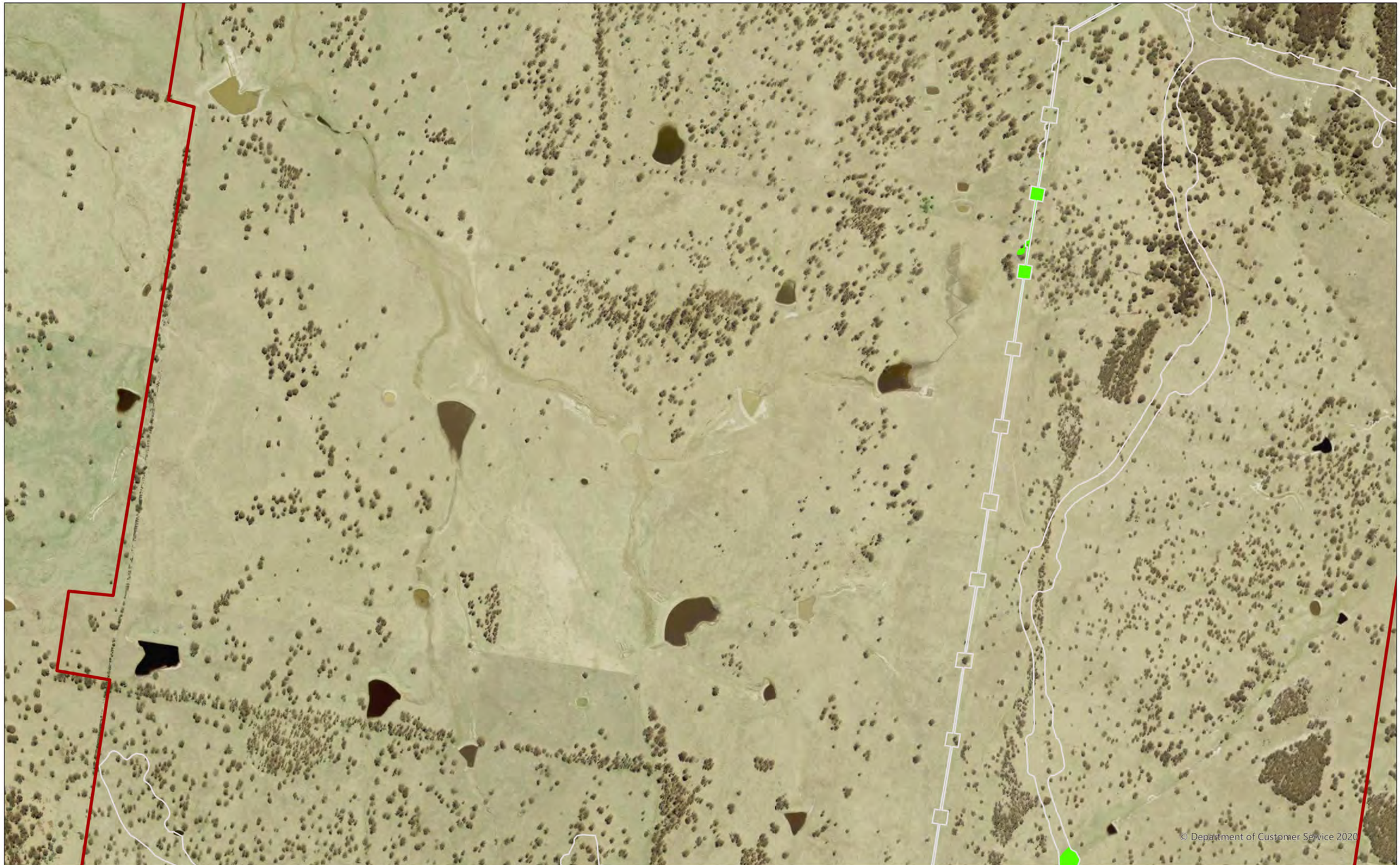
F3-10 CEEC Extent

Map 10 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-10 CEEC Extent

Map 11 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-10 CEEC Extent

Map 12 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F3-10 CEEC Extent

Map 13 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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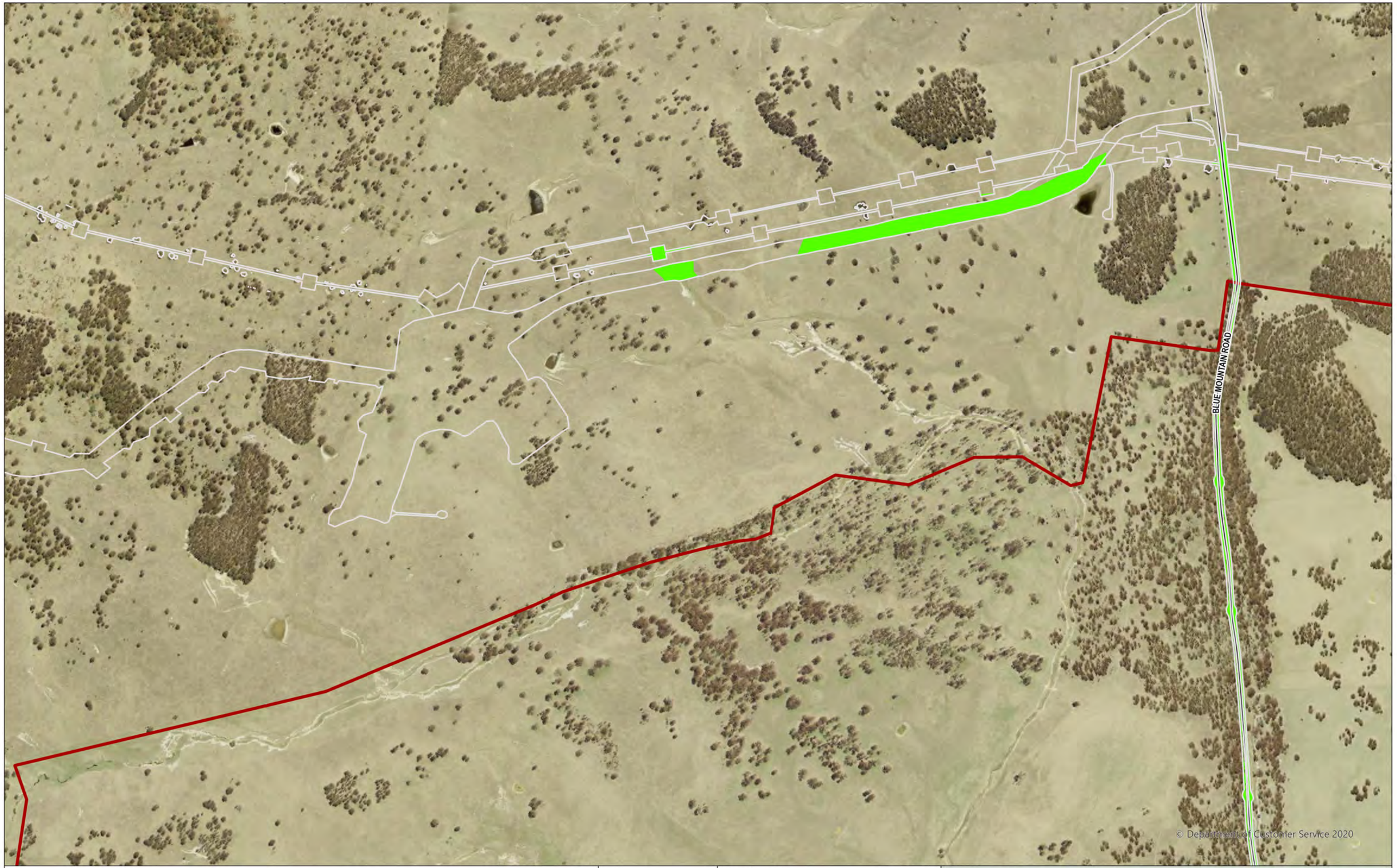

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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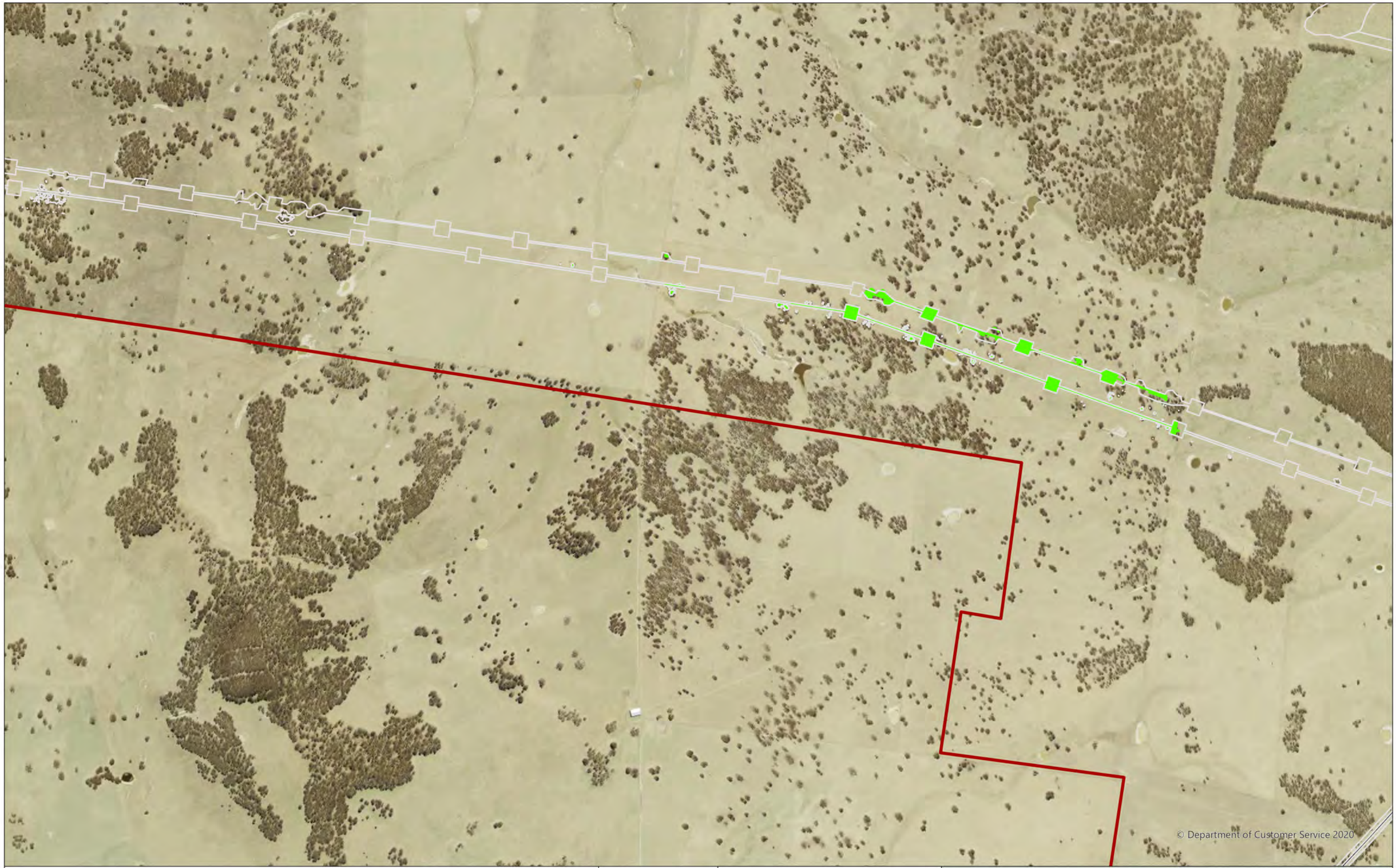
F3-10 CEEC Extent

Map 14 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-10 CEEC Extent

Map 15 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

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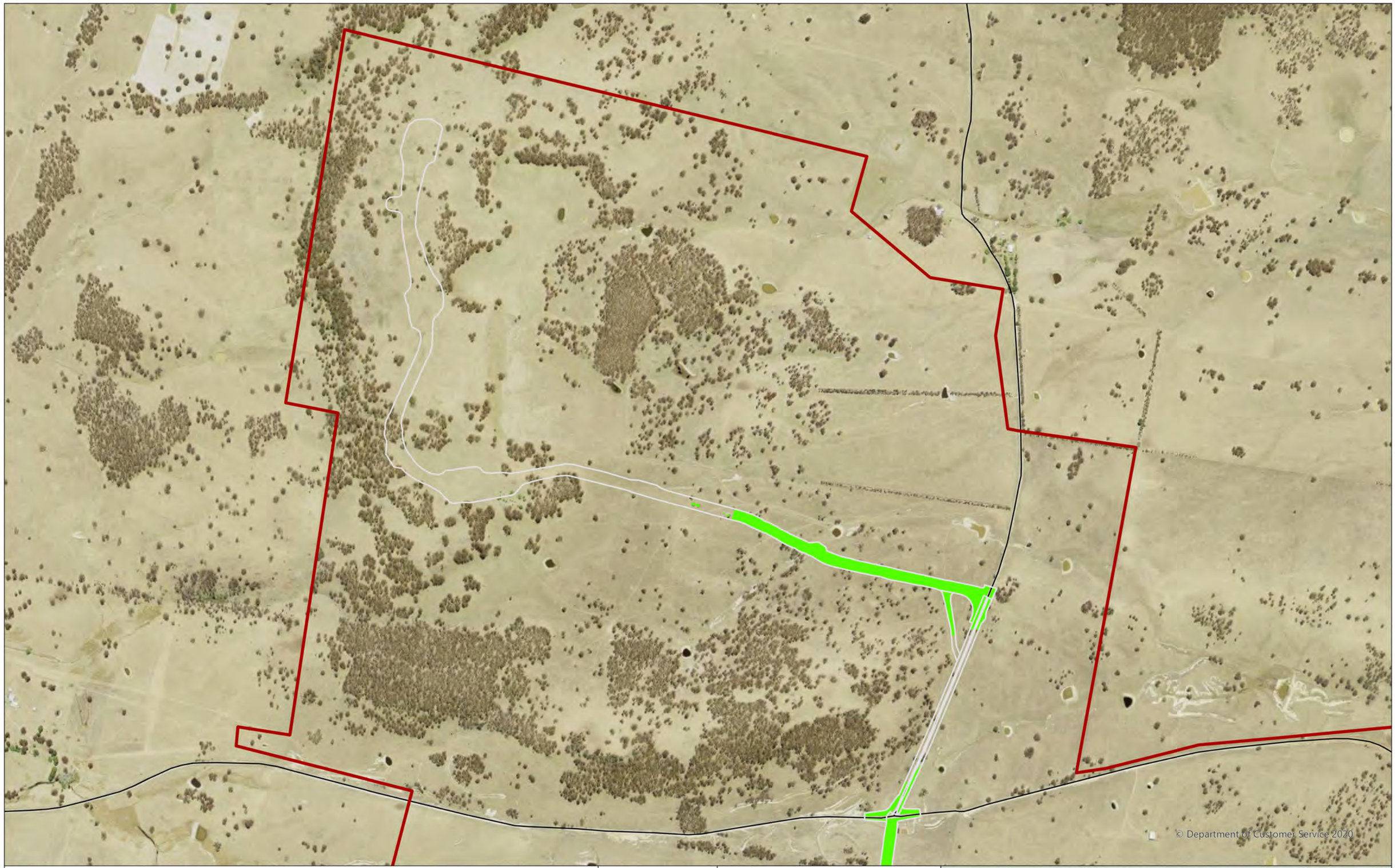

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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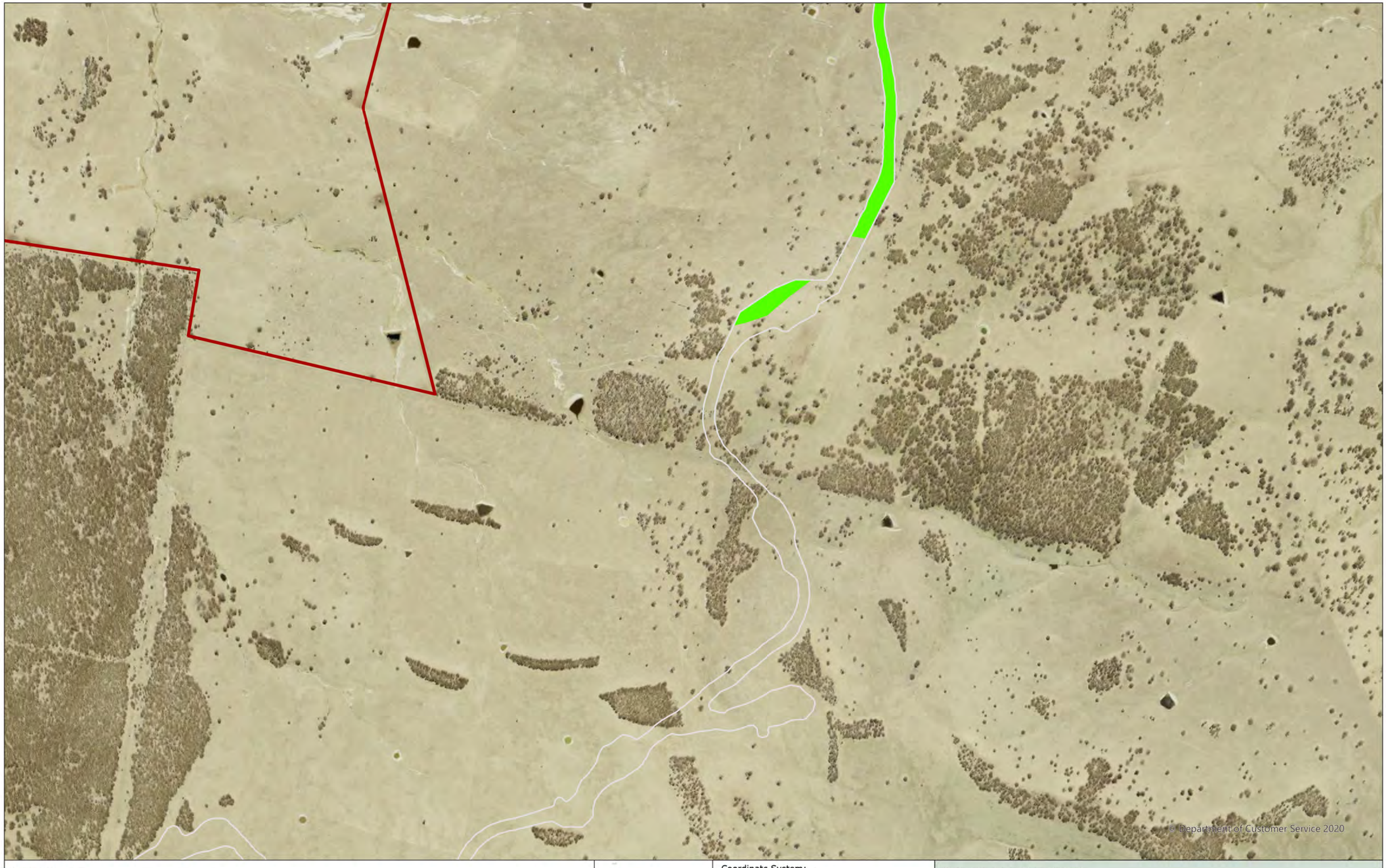
F3-10 CEEC Extent

Map 16 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-10 CEEC Extent

Map 17 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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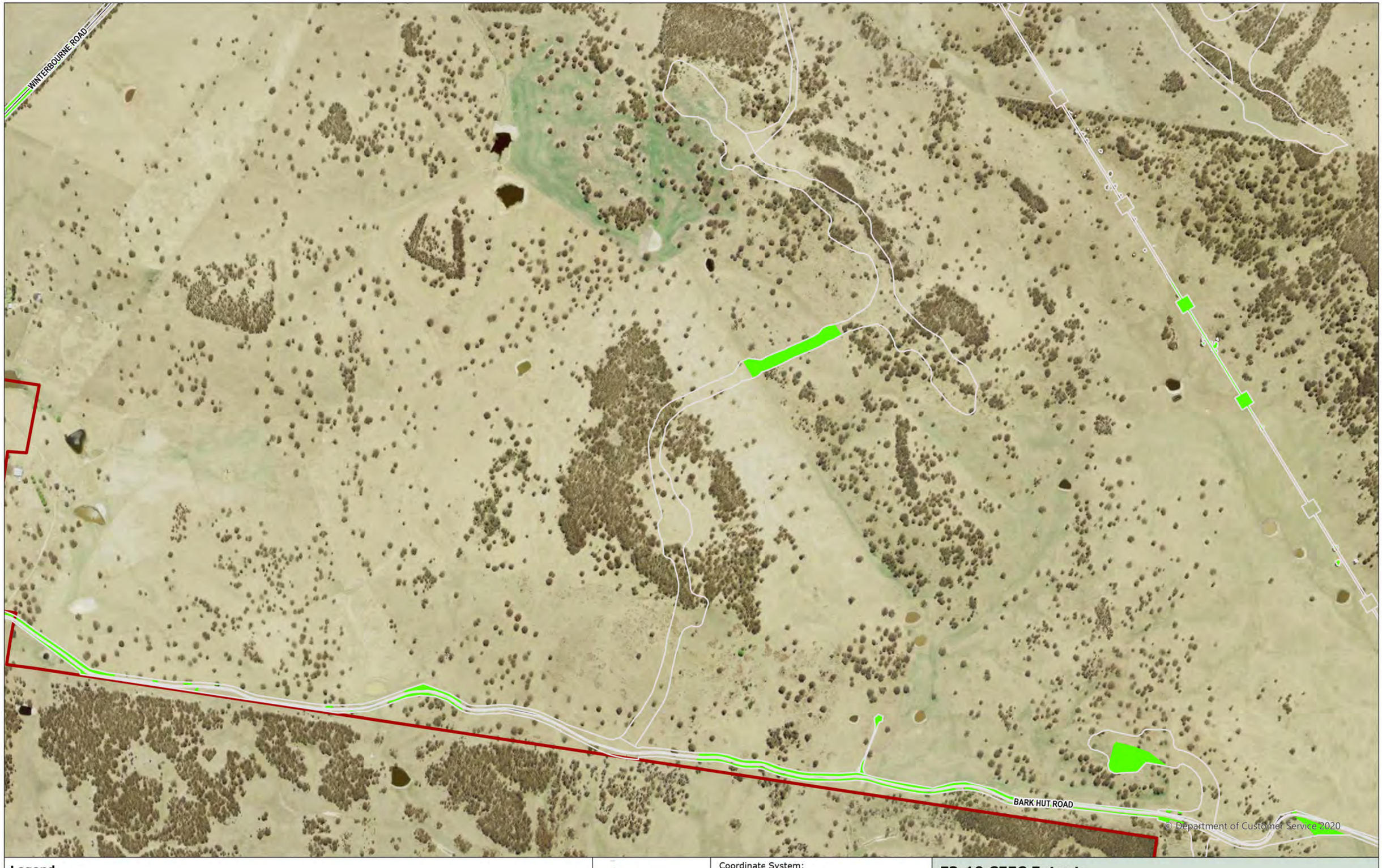
F3-10 CEEC Extent

Map 18 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

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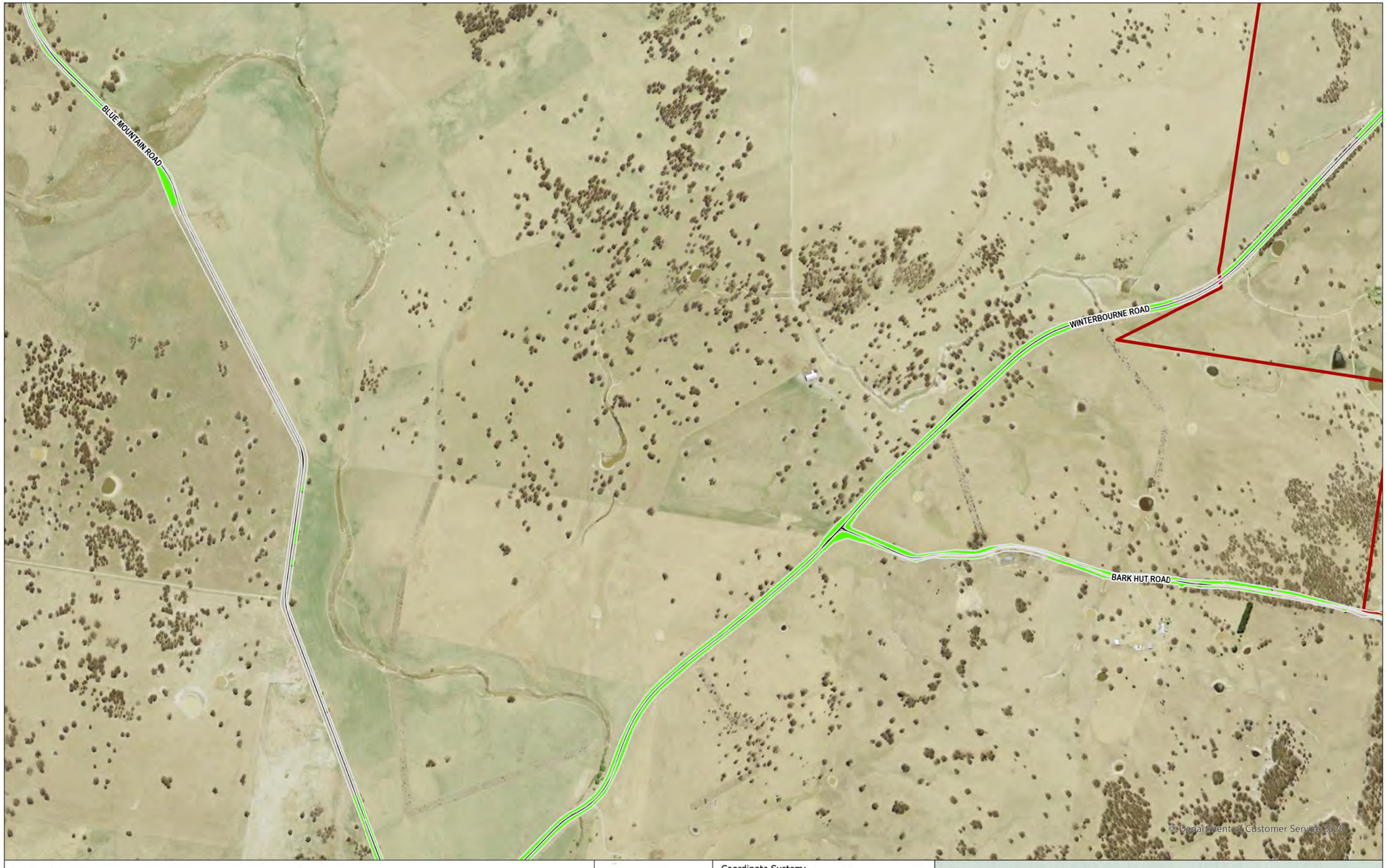
F3-10 CEEC Extent

Map 19 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-10 CEEC Extent

Map 20 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

WINTERBOURNE ROAD

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F3-10 CEEC Extent

Map 21 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 22 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 23 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 24 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

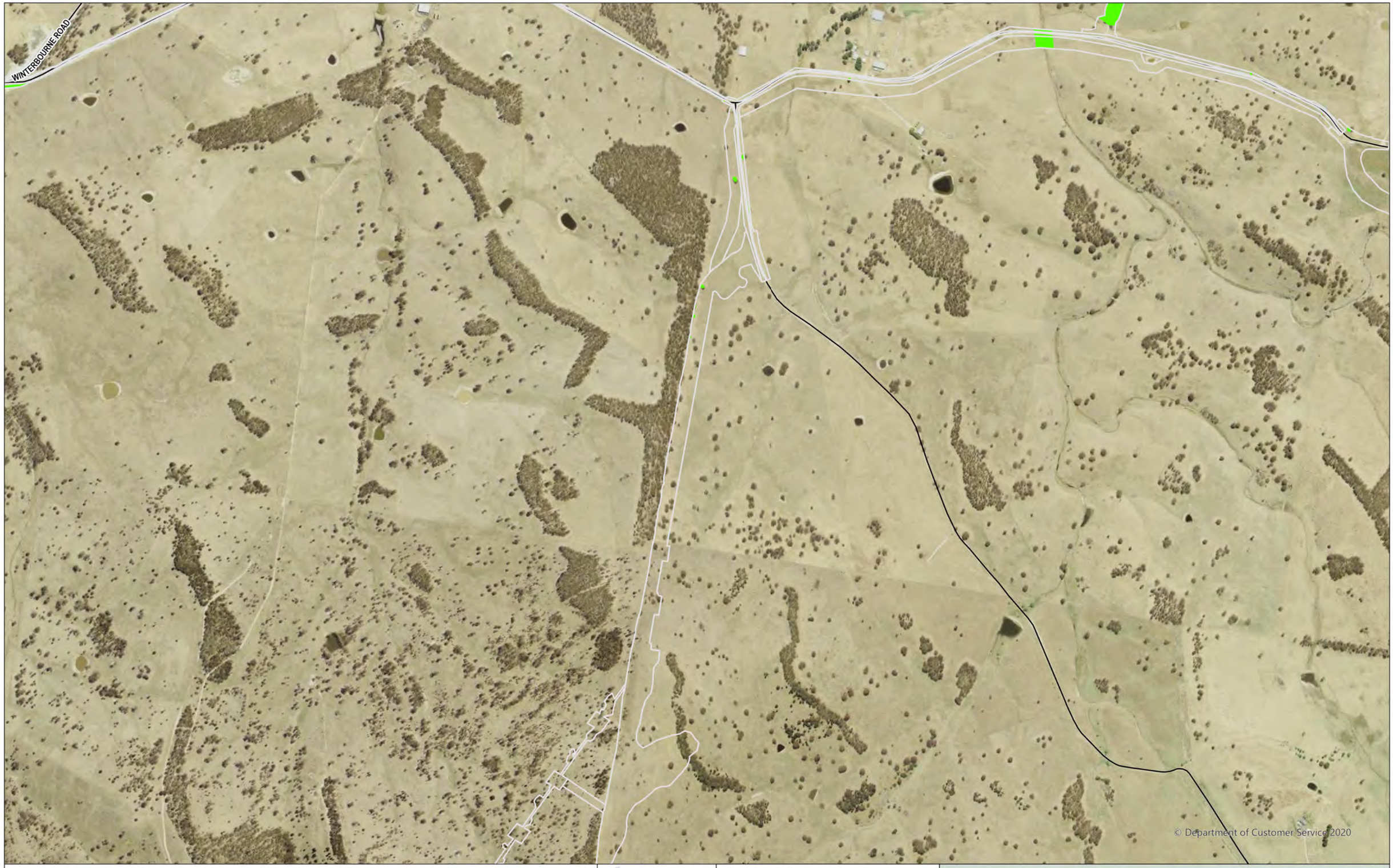
F3-10 CEEC Extent

Map 25 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx



Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 26 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 27 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

BARK HUT ROAD

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 28 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
0 100 200 300m
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F3-10 CEEC Extent

Map 29 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 30 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

0 100 200 300m

1:10,000

F3-10 CEEC Extent

Map 31 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

MOONA PLAINS ROAD

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Legend

- Project Area
- Subject Land
- CEEC Extent
- Highway / Major Road
- Local Road

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F3-10 CEEC Extent

Map 32 of 32

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

4. DISCUSSION

This section outlines the findings obtained through the desktop analysis and site assessment.

4.1 DRAFT NVR MAP

Layers available from the draft NVR map have been analysed to identify any occurrence of Category 2 – Vulnerable or Sensitive Regulated Land within the Subject Land. Category 2 – Vulnerable Land is scattered throughout the Subject Land, as shown in **Figure 2-2**, which is to remain as Category 2 - Regulated Land as this cannot be amended.

4.2 EXTENT OF LOW CONSERVATION VALUE GRASSLANDS

Site investigations have confirmed extensive areas of treeless vegetation cover (i.e., groundcover vegetation only) are compositionally and structurally disturbed (i.e., 'low conservation value grasslands' with low diversity). This is due to past land clearing (see **Figure** 3-3) and cropping/pasture modification (see **Figure 3-4**). For these areas the site investigation data shows that the groundcover vegetation comprises at least 25% or more perennial exotic species cover.

Section 60F(3) of the LLS Act makes provision for determining what is a low conservation value grassland. Where identified, s 60H (2) of the LLS Act states that these lands can be designated as Category 1 - Exempt Land unless s 60I (2) of the LLS Act requires otherwise. These provisions are assessed in **Table 4-1**.

TABLE 4-1 APPLICATION OF S60F TO THE SUBJECT LAND

Legislation	Legislative Description	Assessment
LLS Act – Section 60F	An area is taken, during the transitional period, to be low conservation value grasslands if it comprises only groundcover whose clearing was permitted by section 20 of the NV Act. Section 20 of the NV Act states that 'the clearing of native vegetation that comprises only groundcover is permitted if: (a) the vegetation comprises less than 50% of indigenous species of vegetation, and (b) not less than 10% of the area is covered with vegetation (whether dead or alive), and (c) those percentages are calculated in accordance with the regulations.	Vegetation zones 0, 3, 13, 37, 53 to 57, 58 to 61 all have mean indigenous vegetation cover <50% (see **Table 3-7**) The percentage of bare ground was more than 10% in all LCA transects. Percentages were calculated using a scientific and objective manner (see **Section 2.3.1**)
LLS Act - Section 60I(2)	• Rainforest and old-growth forest • High conservation grasslands • Coastal wetlands and littoral rainforests (*Coastal Management Act 2016*) • Land mapped as containing critically endangered plants and critically endangered ecological communities	• None present • None present • None present • Parts of the ERM (2024) vegetation zones 3, 8, 13, 54 and 55 form part of a listed CEEC. These have been identified and included in Category 2 lands

Legislation	Legislative Description	Assessment
	• Land subject to a private land, property or trust conservation agreement	• None present
	• Land subject to a bio-certification conservation measure	• None present
	• A set aside under the NSW Land Management (Native Vegetation) Code 2018	• None present
	• Land comprising an offset under a PVP or set aside under a code under the repealed *Native Vegetation Act 2003*.	• None present
	• Land identified as koala habitat (of a kind prescribed by the regulations) in a plan of management made under State Environmental Planning Policy No 44—Koala Habitat Protection	• None present
	• Ramsar wetlands (Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*)	• None present
	• Land subject to remedial action or conservation measures under the BC Act	• None present
	• Land recommended for listing as an Area of Outstanding Biodiversity Value	• None present
	• Conservation Areas under the Southern Mallee Land Use Agreement	• None present
	• Native vegetation that must be retained under the NSW Plantation and Reafforestation Act 1999	• None present
	• Land subject to a condition of development consent requiring the land to be set aside for conservation purposes under the NSW *Environmental Planning and Assessment Act 1979*.	• None present

4.3 SIGNIFICANTLY DISTURBED OR MODIFIED

Contrary to what was present prior to European settlement (i.e., a mix of woodlands and open forest), imagery from 1990 (**Figure 3-3**) and 2011 (**Figure 3-4**) shows considerable parts of the Subject Land to be cleared of a tree canopy leaving a residual groundcover stratum. This is generally consistent with the woody vegetation extent map (**Figure 3-5**) and reflective of a highly modified landscape utilised for its agricultural value, as indicated by the land use mapping (**Figure 3-2**). Active agricultural land uses are evident across the Subject land and prior to commencement of Part 5A of the LLS Act (i.e., August 2017).

While LCA transects identify some vegetation as being native (i.e., ≥50% native), the flora composition and structure of the non-woody groundcover vegetation is typical of landscapes affected by routine agricultural land uses (e.g., modified pasture management). Low native species diversity was consistently observed across land use and vegetation zone map units, matched with high perennial exotic vegetation cover.

Notwithstanding native species compositional and structural change through grazing alone, some parts of the Subject Land have been substantially modified through cropping and/or pasture modification and warrant classification as Category 1 - Exempt Land on this basis alone (s60J(2) of the LLS Act).

Such disturbances are often exemplified by the high abundance of non-native grass species such as Cocksfoot (*Dactylis glomerara*) and Slender Pigeon Grass (*Setaria parviflora*), sown for pasture or established after ploughing (**Plate 4-1**).

PLATE 4-1 EXAMPLE OF EXOTIC-DOMINATED GRASSLANDS THAT CONFORM TO CATEGORY 1: COCKSFOOT AND SLENDER PIGEON GRASS GRASSLAND WITHIN SUBJECT LAND

The following sections examine significant change through imagery and species diversity.

4.3.1 TEMPORAL IMAGERY ANALYSIS

Historical land uses and activity have influenced existing vegetation composition and structure. Analysis of the historical aerial imagery from 1990 and 2011 (**Figure 3-3** and **Figure 3-4**) shows that significant agricultural activity has occurred within the Subject Land prior to 1990 and has persisted to the present day, rendering detection of significant disturbance via imagery a challenging task (i.e., most significant disturbance or modification has already occurred).

Areas that were cleared of woody vegetation prior to 1990 have remained cleared from 1990 until the present day (albeit with some natural regeneration in parts). The historical imagery also shows that significant groundcover disturbance has occurred post 1990 following cropping activities and pasture modification.

Change in NDVI across the Subject Land and broader landscape is shown in **Figure 4-1,** with the extent of woody vegetation masked out to focus interpretation on non-woody groundcover vegetation. Locations with evidence of significantly disturbed or modified condition are shown in **Figure 4-2** to **Figure 4-8**. A discussion of these areas of assessment is provided in **Table** 4-2.

Legend

Project Area

Subject Land

NDVI Change between 2017 and 2016

-0.795 - -0.2

-0.2 - -0.15

-0.15 - 0

0 - 0.15

0.15 - 1.888

Woody Vegetation

Source:
Basedata: DTBD and DCBD NSW
Imagery: ESRI World Imagery

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03/04/2025

Created By: VN

Drawing Size: A3

0 2 4 6km

1:155,000

F4-1 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R1.aprx

2011

NDVI changes between 2017 and 2016

2017

Legend

- Project Area
- Subject Land
- Landuse 2017 (Cropping and Grazing Modified Pasture)
- Proposed Modify Landuse
- Woody Vegetation

NDVI Change between 2017 and 2016

- -0.795 - -0.2
- -0.2 - -0.15
- -0.15 - 0
- 0 - 0.15
- 0.15 - 1.888

Transect

- Non-Indigenous Vegeation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 0.2 0.4 0.6km

1:16,000

F4-2 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

2011

NDVI changes between 2017 and 2016

2017

81
82
83
208
65
68
69

Legend

Project Area
Subject Land
Landuse 2017 (Cropping and Grazing Modified Pasture)
Proposed Modify Landuse

Woody Vegetation

NDVI Change between 2017 and 2016
-0.795 - -0.2
-0.2 - -0.15
-0.15 - 0

0 - 0.15
0.15 - 1.888

Transect
Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
0 0.2 0.4 0.6km

1:28,000

F4-3 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

2011

NDVI changes between 2017 and 2016

2017

BLUE MOUNTAIN ROAD

67

114

67

114

Legend

Project Area

Subject Land

Landuse 2017 (Cropping and Grazing Modified Pasture)

Proposed Modify Landuse

Woody Vegetation

NDVI Change between 2017 and 2016

-0.795 - -0.2

-0.2 - -0.15

-0.15 - 0

0 - 0.15

0.15 - 1.888

Transect

Non-Indigenous Vegetation

Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 0.2 0.4 0.6km

1:16,000

F4-4 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

2011

NDVI changes between 2017 and 2016

2017

53
96
97
50
181
180

Legend

- Project Area
- Subject Land
- Landuse 2017 (Cropping and Grazing Modified Pasture)
- Proposed Modify Landuse
- Woody Vegetation
- NDVI Change between 2017 and 2016
  - -0.795 - -0.2
  - -0.2 - -0.15
  - -0.15 - 0
  - 0 - 0.15
  - 0.15 - 1.888
- Transect
  - Non-Indigenous Vegeation
  - Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 0.2 0.4 0.6km

1:16,000

F4-5 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

2011

NDVI changes between 2017 and 2016

2017

BARK HUT ROAD

Legend

Project Area
Subject Land
Landuse 2017 (Cropping and Grazing Modified Pasture)
Proposed Modify Landuse

Woody Vegetation

NDVI Change between 2017 and 2016
-0.795 - -0.2
-0.2 - -0.15
-0.15 - 0
0 - 0.15
0.15 - 1.888

Transect
Non-Indigenous Vegeation
Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56
Date: 01/05/2025
Created By: VN
Drawing Size: A3
0 0.2 0.4 0.6km
1:16,000

F4-6 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

2011

BARK HUT ROAD

NDVI changes between 2017 and 2016

2017

43 40 41 38 42 39 37 36 35 34

Legend

- Project Area
- Subject Land
- Landuse 2017 (Cropping and Grazing Modified Pasture)
- Proposed Modify Landuse
- Woody Vegetation

NDVI Change between 2017 and 2016

- -0.795 - -0.2
- -0.2 - -0.15
- -0.15 - 0
- 0 - 0.15
- 0.15 - 1.888

Transect

- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 0.2 0.4 0.6km

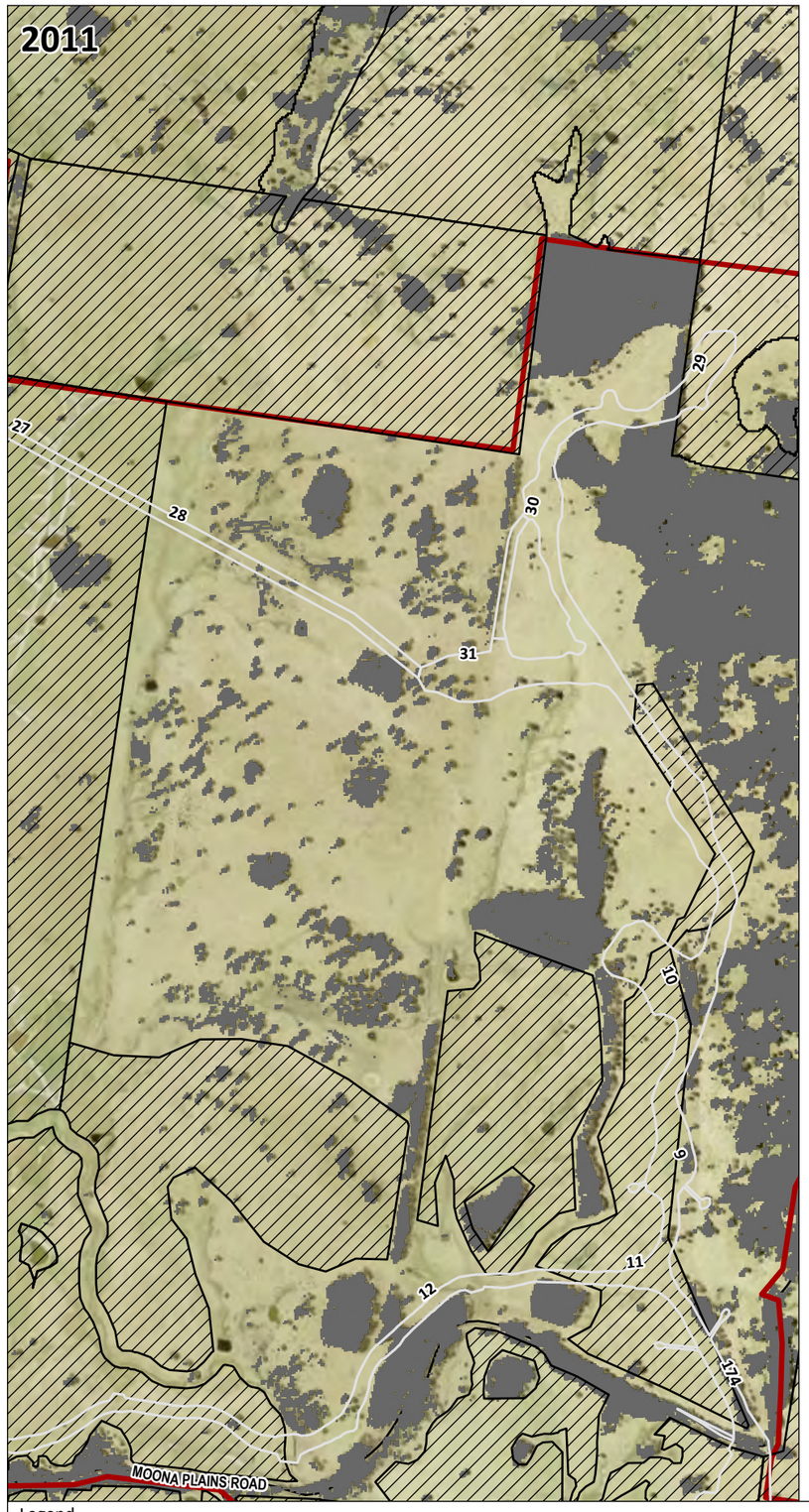
1:25,000

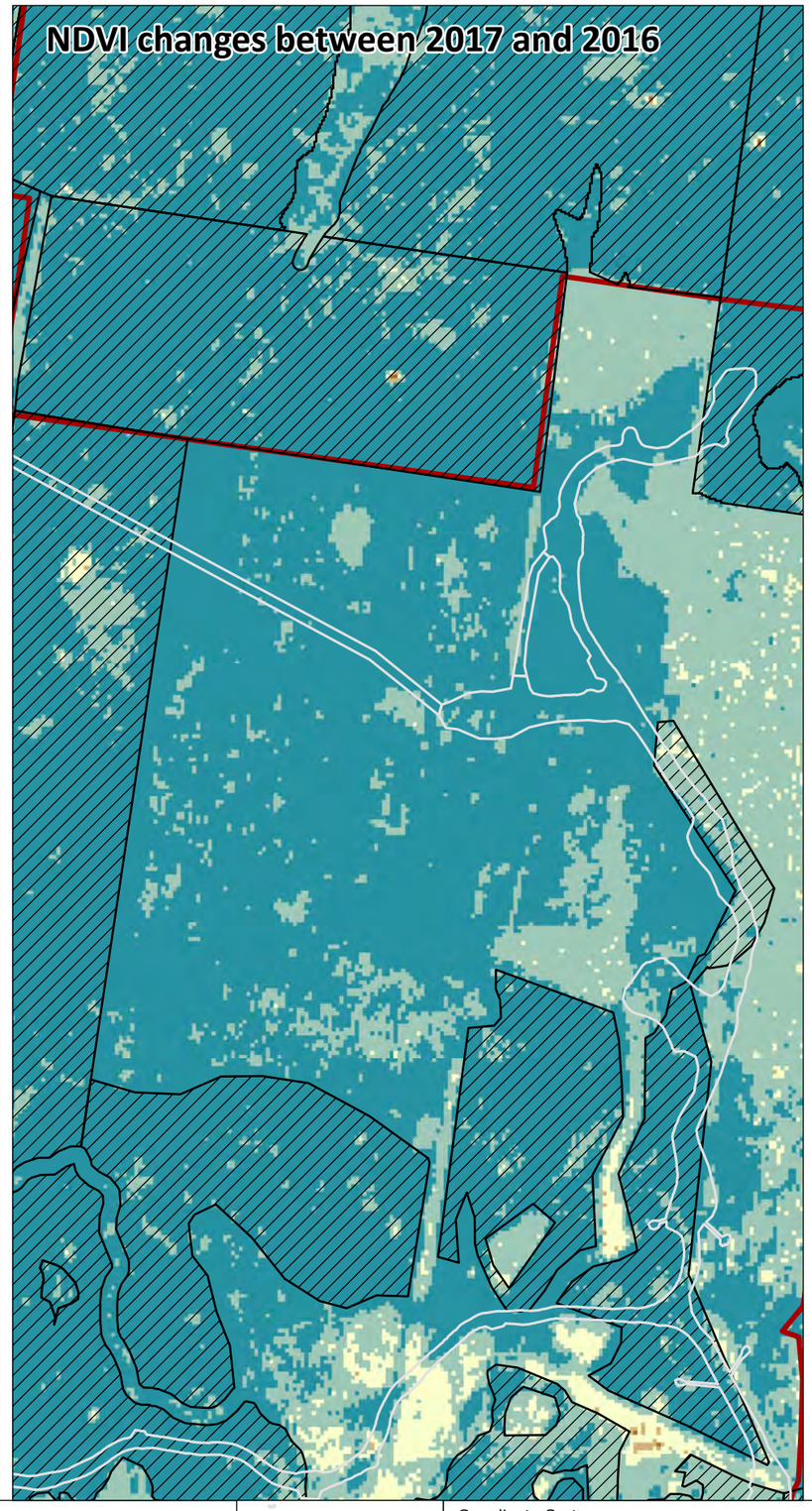
F4-7 Area of Potential Significant Disturbance-Modification

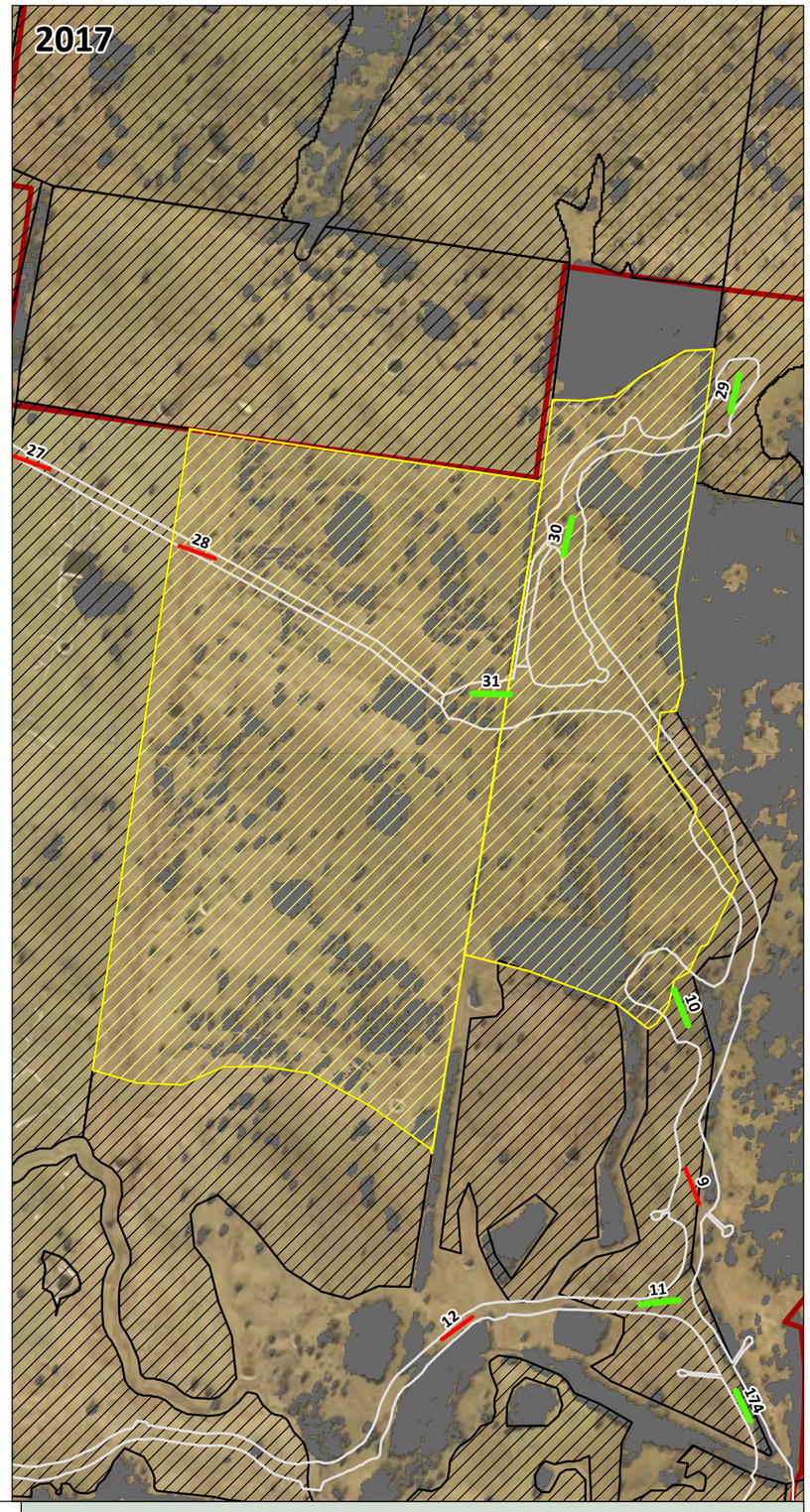
Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx







Legend

- Project Area
- Subject Land
- Landuse 2017 (Cropping and Grazing Modified Pasture)
- Proposed Modify Landuse
- Woody Vegetation

NDVI Change between 2017 and 2016

- -0.795 - -0.2
- -0.2 - -0.15
- -0.15 - 0
- 0 - 0.15
- 0.15 - 1.888

Transect

- Non-Indigenous Vegetation
- Indigenous vegetation

Coordinate System:
GDA 1994 MGA Zone 56

Date: 01/05/2025

Created By: VN

Drawing Size: A3

0 0.2 0.4 0.6km

1:16,000

F4-8 Area of Potential Significant Disturbance-Modification

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

TABLE 4-2 IMAGERY ANALYSIS FOR SIGNFICANTLY DISTURBED OR MODIFIED LAND

Figure	Comments
Figure 4-2	Positive NDVI change shown in this figure provides evidence of groundcover modification (i.e., high annual change in photosynthetic activity). This is likely the result of over sowing with pasture species and/or application of fertilisers. Additionally, comparing the true colour imagery between 2011 and 2017 shows that groundcover was once a consistent colour across the area of assessment, but extensive modification has led to evident changes in the colouration of the groundcover. Conclusion: The yellow hatched polygon presents an area that has been evidently modified in comparison to its surrounds, as supported by the true colour imagery and NDVI change. This patch is concluded to be an area of land subject to modification that is additional to the extent of cropping and grazing modified pasture as presented in the 2017 Landuse mapping. Note: areas of groundcover vegetation with >50% indigenous vegetation cover have been retained as native vegetation for the purposes of assessment (i.e. precautionary principle).
Figure 4-3	A mosaic of different levels of positive change in NDVI across the area of assessment is shown in this image. When comparing areas of land mapped as cropping and grazing modified pasture under the 2017 Landuse mapping to the surrounding areas, little variation is seen between the levels of NDVI change. In some cases, a higher degree of change in groundcover is seen in the supposedly unmodified areas. Conclusion: several yellow hatched polygons are presented within this area of assessment as the groundcover has been modified to an equal or greater extent than the surrounding land known to be modified for cropping or pasture.
Figure 4-4	The change in NDVI evident in this figure shows that a negative change has occurred across parts of this area, indicating that vegetation cover has significantly reduced during the assessment period. In some cases, this reduction in groundcover is highly localised, with clear boundaries and unnatural patterns occurring between areas subject to disturbance and those that are evidently subject to different land management practices. Conclusion: it is evident that the yellow hatched polygon is a paddock that has been subject to land use practices that have significantly reduced the extent of groundcover occurrence and should therefore be mapped as modified land.
Figure 4-5	A mosaic of different levels of positive change in NDVI across the area of assessment is shown in this image. The mosaic is consistent between areas that are mapped as cropping and grazing modified pasture in the 2017 Landuse mapping and areas that are not. Conclusion: the yellow hatched area has been subject to a similar extent of modification to the surrounding areas of cropping and grazing modified pasture and mapping should therefore remain consistent across this area.
Figure 4-6	The change in NDVI shown in this figure is presented in unnatural shapes, providing insight into the extent of impact localised land use practices has had on groundcover condition. The clear boundaries evident in the figure help to identify paddocks and areas that have been subject to modification compared to those that have not. Conclusion: the yellow hatched polygon has been subject to modification of a similar extent to other paddocks in the surrounding areas that are mapped as cropping and grazing modified pasture in the 2017 Landuse mapping and therefore this polygon is an additional area of land subject to this modification and is to be mapped accordingly.
Figure 4-7	The figure shows areas of positive NDVI change across the area of assessment that is consistent between areas that are mapped as cropping and grazing modified pasture in the 2017 Landuse mapping and areas that are not. Except for some areas where NDVI is either negative or neutral, the remaining areas are to be mapped to reflect the consistency in NDVI change. Conclusion: NDVI change within the yellow hatched polygon is consistent with areas mapped as cropping and modified pasture in the broader area and are to be mapped as such.

Figure	Comments
	Note: areas of groundcover vegetation with >50% indigenous vegetation cover have been retained as native vegetation for the purposes of assessment (i.e., precautionary principle).
Figure 4-8	This figure shows a positive NDVI change across the area of assessment that is consistent between areas that are mapped as cropping and grazing modified pasture in the 2017 Landuse mapping and areas that are not. This consistency indicates that land use practices are unvarying across the area of assessment. Conclusion: the yellow hatched polygon is to be treated as cropping and grazing modified pasture in accordance with the surrounding land due to the consistency in NDVI in the area. Note: areas of groundcover vegetation with >50% indigenous vegetation cover have been retained as native vegetation for the purposes of assessment (i.e., precautionary principle).

4.3.2 SPECIES DIVERSITY

Reduced species diversity is often a good indicator of disturbance. The summary statistics for species richness observed in non-woody vegetation derived from the full floristic plots conducted throughout the Subject Land is shown in **Table 3-8**. This shows that most grassland vegetation zones have low to very low diversity.

4.3.2.1 BENCHMARK DIVERSITY

The benchmark of ground-stratum species composition for vegetation zones range between 30 and 34 species (i.e., excludes tree and shrub growth forms). When comparing these benchmark values to the mean native species richness for each vegetation zone, the observed species richness is well below the benchmark, ranging between 8 and 21. The lack of native species richness in these vegetation zones is an indicator of land use history and current disturbance.

Vegetation zones with less than a third of the benchmark species richness level for groundcover species include 13, 37, 54 – 57 and 60. All these vegetation zones have VISs of less than 15, meaning that none have a calculable offset liability under the BAM. This supports the identification of these vegetation zones as candidates for designation as Category 1 - Exempt Land.

4.3.2.2 SHANNON-WEINER INDEX

The Shannon-Weiner Index Value is a measure for species diversity that considers the species richness (i.e., composition) against species abundance (e.g., structure) to identify where dominant species are occurring and the extent to which this is impacting species diversity (Beals, Gross and Harrell, 2000). The higher the index value, the greater the species diversity is within the community and the more even their relative abundance is, in this case the vegetation zone. A Shannon-Weiner Index Value typically falls between 1.5 and 3.5 for diverse systems, though the lowest possible value is 0 indicating no diversity (i.e., one species recorded) (Rain 2024).

Nearly all vegetation zones have a Shannon-Weiner Index Value less than 1.5 (only zones 4, 28 and 53 exceed this level). This is indicative of disturbed systems where either native species richness is low or a few species exhibit overabundance. Overabundant grasses are often observed in livestock grazed systems where:

- Non-palatable species progressively become more abundant at the expense of palatable species; and/or
- Exotic species become more abundant following the addition of soil ameliorants (e.g., fertiliser).

The latter is an example of modified pasture systems, which are relatively common throughout the local area.

For vegetation zones 4, 28 and 53, only one has a VIS less than 15 (i.e., zone 53). Contrary to vegetation zones 4 and 28, which were identified as being in moderate condition (ERM 2024), zone 53 was identified as being in low condition.

The Shannon-Weiner Index by vegetation zone supports the ERM (2024) assignment of condition states to grassland vegetation cover, thus supporting the use of these vegetation zones to stratify LCA transect sampling across the Subject Land for this assessment.

4.3.2.3 EXOTIC SPECIES COVER

Elevated exotic species cover, particularly perennial exotic vegetation, is widespread throughout the Subject Land and is a leading indicator of reduced native flora composition and structure. This effect can be observed by comparing the Shannon-Weiner Index with perennial exotic species richness on a vegetation zone scale, as shown in **Chart 3-3**, which shows the diversity index to decline with increasing perennial exotic species richness. This confirms the effect of pasture modification on native plant diversity.

Vegetation zones with high perennial exotic species cover (i.e., >25% cover) include 3, 4, 13, 37, 43, 54, 55, 57-62. These vegetation zones qualify for designation as Category 1 - Exempt Land.

4.3.3 ASSESSMENT

As outlined in **Table 4-3**, some of the grassland groundcover provisionally identified as Category 2 qualifies for designation as Cateogry 1 – Exempt Lands.

TABLE 4-3 APPLICATION OF S60J TO THE SUBJECT LAND

Legislation	Legislative Description	Assessment
LLS Regulation (Section 114) (which supports LLS Act (Section 60J))	(a) there has been a detectable variation (from information obtained from aerial or satellite imagery) in the structure or composition, or both, of non-woody vegetation, and	Yes. Change in NDVI between 2016 and 2017 shows evidence of groundcover modification.
	(b) that variation is consistent with management of pasture or crops for agricultural purposes, and	The change in photosynthetic activity in the groundcover stratum of non-woody vegetation areas is relatively homogenous and is often bordered by fencelines (i.e., patterns are not random). Areas with little change in photosynthetic activity are also evident and generally align with lands not included in the 2017 landuse mapping. These observations are indicative of either cropping and/or pasture improvement activity.

Legislation	Legislative Description	Assessment
	(c) that variation has been sustained for at least 12 months on more than one occasion before the commencement of Part 5A of the Act, and	Little change in woody vegetation cover is evident between 1990 and 2017.
	(d) that variation has not been caused only by grazing on the land, and	A rise in photosynthetic activity throughout non-woody groundcover vegetation is not likely associated with grazing activity, rather, is more likely associated with pasture modification (e.g., over sowing of pasture species/fertiliser applications) and/or cropping).
	(e) that variation occurred (from information obtained from aerial or satellite imagery) between 1 January 1990 and the date of commencement of Part 5A of the Act.	The variation identified is within the specified period.

4.4 CEEC EXTENT

The ERM (2024) mapped extent of CEEC adopted a precautionary approach as absence was unable to be determined where site-based data was unavailable (e.g., road reserves). Additional site investigations performed as part of this assessment aided the refinement of this mapping, thus improving the differentiation between Category 1 and Category 2 lands.

ERM (2024) vegetation zones in a grassland condition state that were included in the CEEC mapping include 3, 4, 12, 13, 54 and 55. Site investigations identified a mosaic of CEEC occurrence within these VZs with mapping refinements resulting in polygon-by-polygon amendments. A reduced extent of CEEC across the Subject Land was identified; however, patches of CEEC remain and where they do, they cannot be designated as Category 1 - Exempt Land (see **Figure 3-10**).

4.5 SUMMARY

A summary of the data analyses conducted is provided in **Table 4-4** and **Table 4-5**. The proposed land categorisation has been provided in **Section 5**.

TABLE 4-4 LAND CATEGORY DESIGNATION SUMMARY BY ERM (2024) VEGETATION ZONE

VZ	S60F(3) (<50% indigenous vegetation)	S60J(2)	S60I(2)(l)	S60I(2)(m)	Conclusion
0	Low conservation value grassland	Taken to be cleared	absent	absent	Category 1[8] Category 2[6]
3	Low conservation value grassland		absent	partial[7]	Category 1[8] Category 2
4	Native		absent	partial[7]	Category 1[8] Category 2

[6] Where mapped as Category 2 Vulnerable land
[7] Partial: meaning some lands are CEEC with other lands in the zone not forming part of the CEEC
[8] Reassigned to PCT 0 in updated mapping where not a CEEC

VZ	S60F(3) (<50% indigenous vegetation)	S60J(2)	S60I(2)(l)	S60I(2)(m)	Conclusion
12	Native		absent	partial[7]	Category 1[8] Category 2
13	Low conservation value grassland		absent	partial[7]	Category 1[8] Category 2
18	Native		absent	absent	Category 2
21	Native		absent	absent	Category 2
28	Native		absent	absent	Category 2
31	Native		absent	absent	Category 2
37	Low conservation value grassland		absent	absent	Category 1[8]
43	Native	present	absent	absent	Category 2
53	Low conservation value grassland		absent	absent	Category 1[8]
54	Low conservation value grassland		absent	partial[7]	Category 1[8] Category 2
55	Low conservation value grassland		absent	partial[7]	Category 1[8] Category 2
56	Low conservation value grassland		absent	absent	Category 1[8]
57	Low conservation value grassland		absent	absent	Category 1[8]
58	Native		absent	absent	Category 2
59	Low conservation value grassland		absent	absent	Category 1[8]
60	Low conservation value grassland		absent	absent	Category 1[8]
61	Low conservation value grassland		absent	absent	Category 1[8]
62	Native		absent	absent	Category 2

TABLE 4-5 SUMMARY OF ANALYSES OF SPATIAL DATA AND OTHER SOURCES

Data sources	Proposed Category 1 - Exempt Land	Proposed Category 2 - Regulated Land	Excluded Land	Notes
Draft NVR map (**Figure 1-2**)	Areas containing sufficient evidence of significant groundcover modification and disturbance, indicating cropping, modified pastures and demonstrated by machinery lines, bare earth, bright green vegetation cover.	Areas of woody vegetation including scattered trees. Lands mapped as sensitive. Lands mapped as Vulnerable.	-	Category 2 - Vulnerable Regulated Land occurs in the Subject Land. These areas cannot be designated Category 1 - Exempt Land.
Land zoning (**Figure 3-1**)	-	-	-	The development site is zoned rural (RU1 – Primary production) therefore Part 5A of the LLS Act applies and land categorisation can be determined.
NSW Landuse 2017 (**Figure 3-2, Figure 4-1** through **Figure 4-8**)	Land use identified as: • Reservoir/dam • Cropping • Grazing modified pastures • Services • Farm buildings / infrastructure • Transport and communication	Land use identified as: • Grazing native vegetation • River	-	Note that some areas not mapped as 'grazing modified pastures' land use may qualify for this classification because of land use modifications. This is evident through the analysis conducted in **Section 4.3.1** which found NDVI change consistencies when assessed against the NSW Landuse 2017 mapping. Some areas where significant disturbance / modification have been identified have been retained as native vegetation where LCA transects indicate high indigenous vegetation cover (i.e., application of precautionary principle).
Historical imagery (**Figure 3-3**, **Figure 3-4**, **Figure 4-1** through **Figure 4-8**)	Areas containing sufficient evidence of significant groundcover modification or disturbance that was present in 1990. This is demonstrated by machinery lines, bare earth, bright green vegetation cover.	Areas of woody vegetation including scattered trees that were present in 1990. Areas of groundcover vegetation with limited or no evidence of modification or disturbance.	-	Historical imagery from 1991 used for evidence of modification or disturbance present in 1990 and compared with imagery from 2011 to observe changes in this period. No detectable change in woody vegetation cover is evident and agricultural activity beyond grazing of the land is observed in assessment of aerial imagery from 2016 and 2017.

Data sources	Proposed Category 1 - Exempt Land	Proposed Category 2 - Regulated Land	Excluded Land	Notes
NSW Woody Vegetation Extent(**Figure 3-2,** **Figure 4-2** through **Figure 4-8**)	Cover that is not woody (i.e., treeless groundcover vegetation)	Cover that is woody vegetation	-	The NSW Woody Extent map identified 88.2% of the Subject land to comprise treeless non-woody groundcover vegetation (i.e., 104.3 ha woody vegetation). Fine scale woody vegetation mapping (capture scale of 1:1,000) has identified 120.30 ha of native woody vegetation cover, which is 16 ha more woody vegetation cover than the NSW woody extent mapping. Comparatively, the Project area[9] comprises a greater quantum of woody vegetation (i.e., 80.3% of the Project Area is non-woody vegetation). These areas have the potential to be designated as Category 1 - Exempt Land.
NSW State Vegetation Type (**Figure 3-6**)	Some areas that don't contain a mapped PCT which are 'PCT 0' (Not classified) and where there is historical evidence of significant groundcover disturbance or modification. Scale and resolution issues indicate linework inaccuracies.	Areas containing mapped PCTs. Some areas that don't contain a mapped PCT which are 'PCT 0' (Not classified) where there is no historical evidence of significant groundcover disturbance or modification. For example, woody vegetation along roadsides and scattered trees.	-	Scattered trees identified during spatial and site assessment. If native trees species occurred on Category 1 - Exempt Land, then these would be reclassified as Category 2 - Regulated Land. Mapping at a capture scale of 1:1,000 has been used to address scale and resolution limitations in SVTM.
ERM Vegetation Mapping (**Figure** 3-**7**)	Areas of groundcover vegetation that is <50% native vegetation cover. Land that is significantly disturbed or modified.	Areas containing native woody vegetation. Areas of groundcover vegetation that is ≥ 50% native vegetation cover. Land that is not significantly disturbed or modified.	-	Groundcover vegetation in some areas showed signs of significant disturbance during site assessment. Only areas which contained clear historical evidence of significant groundcover disturbance and modification, and contained less than 50% native groundcover vegetation, have been mapped as '0 – Non-native vegetation'.

[9] Project area refers to the land contained within all properties identified in Table 1-1

4.6 PHOTOGRAPHIC EXAMPLES

This section contains photographic examples of Category 1 - Exempt Land and Category 2 - Regulated Land. Images and descriptions of these areas are displayed in **Table 4-6**.

TABLE 4-6 SITE PHOTOGRAPHS

Photograph	Description
	Example of highly disturbed Category 1 - exempt land. Evidence of heavy disturbance with historical clearing (BAM Plot JH052, VZ 13).
	Example of highly disturbed Category 1 - Exempt Land with some native species present (BAM Plot JH083, VZ 54).

Photograph	Description
	Example of Category 1 - Exempt Land. Natives present but area has been significantly disturbed from historical clearing (BAM Plot JH089, VZ 56).
	Example of Category 1 - Exempt Land in the Project Area. (BAM Plot JH049, VZ 0).
	Example of Category 2 - Regulated Land dominated by native grasses (BAM Plot JH067, VZ 28)

5. CONCLUSION

The draft NVR map is published and has identified in force and draft land categories for the Subject Land. The extent of this land categorisation is summarised in **Table 5-1**.

TABLE 5-1 DRAFT NVR MAP LAND CATEGORISATION SUMMARY FOR THE SUBJECT LAND

LLS Act Land Category	Area (ha)
Category 1 - Exempt Land	437.1
Category 2 - Regulated Land	437.03
Category 2 - Vulnerable Regulated Land	6.34
Excluded from the LLS Act	1.48
Total	**881.95**

Sections 2 through 4 provide sufficient information to review the designation of land categorisation in the draft NVR map for the Subject Land. This has included the consideration of:

- Per cent indigenous vegetation cover (<50% or ≥50%) (pursuant to s60F (3) of the LLS Act);
- Evidence of significantly disturbed or modified land (pursuant to s60 J(2) of the LLS Act); and
- Presence of Category 2 matters as specified in s60I (2) of the LLS Act (e.g., presence of CEECs).

A summary of the reviewed land categorisation for the Subject Land is provided in **Table 5-2**. The proposed land categorisation is presented in **Figure 5-1**.

TABLE 5-2 PROPOSED LAND CATEGORISATION SUMMARY FOR THE SUBJECT LAND

Land Categorisation	Non-CEEC (ha)	CEEC (ha)	Grand Total (ha)
Category 1 - Exempt Land	415.34	0	415.34
Category 2 - Regulated Land	377.66	80.84	458.50
Category 2 - Vulnerable Land	4.92	1.61	6.54
Excluded Land	1.69	0	1.69
Total	**799.71**	**82.45**	**882.07**

The extent of Category 1 - Exempt Land identified in the proposed NVR map, as presented by this assessment, is 25.71 ha less than the draft NVR map, indicating general agreement between the two maps. However, spatial differences do exist between the draft NVR map and that proposed by this assessment, with these differences based on the detailed site investigations presented in this assessment and application of the precautionary principle.

Land categorisation by vegetation structure (i.e., woody vegetation and grassland condition state) is presented in **Table 5-3**.

TABLE 5-3 LAND CATEGORISATION SUMMARY BY VEGETATION STRUCTURE

Grassland Condition State	Non-CEEC (ha)	CEEC (ha)	EEC (ha)	Total (ha)
Low Condition Grassland				
Category 1 - Exempt Land	392.43	0	0	392.43
Category 2 - Regulated Land	132.65	45.02	0	177.67
Category 2 - Vulnerable Regulated Land (in-force)	3.71	1.09	0	4.8
Land excluded from the LLS Act	1.61	0	0	1.61
Moderate Condition Grassland				
Category 1 - Exempt Land	9.64	0	0	9.64
Category 2 - Regulated Land	135.98	24.02	0	160.00
Category 2 - Vulnerable Regulated Land (in-force)	0	0.5	0	0.5
Land excluded from the LLS Act	0	0	0	0
Woody vegetation				
Category 1 - Exempt Land	13.27	0	0	13.27
Category 2 - Regulated Land	104.73	11.73	4.38	120.84
Category 2 - Vulnerable Regulated Land (in-force)	0.27	0.02	0.94	1.23
Land excluded from the LLS Act	0.08	0	0	0.08

According to **Figure 3-5**, the extent of woody vegetation occurring within the Subject Land in 2011 was 104.3 ha. The mapped extent of woody vegetation presented as part of this assessment (and BDAR), mapped at a capture scale of 1:1,000 or less, delineated 135.56 ha for the same area. The difference between the two estimates is a function of scale and resolution, with the estimate through the detailed investigation presented in this report identifying a greater amount of woody vegetation.

Land excluded from the LLS Act occurs within the Subject Land and is limited to non-rural land zoning on the eastern edge of Walcha.

Conclusions by land categorisation type are provided in the following sections.

5.1 CATEGORY 2 - REGULATED LAND

Areas containing patches of woody vegetation or non-woody groundcover vegetation with more than 50% native groundcover vegetation have been mapped as Category 2 - Regulated Land (unless deemed to be significantly disturbed by prior earthworks (pursuant to s60J (2) of the LLS Act).

Lands containing vegetation that forms part of a listed CEEC, but comprise less than 50% native vegetation cover, are also designated as Category 2 - Regulated Land.

Scattered trees evident in the historical imagery have been mapped as Category 2 - Regulated Land and, in many cases, were found to be fully surrounded by Category 1 - Exempt Land. Notwithstanding, the groundcover beneath the drip line of these trees is likely to be Category 1 - Exempt Land.

Areas that cannot be reliably identified as Category 1 have been mapped as Category 2 - Regulated Land (e.g., areas of grassland that are significantly disturbed or modified but have high indigenous native vegetation cover).

5.2 CATEGORY 1 - EXEMPT LAND

Areas that qualify for designation as Category 1 - Exempt Land are:

- Lands cleared of woody vegetation prior to 1990 with a groundcover that is <50% indigenous vegetation; and/or
- Lands that are deemed to be significantly disturbed or modified (pursuant to s60J(2) of the LLS Act).

Generally, this non-woody vegetation cover, which is not reflective of pre-European vegetation cover for the locality, has been modified through persistent agricultural activity such as:

- Cropping and pasture modification in the more arable areas; and
- Livestock grazing in the less arable areas (e.g., steep slopes and ridges).

The vegetation of the road reserves may have been adversely impacted by edge effects from adjoining lands where actively used for agricultural activities and/or other routine activities associated with the management of public roads.

The LCA transect data indicates that most of the groundcover vegetation in these areas comprises <50% native vegetation cover. According to s60F (3) of the LLS Act, these areas qualify for classification as low conservation value grasslands and, subject to s60I (2) of the LLS Act, are to be designated as Category 1 - Exempt Land (pursuant to s60H (2)(a) of the LLS Act). The data supports a reasonable conclusion that these lands are low conservation value grasslands and thus represent Category 1 - Exempt Land, noting that these lands comprise:

1. High abundance of perennial exotic vegetation (i.e., >25% cover); and
2. Low native species richness (and per cent cover, noting this never exceeds 50%).

Temporal analysis of satellite imagery shows considerable evidence of significant disturbance or modification throughout the Subject Land. This is expected as the lands are zone rural, and the area is used for broadacre agriculture. Lands that are deemed to be significant disturbed or modified are to be designated as Category 1 - Exempt Land (pursuant to s60J (2) of the LLS Act). These have been identified through the 2017 land use mapping and/or satellite imagery analysis. However, lands that have ≥50% indigenous vegetation cover in these areas have been retained as Category 2 - Regulated Land (precautionary principle).

The proposed land categorisation mapping is supported in the west of the Subject Land by the 2017 Land Use Dataset (State Government of NSW and Department of Planning and Environment (DPE), 2020) which indicates that areas mapped as Category 1 - Exempt Land have been subject to cropping, irrigated cropping and/or are farm infrastructure.

The additional satellite imagery analysis performed for the 2016 – 2017 period supports this land use mapping and, in some areas, extends its reach.

The Category 1 - Exempt Land mapping is supported by the NSW Woody Vegetation Extent mapping (State Government of NSW and DCCEEW, 2019), which indicates that most of the Subject Land was cleared of woody vegetation and remains so following detailed site investigations.

DUKE STREET

THUNDERBOLTS WAY

NEW ENGLAND HIGHWAY

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F5-1 Proposed Land Categorisation Mapping

Map 1 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 2 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 3 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 4 of 43

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THUNDERBOLTS WAY

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 5 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 6 of 43

Winterbourne Wind Farm
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 7 of 43

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BLUE MOUNTAIN ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 8 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 9 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 10 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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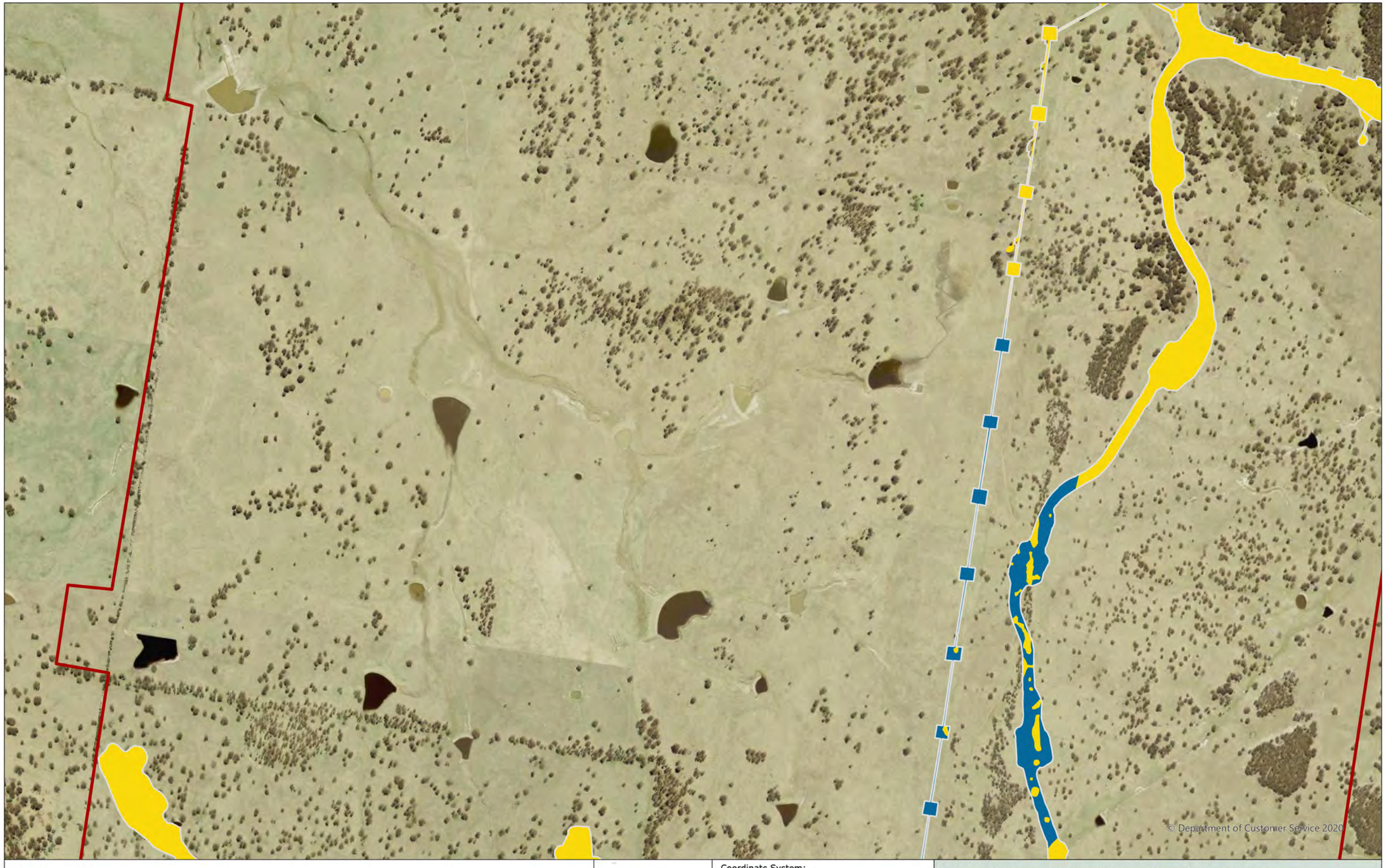

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 11 of 43

Winterbourne Wind Farm
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- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

Map 12 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

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F5-1 Proposed Land Categorisation Mapping

Map 13 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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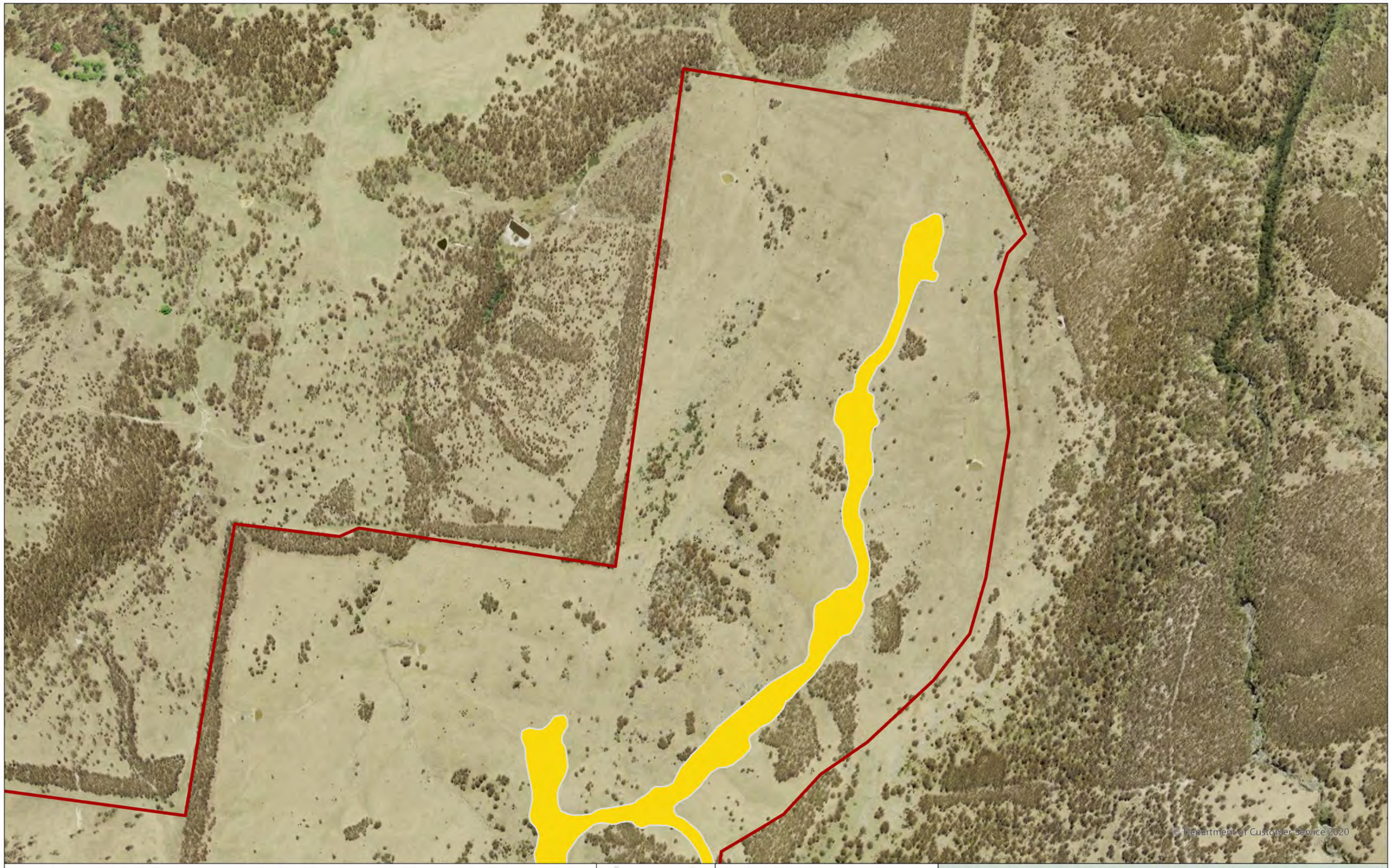

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- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

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Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

Map 15 of 43

Winterbourne Wind Farm
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BLUE MOUNTAIN ROAD

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- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

Map 16 of 43

Winterbourne Wind Farm
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BLUE MOUNTAIN ROAD

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- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

Map 17 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

Map 18 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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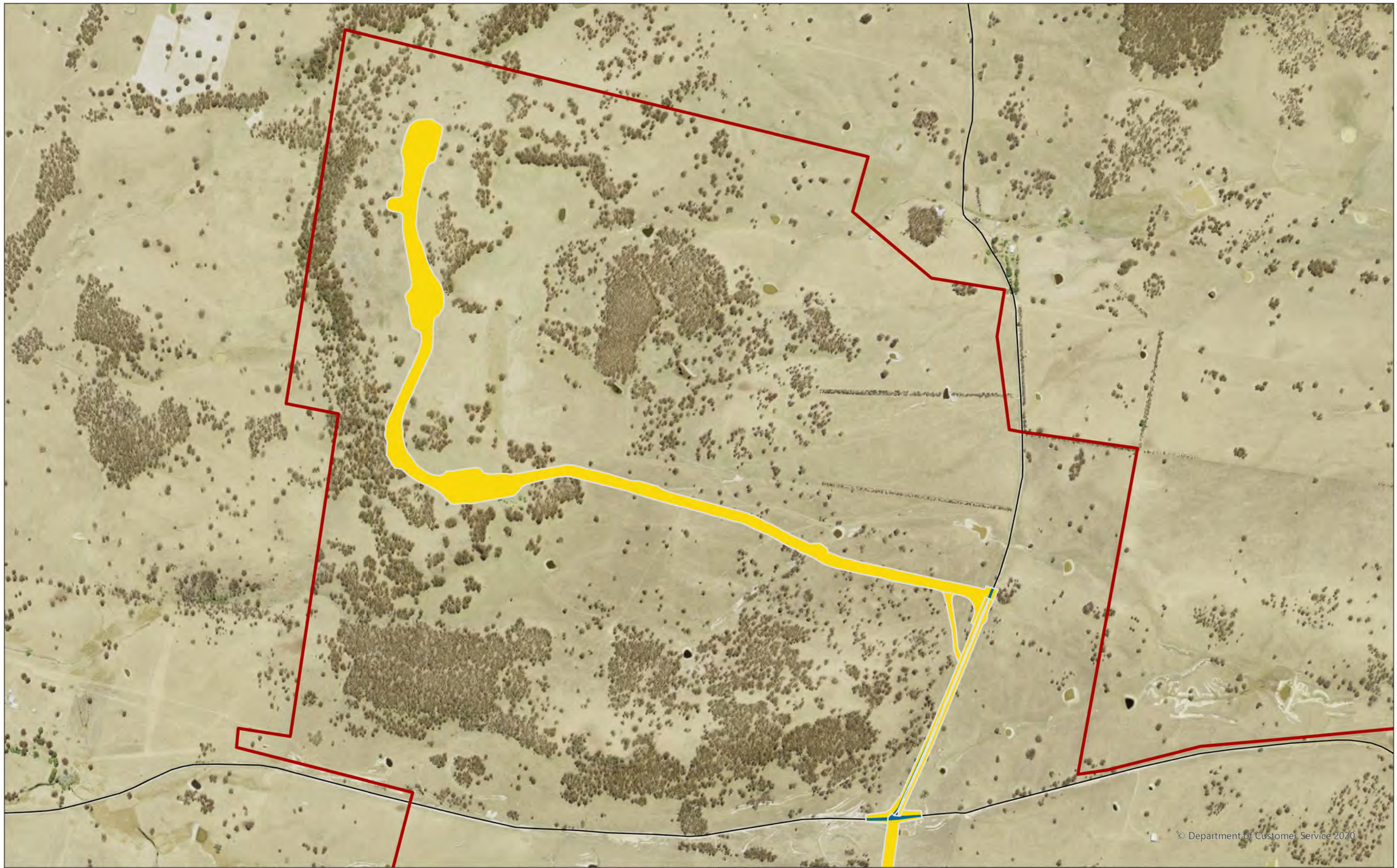

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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F5-1 Proposed Land Categorisation Mapping

Map 19 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

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F5-1 Proposed Land Categorisation Mapping

Map 20 of 43

Winterbourne Wind Farm
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WINTERBOURNE ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 21 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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WINTERBOURNE ROAD

BARK HUT ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

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F5-1 Proposed Land Categorisation Mapping

Map 22 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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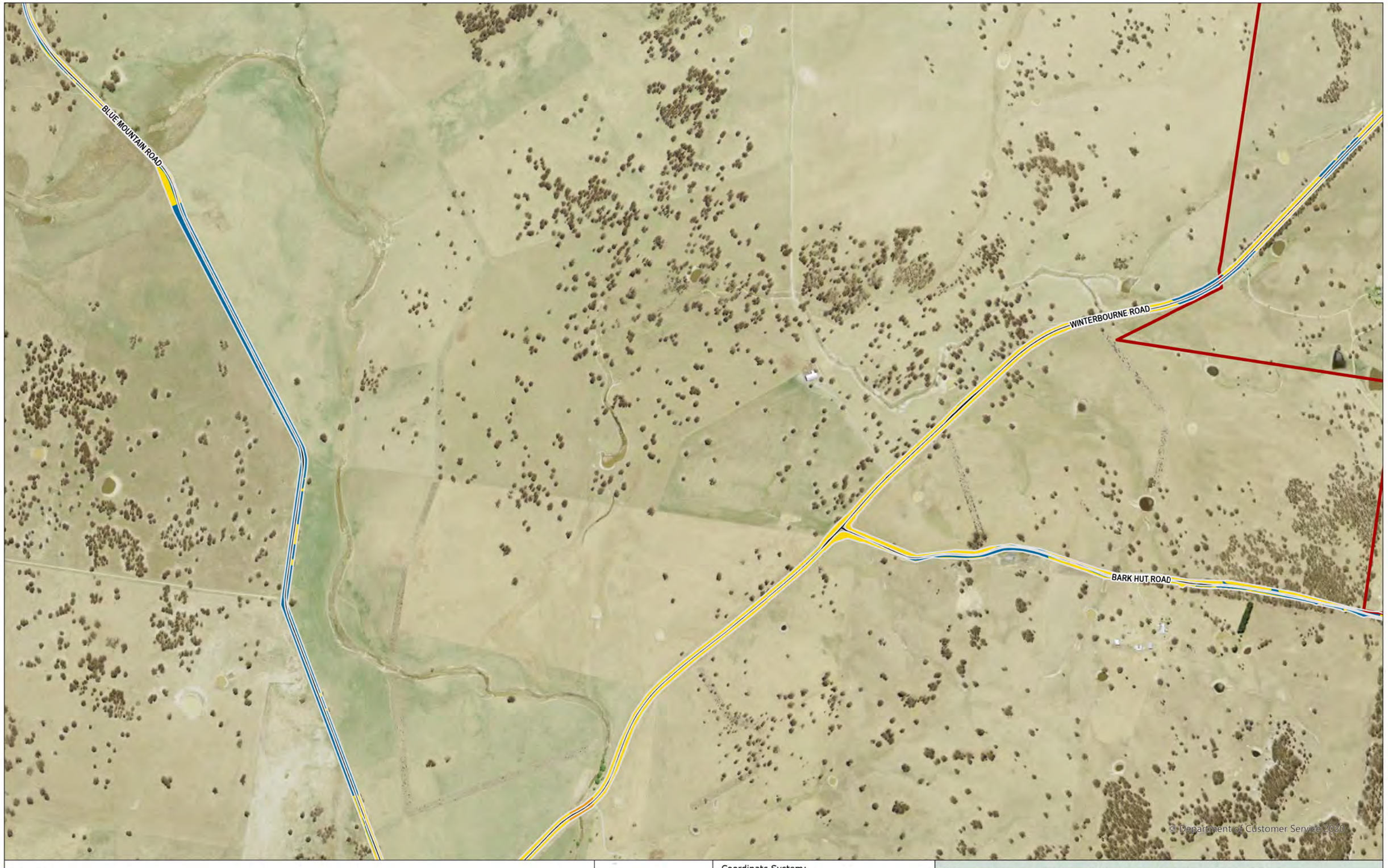

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 23 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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WINTERBOURNE ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
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F5-1 Proposed Land Categorisation Mapping

Map 24 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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WINTERBOURNE ROAD

EMU CREEK ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

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Drawing Size: A3

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F5-1 Proposed Land Categorisation Mapping

Map 25 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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EMU CREEK ROAD

MOONA PLAINS ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025

Created By: VN

Drawing Size: A3

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F5-1 Proposed Land Categorisation Mapping

Map 26 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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URALLA ROAD
EMU CREEK ROAD
DERBY STREET
WALCHA
OXLEY HIGHWAY

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
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F5-1 Proposed Land Categorisation Mapping

Map 27 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM

0760651_WWF_LCA_R3.aprx

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 28 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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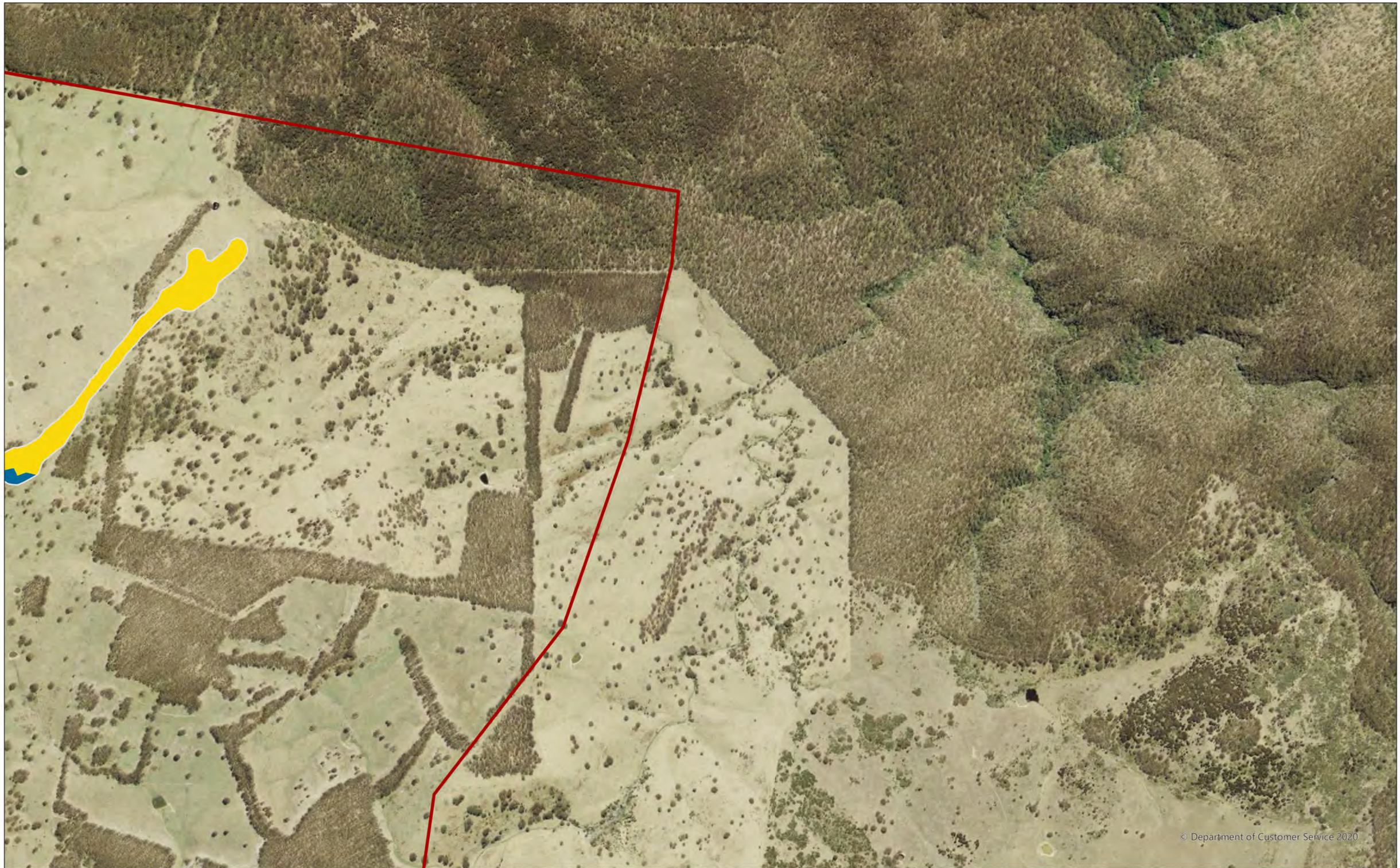
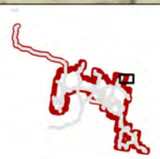


Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land



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F5-1 Proposed Land Categorisation Mapping

Map 29 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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WINTERBOURNE ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 30 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 31 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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BARK HUT ROAD

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
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F5-1 Proposed Land Categorisation Mapping

Map 32 of 43

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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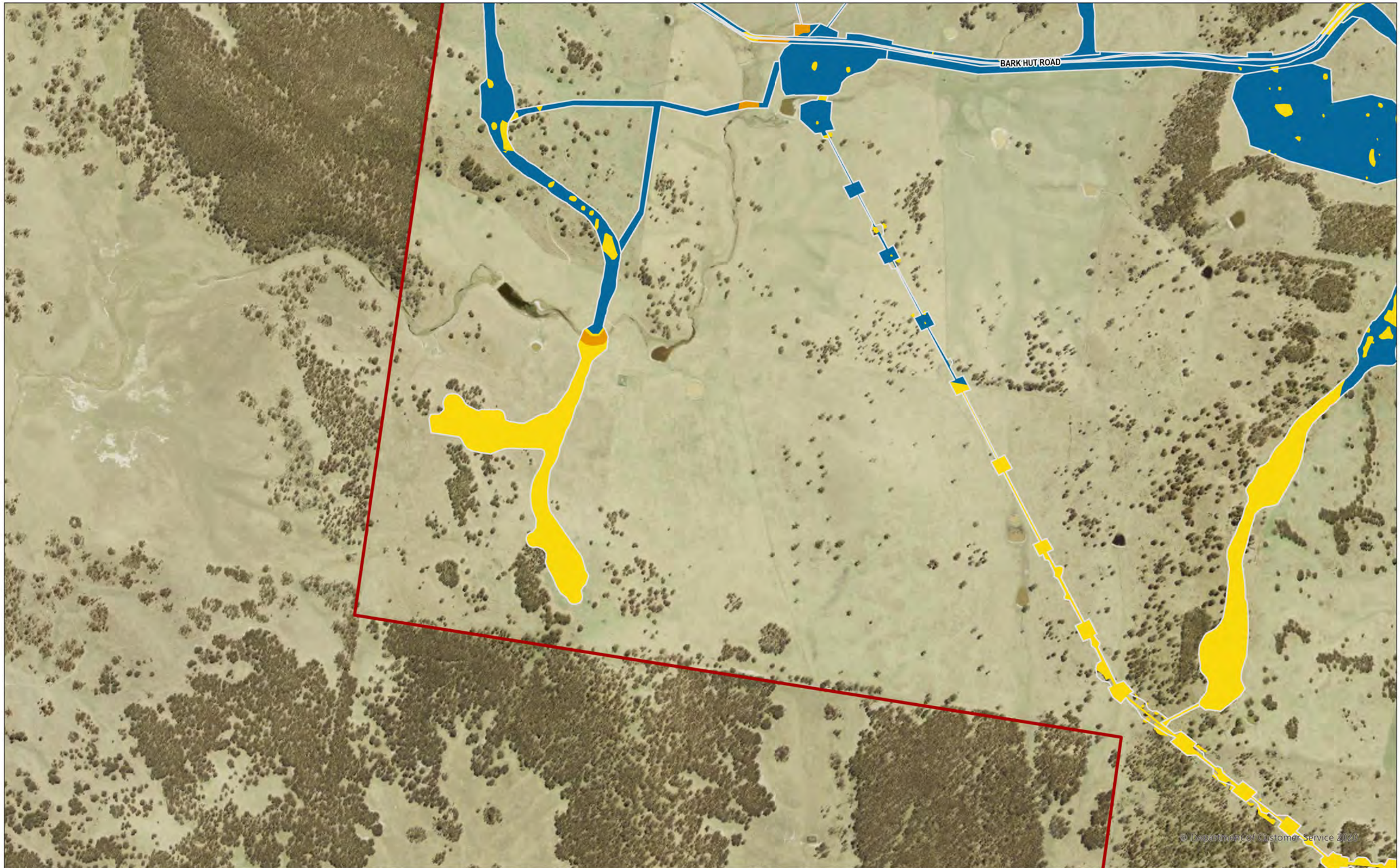
F5-1 Proposed Land Categorisation Mapping

Map 33 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

ERM



Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 34 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
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F5-1 Proposed Land Categorisation Mapping

Map 35 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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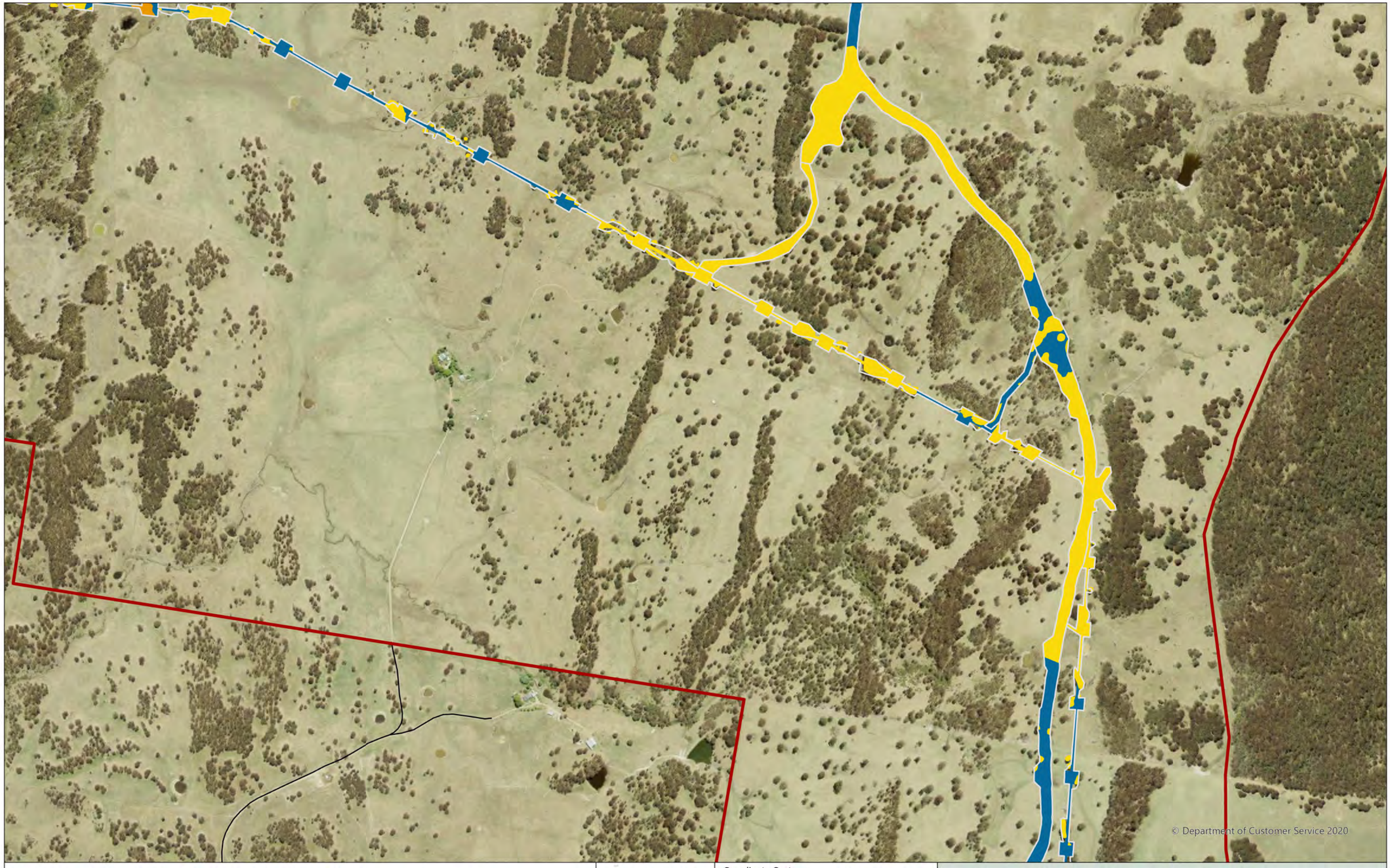

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
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F5-1 Proposed Land Categorisation Mapping

Map 36 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 37 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56

Date: 20/05/2025
Created By: VN
Drawing Size: A3

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F5-1 Proposed Land Categorisation Mapping

Map 38 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 39 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 40 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 41 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
GDA 1994 MGA Zone 56
Date: 20/05/2025
Created By: VN
Drawing Size: A3
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F5-1 Proposed Land Categorisation Mapping

Map 42 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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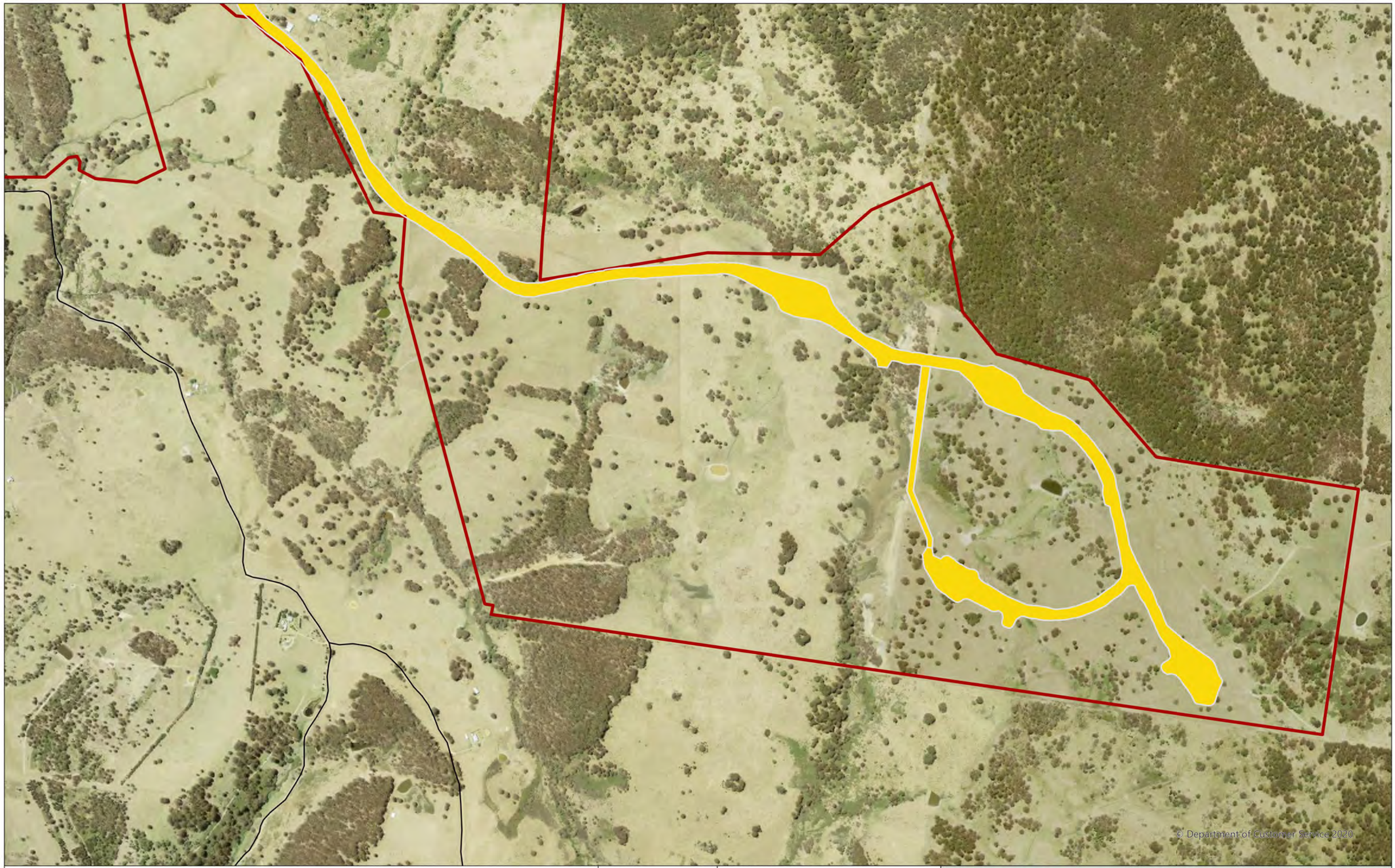

Legend

- Project Area
- Subject Land
- Highway / Major Road
- Local Road
- Category 1 - Exempt Land
- Category 2 - Regulated Land
- Category 2 - Vulnerable Land
- Excluded Land

Coordinate System:
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Drawing Size: A3
0 100 200 300m
1:10,000

F5-1 Proposed Land Categorisation Mapping

Map 43 of 43

Winterbourne Wind Farm
Land Categorisation Assessment Report
WWPL

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APPENDIX A DICHOTOMOUS KEYS FOR CEEC IDENTIFICATION

New England Peppermint Grassy Woodland ID Key (BC Act)

1. Vegetation within 100m of the site is in the valley flats subject to cold air drainage (paragraph 6 of the final determination)	Yes (go to 2) No (go to 5)
2. Is a eucalypt tree canopy present within 30m of the site (a 'patch')	Yes (go to 3) No (go to 12)
3. Is New England Peppermint the dominant canopy species (paragraph 4 of the final determination)	Yes (go to 4) No (go to 5)
4. Does the groundcover vegetation comprise >50% exotic perennial vegetation	Yes (CEEC with Category 1 groundcover) No (CEEC with understorey)
5. Is New England Peppermint present?	Yes (go to 8) No (go to 6)
6. Are any eucalypts **other** than the following present within the patch (notate relative abundance if present): *Eucalyptus blakelyi* *Eucalyptus dalrympleana* subsp. *heptantha* *Eucalyptus nicholii* *Eucalyptus pauciflora* *Eucalyptus radiata subsp. sejuncta*	Yes (go to 7) No (go to 8)
7. Is Ribbon Gum and/or Yellow Box present?	Yes (Not the community. Refer to other TEC identification guidelines) No (go to 8)
8. Is the groundcover vegetation dense with native grasses and herbs. Shrubs never being abundant?	Yes (go to 16) No (go to 9)
9. Does the groundcover vegetation comprise >50% exotic perennial vegetation	Yes (Category 1 land – not CEEC) No (go to 10)
10. Does the groundcover vegetation comprise >25% exotic perennial vegetation	Yes (go to 11) No (go to 17)

New England Peppermint Grassy Woodland ID Key (BC Act)

11. Are any of the following groundcover species present within a 1,000m^2 plot: *Asperula conferta, Poa sieberiana, Themeda australis, Juncus filicaulis, Dichondra repens, Carex inversa, Rumex brownii, Acaena ovina and Desmodium varians*? *OR* Is there any regenerating New England Peppermint?	Yes (go to 18) No (Not the Community)
Groundcover Assessment	
12. Is New England Peppermint located within 100m of the site	Yes (go to 16) No (go to 12)
13. Is Yellow Box located upslope and within 100m of the site	Yes (not the community. Refer to Box Gum Woodland final determination) No (go to 13)
14. Is Ribbon Gum located upslope and within 100m of the site	Yes (not the community. Refer to Ribbon Gum Woodland final determination) No (go to 14)
15. Does the groundcover vegetation comprise >50% exotic perennial vegetation	Yes (not the community and is likely Category 1 land) No (go to 16)
16. Does the groundcover vegetation comprise >25% exotic perennial vegetation	Yes (go to 17) No (go to 18)
17. Are any of the following groundcover species present within a 1,000m^2 plot: *Asperula conferta, Poa sieberiana, Themeda australis, Juncus filicaulis, Dichondra repens, Carex inversa, Rumex brownii, Acaena ovina and Desmodium varians*	No (not the community) Yes (go to 18)
18. Is the groundcover dense and comprise several of the following species: *Asperula conferta, Poa sieberiana, Themeda australis, Juncus filicaulis, Dichondra repens, Carex inversa, Rumex brownii, Acaena ovina and Desmodium varians*	Yes (is the community and is a moderate to high condition) No (go to 19)
19. Is New England Peppermint the dominant canopy species in proximal Eucalypts stand (i.e., stands within same landscape as in (1) above and within 100m)	Yes (is the community and is in a low condition) No (is not the community)

APPENDIX B LAND CATEGRORY ASSESSMENT TRANSECT DATA

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 01	50	33	17	0	0
LCA 02	51	37	11	1	0
LCA 03	47	36	17	0	0
LCA 04	59	22	18	1	0
LCA 05	57	36	7	0	0
LCA 06	56	30	12	2	0
LCA 07	75	9	16	0	0
LCA 08	96	2	1	1	0
LCA 09	39	54	7	0	0
LCA 10	59	38	1	2	0
LCA 11	82	3	15	0	0
LCA 12	3	75	17	4	1
LCA 13	30	28	42	0	0
LCA 14	45	38	17	0	0
LCA 15	5	87	8	0	0
LCA 16	45	41	14	0	0
LCA 17	4	61	34	0	1
LCA 18	6	66	27	1	0
LCA 19	4	79	17	0	0
LCA 20	5	67	28	0	0
LCA 21	0	94	6	0	0
LCA 22	50	35	15	0	0
LCA 23	2	67	31	0	0
LCA 24	2	77	20	1	0
LCA 25	30	62	8	0	0
LCA 26	33	51	16	0	0
LCA 27	8	73	19	0	0
LCA 28	35	55	10	0	0
LCA 29	50	46	4	0	0
LCA 30	83	13	4	0	0
LCA 31	86	7	7	0	0

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 32	30	62	8	0	0
LCA 33	24	62	14	0	0
LCA 34	18	77	5	0	0
LCA 35	48	37	15	0	0
LCA 36	39	51	10	0	0
LCA 37	58	29	13	0	0
LCA 38	36	36	1	0	27
LCA 39	72	17	11	0	0
LCA 40	33	66	1	0	0
LCA 41	64	31	5	0	0
LCA 42	49	36	15	0	0
LCA 43	72	20	2	0	6
LCA 44	1	54	22	4	19
LCA 45	1	57	26	2	14
LCA 46	38	48	14	0	0
LCA 47	8	79	11	1	1
LCA 48	13	38	32	15	2
LCA 49	19	46	29	3	3
LCA 50	3	84	12	0	1
LCA 51	1	95	3	0	1
LCA 52	27	56	15	2	0
LCA 53	64	4	30	1	1
LCA 54	5	86	3	5	1
LCA 55	29	56	15	0	0
LCA 56	13	50	32	5	0
LCA 57	25	39	27	4	5
LCA 58	76	12	10	2	0
LCA 59	69	7	24	0	0
LCA 60	41	31	18	7	3
LCA 61	42	23	35	0	0
LCA 62	58	3	28	10	1

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 63	57	1	31	10	1
LCA 64	30	67	3	0	0
LCA 65	57	0	34	9	0
LCA 66	54	2	41	2	1
LCA 67	1	51	46	1	1
LCA 68	66	10	21	2	1
LCA 69	74	6	18	2	0
LCA 70	46	5	45	2	2
LCA 71	1	81	11	3	4
LCA 72	34	31	31	1	3
LCA 73	0	77	8	8	7
LCA 74	27	37	23	11	2
LCA 75	73	10	12	0	5
LCA 76	68	7	23	0	2
LCA 77	53	13	34	0	0
LCA 78	0	80	0	4	16
LCA 79	9	49	31	8	3
LCA 80	10	73	2	14	1
LCA 81	26	61	11	0	2
LCA 82	7	87	0	5	1
LCA 83	26	24	48	1	1
LCA 84	9	70	20	0	1
LCA 85	28	34	26	5	7
LCA 86	83	6	6	4	1
LCA 87	81	8	8	1	2
LCA 88	32	39	24	5	0
LCA 89	75	4	18	0	3
LCA 90	59	5	27	9	0
LCA 91	38	36	20	1	5
LCA 92	23	56	10	2	9
LCA 93	13	40	25	6	16

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 94	6	12	69	9	4
LCA 95	14	52	20	4	10
LCA 96	82	4	13	1	0
LCA 97	17	76	0	6	1
LCA 98	42	9	47	1	1
LCA 99	43	18	34	0	5
LCA 100	39	6	49	2	4
LCA 101	56	1	43	0	0
LCA 102	35	1	64	0	0
LCA 103	88	0	11	0	1
LCA 104	12	72	12	4	0
LCA 105	28	59	13	0	0
LCA 106	20	78	2	0	0
LCA 107	85	3	11	0	1
LCA 108	45	45	4	0	6
LCA 109	29	66	5	0	0
LCA 110	79	0	5	16	0
LCA 111	84	0	6	3	7
LCA 112	88	1	10	0	1
LCA 113	64	8	28	0	0
LCA 114	1	78	13	5	3
LCA 115	40	30	9	10	11
LCA 116	52	26	5	4	13
LCA 117	6	82	3	3	6
LCA 118	1	82	13	1	3
LCA 119	54	26	20	0	0
LCA 120	55	33	12	0	0
LCA 121	4	68	28	0	0
LCA 122	77	20	2	1	0
LCA 123	7	80	13	0	0
LCA 124	51	31	17	1	0

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 125	50	28	22	0	0
LCA 126	44	39	12	1	4
LCA 127	41	50	7	1	1
LCA 128	69	14	16	1	0
LCA 129	62	32	4	2	0
LCA 130	30	50	17	2	1
LCA 131	85	14	1	0	0
LCA 132	2	89	9	0	0
LCA 133	32	54	10	1	3
LCA 134	5	90	5	0	0
LCA 135	39	32	22	7	0
LCA 136	72	21	6	1	0
LCA 137	2	93	5	0	0
LCA 138	12	82	6	0	0
LCA 139	27	63	10	0	0
LCA 140	13	79	3	5	0
LCA 141	45	18	30	7	0
LCA 142	63	23	14	0	0
LCA 143	8	83	9	0	0
LCA 144	36	63	1	0	0
LCA 145	8	88	4	0	0
LCA 146	3	92	2		3
LCA 147	12	86	1	1	0
LCA 148	25	75	0	0	0
LCA 149	18	41	2	32	7
LCA 150	80	0	20	0	0
LCA 151	75	18	4	1	2
LCA 152	33	57	3	4	3
LCA 153	42	53	3	1	1
LCA 154	13	84	0	2	1
LCA 155	12	76	9	2	1

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 156	46	38	11	2	3
LCA 157	2	85	13	0	0
LCA 158	75	9	6	5	5
LCA 159	14	74	12	0	0
LCA 160	11	72	17	0	0
LCA 161	21	66	12	1	0
LCA 162	45	48	7	0	0
LCA 163	95	4	0	0	1
LCA 164	26	74	0	0	0
LCA 165	76	20	2	2	0
LCA 166	77	0	1	14	8
LCA 167	57	34	0	9	0
LCA 168	66	16	8	5	5
LCA 169	29	59	1	10	1
LCA 170	4	86	3	4	3
LCA 171	52	17	20	5	6
LCA 172	63	13	22	1	1
LCA 173	83	15	2	0	0
LCA 174	98	2	0	0	0
LCA 175	20	75	5	0	0
LCA 176	24	66	9	0	1
LCA 177	54	38	6	1	1
LCA 178	99	0	0	0	1
LCA 179	48	42	0	10	0
LCA 180	2	44	50	0	4
LCA 181	56	35	9	0	0
LCA 182	61	37	0	0	2
LCA 183	57	16	4	12	11
LCA 184	64	32	0	0	4
LCA 185	83	16	0	1	0
LCA 186	97	0	3	0	0

Transect/Plot	Native	Exotic (Perennial)	Exotic (Annual)	Bare	Litter
LCA 187	97	0	1	1	1
LCA 188	13	78	0	7	2
LCA 189	94	0	6	0	0
LCA 190	92	0	8	0	0
LCA 191	26	69	3	1	1
LCA 192	73	14	0	7	6
LCA 193	82	15	1	0	2
LCA 194	87	7	0	6	0
LCA 195	57	17	1	17	8
LCA 196	0	0	0	19	81
LCA 197	93	1	0	4	2
LCA 198	90	9	0	1	0
LCA 199	87	1	9	3	0
LCA 200	91	0	1	6	2
LCA 201	70	21	0	9	0
LCA 202	86	0	5	8	1
LCA 203	18	24	9	9	40
LCA 204	64	16	4	13	3
LCA 205	86	7	2	3	2
LCA 206	84	12	0	0	4
LCA 207	98	0	0	1	1
LCA 208	87	9	1	1	2

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APPENDIX B NGH TECHNICAL MEMOS

Field Survey Technical Memo 1

Winterbourne Wind Farm

September 2023

Project Number: 23-247

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Document verification

Survey	Winterbourne Wind Farm
Project Number:	23-247
Project File Name:	23-247 23-247 Field Survey Technical Memo 18-23 September Final V1.0

Revision	Date	Prepared by	Reviewed by	Approved by
Final	17/1123	Elise Keane	Bianca Heinze	Bianca Heinze

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Executive Summary

Surveys were undertaken across the entire Winterbourne Wind Farm study area to determine locations of breeding habitat for Glossy Black-Cockatoo and Little Eagle. Where habitat was identified, transects were undertaken searching for suitable hollow-bearing trees for Glossy Black-Cockatoo and suitable stick nests for Little Eagle. Vantage point surveys were also undertaken to look for individuals flying within the study area.

A total of 18 suitable hollow-bearing trees were recorded for Glossy Black-Cockatoo and 15 suitable stick nests were recorded for Little Eagle. None of these habitats showed signs of use, and there were no individuals of Glossy Black-Cockatoo or Little Eagle observed within the study area. One raptor was observed flying on the edge of the study area, however it could not be confirmed whether this was a Little Eagle due to the distance. The individual was flying over an open paddock, and not displaying breeding behaviour.

Camera traps were deployed at five sites with suitable habitat for Rufous Bettong, with three cameras per site. Suitable habitat was considered to be those sites with the highest grass cover and the lowest grazing pressure.

There were four areas which were unable to be surveyed for Glossy Black-Cockatoo or Little Eagle due to time and access constraints. It is recommended that these be surveyed within the next round of surveys.

1. Methods

1.1. Desktop assessment

A literature review was carried out, including:

- Breeding habitat, nest-site characteristics and productivity of the little eagle (*Hieraaetus morphnoides*) near Armidale, New South Wales (Larkin, Jenkins, McDonald, & Debus, 2020)
- Parental time-budgets and breeding behaviour of the Little Eagle *Hieraaetus morphnoides* in northern New South Wales (Debus, 2011)
- Glossy Black-Cockatoo Conservation Guidelines for south-eastern Queensland and far north-eastern New South Wales (Glossy Black Conservancy, 2022)
- Characteristics of tree hollows used by Australian birds and bats (Goldingay, 2009)
- The breeding ecology and movements of the Little Eagle in the ACT and nearby NSW, 2017-2020 with reference to the Ginninderry development area (Rae, 2021)
- Heavy livestock grazing negatively impacts a marsupial ecosystem engineer (Neilly & Schwarzkopf, 2018)
- Fauna Technical Note Series: Eagle Nest Management (Forest Practices Authority, 2015)

1.2. Field survey

The following guidelines are relevant to the survey:

- Threatened biodiversity survey and assessment Guidelines for developments and activities (2004 working draft) (DEC, 2004)

Vantage point surveys were undertaken to determine flight paths for Glossy Black-cockatoos and Little Eagle. Survey effort included two within hours of dawn and dusk respectively and five midday surveys. Unbaited camera traps targeting Rufous Bettong were deployed strategically across woodland and forest areas with denser ground cover vegetation. Cameras were pointed diagonally across the trail and left in place for 21 days. Further information is provided in Section 1.2.4.

1.2.1. Consultation

BCD was consulted via email on 27 June 2023 to confirm survey effort and method for Rufous Bettong; BCD input was received on 17 August 2023. These emails are appended in Appendix C.

1.2.2. Survey team and dates

Table 1-1 Survey Team and Survey Name

Name	Role	Fieldwork Conducted	Survey dates
Elise Keane	Senior Ecologist (Team Leader)	Habitat survey for Glossy Black Cockatoo and Little Eagle, marking habitat trees including suitable hollows and nests, vantage point surveys, camera deployment for Rufous Bettong	18th – 22nd Sep 2023

Name	Role	Fieldwork Conducted	Survey dates
Izaac Graham-Higgs	Ecologist	Habitat survey for Glossy Black Cockatoo and Little Eagle, marking habitat trees including suitable hollows and nests, vantage point surveys, camera deployment for Rufous Bettong	18th – 22nd Sep 2023

1.2.3. Survey conditions

Conditions were predominantly mild, dry, and calm during the beginning of the week. Gusty winds were present on Thursday, with overcast and windy conditions on Friday. Weather data from Armidale (BOM) provided in Table 1-2 below.

Table 1-2 Survey weather conditions over the survey period

Date	Min. temp (°C)	Max temp (°C)	Max. wind gust (km/h)	Weather conditions, recorded on site
18th	8.8	26.5	28	Clear day, warm temperatures
19th	9.9	24.8	35	Clear day, warm temperatures
20th	8.8	24.1	39	Clear day, warm temperatures
21st	12.3	25.3	56	Gusty winds
22nd	6.0	15.7	48	Cloudy, windy conditions

1.2.4. Survey effort

Within each nine hour survey day, a total of 14 habitat transects were undertaken for Glossy Black-Cockatoo and 14 habitat transects were undertaken for Little Eagle (see Appendix B). Four vantage point surveys, two within two hours of sunrise and two within two hours of sunset, were undertaken across the study area for Glossy Black-Cockatoo. Vantage point surveys were also undertaken around midday each day for Little Eagle.

Cameras were deployed for Rufous Bettong at five locations, with three cameras deployed at each location (see Appendix B). Suitable habitat as per Table 1-4 was targeted.

Table 1-3 Survey effort

Target	Attributes collected in the field	Survey locations/areas	Survey effort
Habitat ground-truthing for Glossy Black-Cockatoo and Little Eagle	Rapid assessments Habitat tree	Woodland patches across the entire study area	41 rapid assessments of potential habitat for threatened species were undertaken across the entire study area (Appendix A). Where patches met the characteristics, as per Table 1-4, habitat transects were undertaken to record habitat trees and search for threatened species. Vantage point surveys were undertaken for both species, with two undertaken within two hours of dawn and dusk respectively, and five midday surveys.
Rufous Bettong	Fauna survey locations	Grassy woodland with moderate structural diversity	Required survey effort is 238 trap nights. Cameras were deployed at five locations, with three cameras at each location for a total of 15 camera traps. These will be left in place for approximately 31 days with pick-up scheduled 23 October 2023 (total planned trap nights 450).

Table 1-4 Species and habitats targeted

Common name	Scientific Name	BC Act	EPBC Act	Habitats targeted
Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	Vulnerable	Vulnerable	Woodlands with trees greater than 60 DBH, containing hollows greater than 15cm, located >8m above ground. Angle of trunk or branch not more than 45°

Common name	Scientific Name	BC Act	EPBC Act	Habitats targeted
				from vertical.
Little Eagle	*Hieraaetus morphnoides*	Vulnerable	Not listed	Woodland patches at least 4 ha, midslope of approximately 15% less than 200m from woodland edge, sheltered from westerly winds and midday sun. Nest orientation northerly to easterly, in canopy 14-24m high.
Rufous Bettong	*Aepyprymnus rufescens*	Vulnerable	Not listed	Grassy woodland with moderate structural diversity. Associated with medium sized litter (<5mm), high coarse woody debris, high level of fine woody debris, low to tall grass height and medium to low density shrub layer. Avoid heavily grazed areas.

2. Results

2.1. Threatened species

There were no Glossy Black-Cockatoo or Little Eagle recorded during the targeted surveys. The likelihood of breeding habitat occurrence (based on habitat assessment) for these species are listed in Table 2-1. Appendix A shows the locations of potential habitat for these species.

Eighteen (18) suitable hollow bearing trees for Glossy Black-Cockatoo were recorded, however none of these hollows showed signs of use (such as whitewash, debris including chewed *Allocasuarina* seeds (orts) at the base of the tree, or animals coming in or out of the hollow).

A total of 35 stick nests were recorded, of which 15 were considered to be suitable nest trees for Little Eagle. One nest with evidence of use was found and considered likely to be utilised by Wedge-tailed Eagle, due to the size of the nest (1.6m wide; Figure 2-1 and Figure 2-2). The remaining nests had no signs of use (such as whitewash, fresh nesting material, debris at the base of the tree, or birds within or nearby the nest).

Neither Glossy-Black Cockatoo or Little Eagle were observed during the vantage point surveys. One raptor was observed flying on the edge of the study area, however it could not be confirmed whether this was a Little Eagle due to the distance. The individual was flying over open paddock and was not displaying breeding behaviour such as carrying nesting materials, interacting with another individual, such as displaying

(soaring, diving, engaging in chases) or a male calling in flight with a female begging from a tree (OEH, 2023). Seven Wedge-tailed Eagles were recorded within the study area during the targeted surveys.

Table 2-1 Targeted threatened species likelihood of breeding habitat occurrence

Scientific name	Common name	Status		Potential breeding habitat occurrence (Moderate, High, Recorded)
		BC Act	EPBC Act	
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	Vulnerable	Vulnerable	Low
Hieraaetus morphnoides	Little Eagle	Vulnerable	Not listed	Moderate

Figure 2-1 Large nest recorded within study area

Figure 2-2 Whitewash under tree containing large nest

2.2. Rufous Bettong camera locations

Eleven (11) sites were assessed for potential habitat for Rufous Bettong. Of these, the five sites with the highest quality habitat were selected, with three cameras deployed at each site (locations shown in Appendix B). Optimal habitat was considered areas with the highest grass coverage, and the lowest level of grazing pressure.

3. Limitations

The areas shown on Figure 5-1 (Appendix A) could not be accessed to carry out the surveys due to constraints such as access (lambing) and time limitations.

The gusty winds experienced during the survey on the 21st September may have resulted in lower bird activity. Wind speeds were up to 56 km/hr, and general bird activity was quiet during the morning vantage point survey.

While every effort has been made to obtain accurate and reliable data about presence of hollows, it is difficult to be certain about whether an apparent hollow is actually hollow, and vice versa, without physical inspection. Thus, it is likely that some hollows have been overlooked while others have been recorded when they are in fact not hollow. The figures obtained are considered to be a reliable estimation of type and number of hollows located within the study area. Hollows less than 10 cm diameter may have been overlooked as they are too small to be utilised by Glossy Black-Cockatoos and were outside of the scope of work.

No Glossy Black-Cockatoo or Little Eagle were observed during the vantage point surveys. As such, species presence could not be utilised to prioritise habitat areas to survey. Due to the large area to cover, greater survey effort was undertaken within areas containing patches of large trees (>60 DBH). As such, limited habitat transects were undertaken within woodland patches dominated by younger trees (<60 DBH) or scattered paddock trees, unless time permitted a higher survey effort.

4. Recommendations

There were four patches with potentially suitable breeding habitat for Glossy Black-Cockatoo and/or Little Eagle which were unable to be surveyed, due to time or access constraints (Figure 5-1). It is recommended that surveys are undertaken within these patches during the October survey effort.

5. References

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APPENDIX A MAPS

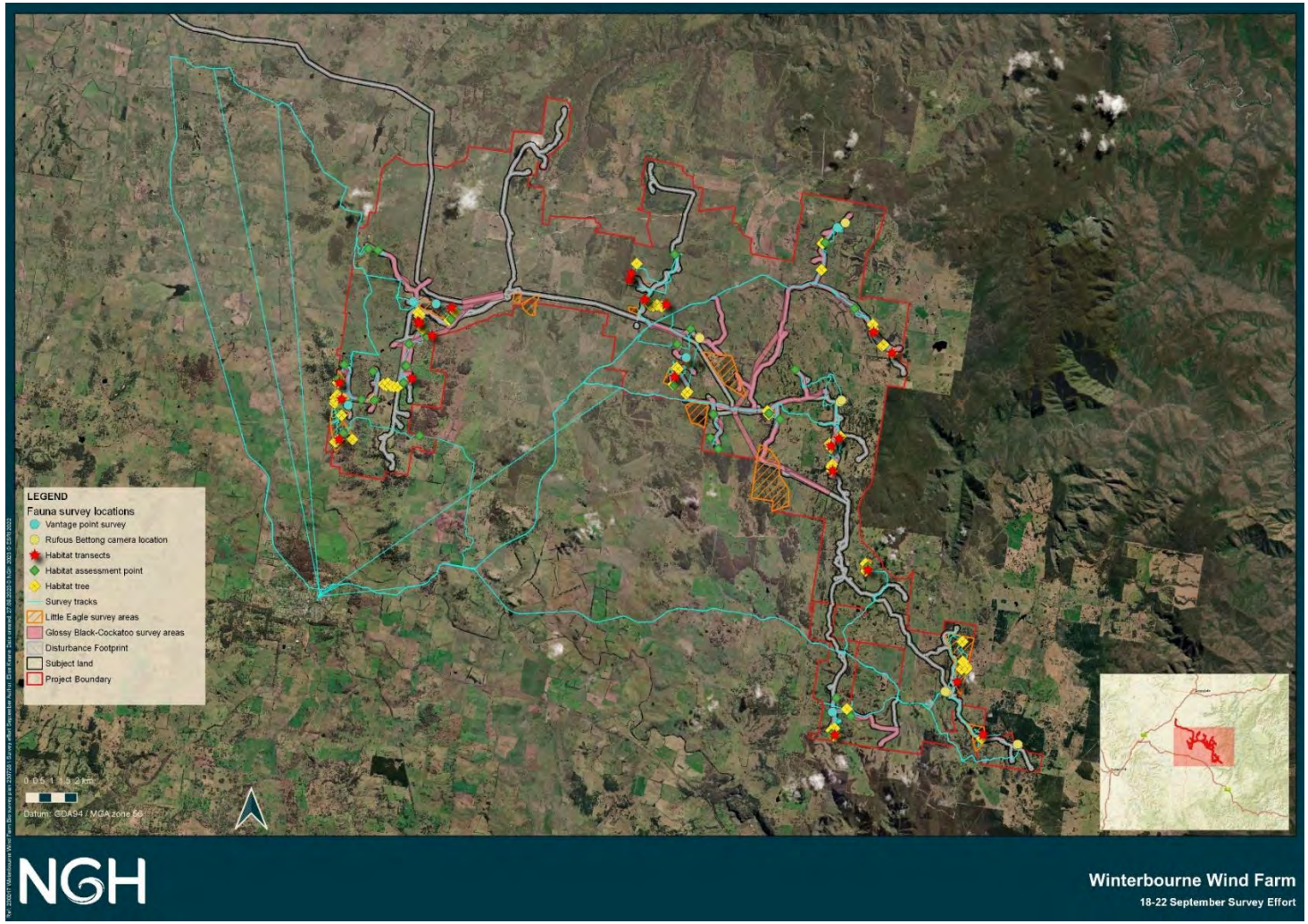

Figure 5-1 Overview of survey effort

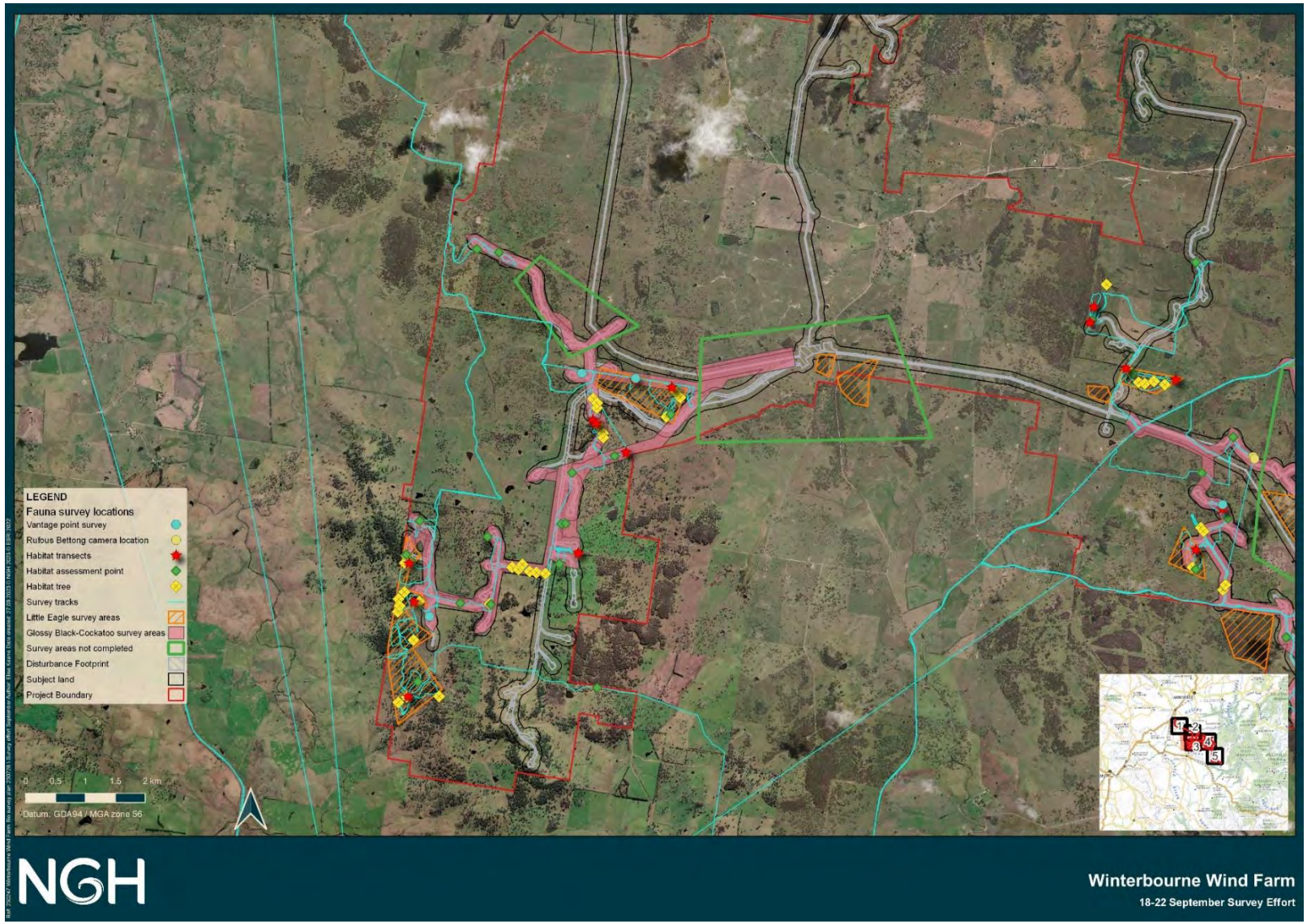

Figure 5-2 Survey effort map 1 of 3

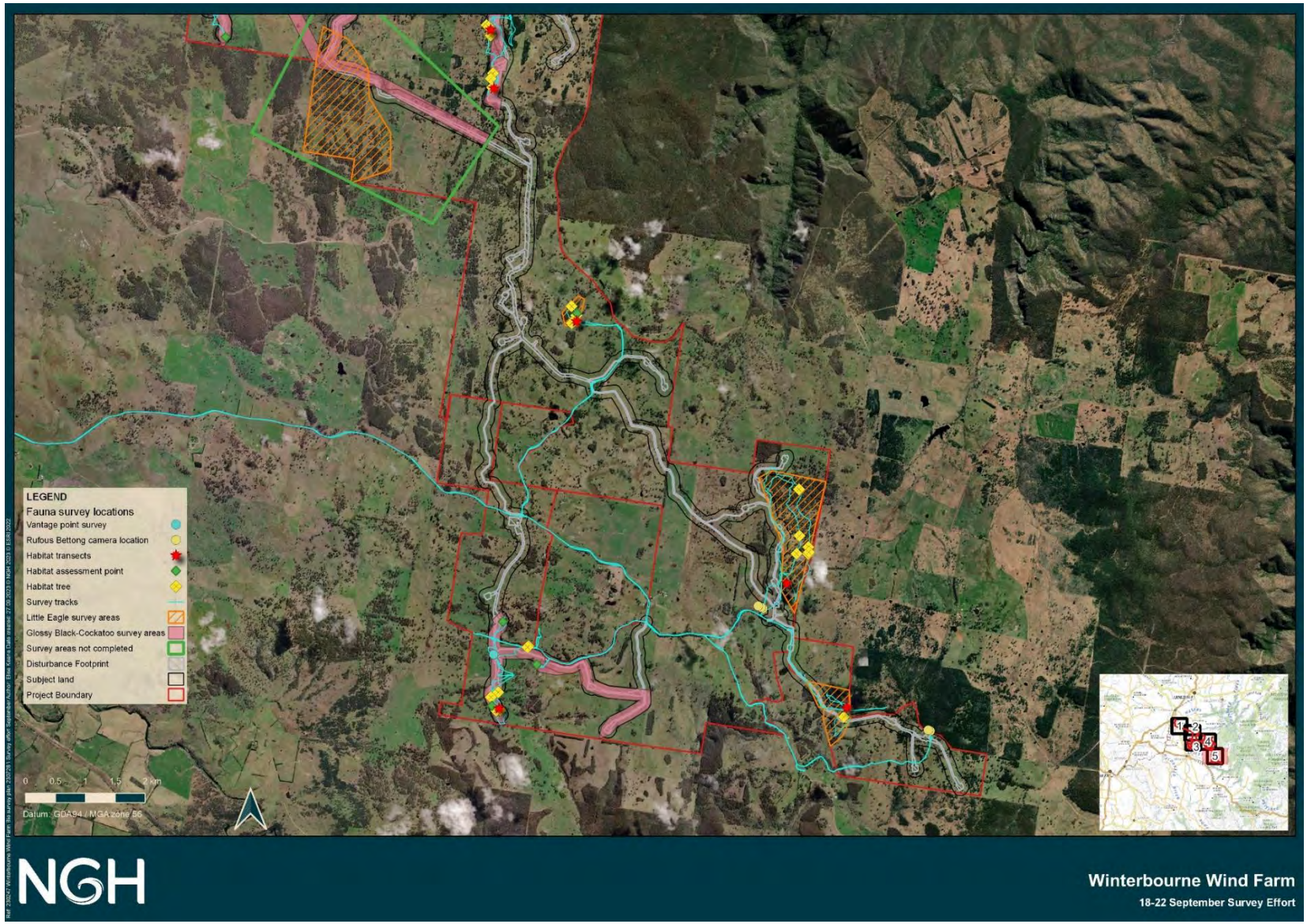

Figure 5-3 Survey effort map 2 of 3

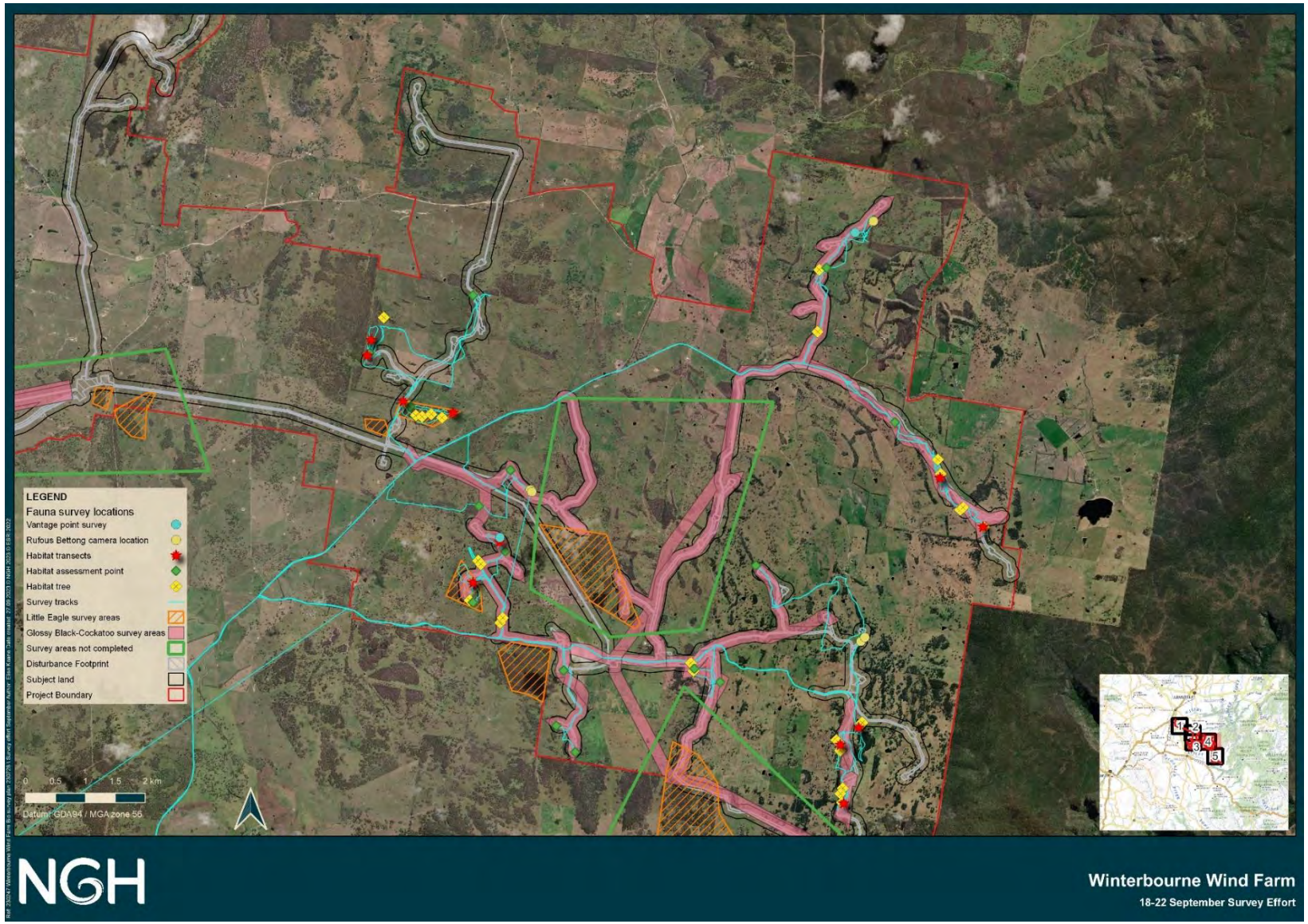

Figure 5-4 Survey effort map 3 of 3

APPENDIX B RUFOUS BETTONG CAMERA LOCATIONS

Coordinates	Photo	Habitat Description
Site 1		
381121, 6581940		Low *Eucalyptus caliginosa* woodland with tussock grasses, including *Austrostipa verticillata*. Lightly grazed.
381137, 6581938		

381157, 6581905		
Site 2		
386851, 6586415		Low *Eucalyptus caliginosa* woodland with tussock grasses, including *Poa sieberiana*, *Microlaena stipoides* and *Echinopogon caespitosus*. Lightly grazed.

386859, 6586422		
386868, 6586432		
Site 3		

386661, 6579404		*Eucalyptusa nobilis, Eucalyptus radiata* subsp. s*ejuncta* and *Eucalyptus obliqua* w*oodland* with sparse grass cover. Grass species include *Dactylis glomerata* and *Microlaena* stipoides. Moderately grazed.
386657, 6579402		

386724, 6579470		
Site 4		
390867, 6567996		*Eucalyptus radiata* subsp. s*ejuncta, Eucalyptus acaciiformis* and *Eucalyptus dalrympleana* w*oodland.* Dominated by *Microlaena stipoides,* with *Poa sieberiana* and *Dactylis glomerata* also present. Some LWD.

390840, 6568014		Moderately grazed.
390789, 6568038		
Site 5		

393666, 6565946		Has been historically burnt, during a high intensity fire in Summer 2019/2020. *Eucalyptus obliqua, Eucalyptus radiata* subsp. s*ejuncta,* and *Eucalyptus nobilis* woodland. Groundcover dominated by *Lomandra longifolia.*
393662, 6565948		

393633, 6565963		

APPENDIX C CONSULTATION WITH BCD

From: Dimitri Young <Dimitri.Young@environment.nsw.gov.au>

Sent: Thursday, August 17, 2023 2:26 PM

To: Bianca Heinze <bianca.h@nghconsulting.com.au>

Cc: Beth Noel <beth.n@nghconsulting.com.au>; Jane Lambert <jane.lambert@nghconsulting.com.au>; Shania Channon <shania.c@nghconsulting.com.au>; Tom Schmidt <tom.schmidt@environment.nsw.gov.au>

Subject: BCD Response - RE: Winterbourne Wind Farm additional surveys - survey effort Rufous Bettong & Eastern Pymgy-possum (SSD-10471) (Our ref 230247)

Dear Ms Heinze

Thank you for your e-mail below to the Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment, seeking advice on Rufous Bettong and Eastern Pygmy-possum survey effort for the Winterbourne Wind Farm Environmental Impact Statement (EIS). I appreciate the opportunity to provide further input and apologise for the delay in responding.

- Rufous Bettong
  - We are satisfied your proposed survey effort accords with our previous advice and is suitable for Rufous Bettong for this site.

- Eastern Pygmy-possum
  - We understand survey for the species to date is 252 hair tube nights and 56 camera nights.
  - We recommend additional survey effort of 20 cameras, each in place for a minimum of 14 nights.
  - Cameras should be:
    - well distributed across the site and target the areas of highest quality habitat
    - arboreally mounted (mounted at approximately head height)
    - baited with universal bait mix (peanut butter/oat/honey) and sprayed very liberally with honey-water in front of each camera, or trained on vegetation which contains profusely flowering species from the families Proteaceae and Mimosaceae
    - aimed with a short field of view (<2m to bait or flowering shrubs).
  - We note your intention to mobilise a survey team in September. The survey period for Eastern Pygmy-possum is October to March. Survey nights for Eastern Pygmy-possum should only be counted starting in October, and baits and honey-water spray should be fresh at this time.
- The suggested survey effort for Rufous Bettong and Eastern Pygmy-possum described above is only specific to the Winterbourne Wind Farm project site and should not be used to inform surveys for any other sites.

If you have any further questions, or wish to discuss this advice, please do not hesitate to contact Mr Tom Schmidt, Senior Conservation Planning Officer, at tom.schmidt@environment.nsw.gov.au or on 6659 8227.

Yours sincerely

Dimitri Young

Senior Team Leader Planning, North East Branch

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From: Bianca Heinze <bianca.h@nghconsulting.com.au>

Sent: Tuesday, 27 June 2023 4:39 PM

To: Dimitri Young <Dimitri.Young@environment.nsw.gov.au>

Cc: Beth Noel <beth.n@nghconsulting.com.au>; Jane Lambert <jane.lambert@nghconsulting.com.au>; Shania Channon <shania.c@nghconsulting.com.au>

Subject: Winterbourne Wind Farm additional surveys - survey effort Rufous Bettong & Eastern Pymgy-possum (SSD-10471) (Our ref 230247)

Hi Dimitri

I am writing in relation to BCD's submission regarding Winterbourne Wind Farm EIS (SSD-10471), specifically in relation to additional targeted surveys for eastern pygmy-possum and rufous bettong. We are seeking confirmation from BCD with our proposed survey approach and effort for additional surveys. There is approximately 200 ha of woodland in the subject site although not all of this has suitable microhabitat for either species. Please note we would need to mobilise a team in September, so would greatly appreciate your response by the end of July to allow for planning and costing the field work.

Rufous Bettong

Following surveys undertaken in 2021, we received advice from BCD (as appended to the BDAR in Appendix O) for Rufous Bettong. We have based our proposed survey plan on this advice as well as on survey effort undertaken to date.

As per the email advice, we propose to place the cameras strategically across denser ground cover vegetation in woodland and forest, point diagonally across a trail, leave in place for 21 days, without bait. The initial survey effort recommended was 16 cameras for 21 nights (336 nights). As 98 camera trap nights have already been undertaken (see table below), we propose to undertake an additional 12 cameras for 21 nights (252 additional nights). This would exceed the total 336 nights recommended.

Rufous Bettong

Total survey nights	Camera
Undertaken	98
Required	336
Difference	**238**

Eastern Pygmy-possum

We have based our proposed survey plan for Eastern Pygmy-possum on the *Threatened Species Survey & Assessment Guidelines*, substituting small Elliot traps with cameras for a total of 100 trap nights per stratification unit and/or 240 hair tubes per 100 ha of stratification unit. There is one stratification unit – broadly, woodland with shrubby understorey in moderate condition. As you can see in the table below, the hair tube effort undertaken is sufficient. The camera trap effort requires an additional 44 nights. We propose 5 tree-mounted cameras with baits for 14 nights.

Eastern Pygmy-possum

Total survey nights	Hair tube	Camera / Elliot
Undertaken	252	56
Required (per 100 or 50 ha)	240	100
Difference	12	44

Happy to discuss with you further. Look forward to your reply by the end of July.

Kind Regards,

Bianca Heinze

Senior Ecologist

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Field Survey Technical Memo 2

Winterbourne Wind Farm

October 2023

Project Number: 23-247

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Survey	Winterbourne Wind Farm
Project Number:	23-247
Project File Name:	23-247 Field Survey Technical Memo 2-6 October Final V1.01

Revision	Date	Prepared by	Reviewed by	Approved by
Final V1.0	13/10/2023	Izaak Graham-Higgs	Bianca Heinze	Bianca Heinze
Final V1.01	14/03/2024	Emma Barlow	Bianca Heinze	Bianca Heinze

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Appendix C Eastern Pygmy Possum Camera Results.....C-I

Executive Summary

Follow-up surveys were undertaken to complete survey of breeding habitat for Glossy Black-Cockatoo and Little Eagle, commenced in September 2023. Methods followed those used in September.

An additional 21 suitable hollow-bearing trees were recorded for Glossy Black-Cockatoo and 13 suitable stick nests were recorded for Little Eagle. None of these features showed signs of use, and there were no individuals of Glossy Black-Cockatoo or Little Eagle observed within the study area.

Targeted frog surveys were undertaken at East Lynne and Ellandonan properties, to determine if the habitat was suitable for *Litoria boorroolongensis, L.daviesae, L.subglandulosa, L.piperata* and *Adelotus brevis*. Both locations had low quality habitat due to degradation such as pugging by livestock (cows and sheep) and weed invasion such as Fringed Sedge *Carex crinita* and Blackberry *Rubus fruticosus agg*.

Camera traps were deployed at three sites with suitable habitats for the Eastern Pygmy Possum, with 20 total cameras. Suitable habitat was considered to be those sites with PCTs associated with the species and in the highest condition.

None of the targeted species were detected during the surveys.

1. Methods

1.1. Desktop assessment

The following guidelines are relevant to the survey:

- Threatened biodiversity survey and assessment Guidelines for developments and activities (2004 working draft) (DEC 2004)
- NSW Survey Guide for Threatened Frogs (DPE, 2020)

In addition to the literature cited for Survey Memo 1, the following literature review was used to design the survey:

- Detection of the Eastern Pygmy-possum *Cercartetus nanus* (Marsupialia: Burramyidae) at Barren Grounds Nature Reserve, New South Wales (Harris & Goldingay, 2005)

1.2. Field survey

1.2.1. Consultation

BCD was consulted via email on 27 June 2023 to confirm survey effort and method for Eastern Pygmy Possum; BCD input was received on 17 August 2023.

1.2.2. Survey team and dates

The survey was undertaken between 3rd – 6th Oct 2023 as shown in Table 1-1.

Table 1-1 Survey team at Winterbourne

Name	Role	Fieldwork Conducted	Survey dates
Nicholas Gale	Senior Ecologist (Team Leader)	Habitat survey for Glossy Black Cockatoo and Little Eagle, marking habitat trees including suitable hollows and nests, camera deployment for Eastern Pygmy possum. Targeted frog surveys for: *L.boorroolongensis, L.daviesae, L.subglandulosa, L.piperata* and *Adelotus brevis*.	3rd – 6th Oct 2023
Izaak Graham-Higgs	Ecologist	Habitat survey for Glossy Black Cockatoo and Little Eagle, marking habitat trees including suitable hollows and nests, camera deployment for Eastern Pygmy possum. Targeted frog surveys for: *L.boorroolongensis, L.daviesae, L.subglandulosa, L.piperata* and *Adelotus brevis*.	3rd – 6th Oct 2023

1.2.3. Survey conditions

Conditions were predominantly mild, dry, and calm during surveys, with some exceptions. Weather data from Woolbrook (BOM) provided in Table 1-2 below. Scattered showers occurred on 5 October. Conditions were generally calm, with a cool change on 6 October bringing the coldest morning of the month.

Table 1-2 Survey weather conditions over the survey period

Date	Min. temp (°C)	Max temp (°C)	Max. wind gust (km/h)	Rain (mm)	Weather conditions, recorded on site
2/10/2023	7.5	29.0	Calm	0	Travel to site
3/10/2023	6.5	29.0	Calm	0	Clear day. Very hot.
4/10/2023	11.0	23.5	NNW 4	0	Clear day. Cool change and rain in the afternoon.
5/10/2023	5.0	16.0	NW 19	13	Slightly cloudy, with some wind.
6/10/2023	-2.5	20.5	Calm	0	Cold in the morning, clear day.

1.2.4. Survey effort

Survey effort for surveys targeting Glossy Black-Cockatoo, Little Eagle, Eastern Pygmy Possum and amphibians is given in (Table 1-3). Habitat transects were undertaken for Glossy Black-Cockatoo and the Little Eagle in areas of suitable habitat (see Appendix B). Vantage point surveys were undertaken at lunchtime each day for Little Eagle. Cameras were deployed for the Eastern Pygmy Possum at three locations, with six to seven cameras deployed at each location (see Appendix B). Suitable habitat as per Table 1-4 was targeted.

Table 1-3 Survey effort

Target	Attributes collected in the field	Survey locations/areas	Effort
Habitat ground-truthing for Glossy Black-Cockatoo and Little Eagle	Rapid assessments Habitat tree	Potential habitat woodland patches as mapped across the study area	Undertaking rapid assessment of potential habitat for threatened species across the entire study area. Where patches met the characteristics, as per Table 1-4, habitat transects were undertaken to record habitat trees and search for threatened species. Four midday vantage point surveys were undertaken for Little Eagle.

Target	Attributes collected in the field	Survey locations/areas	Effort
Easten Pygmy Possum	Fauna survey locations	Grassy woodland with moderate structural diversity	Cameras were deployed at three locations, with six to seven cameras at each location. A total of 20 cameras were deployed.
Frog surveys for: *L.boorroolongensis, L.daviesae, L.subglandulosa, L.piperata* and *Adelotus brevis*.	Potential habitat Start and end point of survey transect Identified frog locations	Riparian zones	Aural-visual surveys were undertaken looking for potential threatened target species and breeding habitat in accordance with NSW amphibian survey guidelines (DPE, 2020).

Table 1-4 Species and habitats targeted

Common name	Scientific Name	BC Act	EPBC Act	Habitats targeted
Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	Vulnerable	Vulnerable	Woodlands with trees greater than 60cm diameter at breast height (DBH), containing hollows greater than 15cm, located >8m above ground. Angle of trunk or branch not more than 45° from vertical.
Little Eagle	*Hieraaetus morphnoides*	Vulnerable	Not listed	Woodland patches at least 4 ha, midslope of approximately 15% less than 200m from woodland edge, sheltered from westerly winds and midday sun. Nest orientation northerly to easterly, in canopy 14-24m high.
Eastern Pygmy Possum	*Cercartetus nanus*	Vulnerable	Not listed	Associated PCTs in good condition.

Common name	Scientific Name	BC Act	EPBC Act	Habitats targeted
Booroolong Frog	*Litoria booroolongensis*	Endangered	Endangered	Permanent streams with rocky structures
Davies' Tree Frog	*L.daviesae*	Vulnerable	Not listed	Permanent slow flowing small streams
Glandular Frog	*L.subglandulosa*	Vulnerable	Not listed	Permanent streams
Peppered Tree Frog	*L.piperata*	Vulnerable	Vulnerable	Permanent streams with rocky structures
Tusked Frog	*Adelotus brevis*	Endangered Population	Not listed	Permanent slow flowing small streams

2. Results

2.1. Threatened Species

None of the target species were recorded during the targeted surveys, however Spotted-tail Quoll was recorded on Camera Trap 787 located at camera Site 2 on 11 October 2023 (Figure 2-3). The likelihood of occurrence (based on habitat assessment) for frogs is listed in Table 2-1. The likelihood of breeding habitat occurrence for Glossy Black-Cockatoos and Little Eagle remains unchanged from the evaluation given in the September survey memo. Appendix A shows the locations of potential habitat for these species.

An additional twenty-one (21) suitable hollow bearing trees for Glossy Black-Cockatoo were recorded, however none of these hollows showed signs of use (such as whitewash, debris including *Allocasuarina* seeds at the base of the tree, or animals coming in or out of the hollow).

A total of thirteen (13) stick nests were recorded which are considered to be suitable nest trees for Little Eagle, however the nests had no signs of use (such as whitewash, debris at the base of the tree, or animals within or nearby the nest).

No Little Eagles were observed during midday vantage point surveys. One (1) Wedge-tailed Eagle was incidentally recorded within the study area during the targeted surveys, flying less than 20m from the ground.

Targeted frog surveys were undertaken at East Lynne property and Ellandonan property, to determine if the habitat was suitable for *Litoria boorroolongensis, L.daviesae, L.subglandulosa, L.piperata* and *Adelotus brevis*. Both locations had low quality habitat due to degradation such as pugging by livestock (cows and sheep) and weed invasion such as Fringed Sedge *Carex crinita* and Blackberry *Rubus fruticosus agg*.

The East Lynne's habitat overall was not suitable for target species: lacking in cobble banks for *L.boorroolongensis;* no suitable overstorey was present for *L.daviesae, L.subglandulosa, L.piperata* and *Adelotus brevis.* Over the transect *L.dumerlli, L.Verreauxii, L.tasmaniensis* and *Crinia. signifera* were heard calling. See Figure 2-1 for an example of the aquatic habitat.

Ellandonan's habitat was very degraded and not suitable for target species; lacking in cobble banks for *L.boorroolongensis* and no suitable overstorey was present for *L.daviesae, L.subglandulosa, L.piperata.* No frogs were heard or seen along the transect. See Figure 2-2 for an example of the aquatic habitat.

Table 2-1 Targeted threatened species surveyed for and the likelihood of occurrence

Scientific name	Common name	Status		Potential occurrence (Low, Moderate, High, Recorded)	Recorded in targeted surveys
		BC Act	EPBC Act		
Easten Pygmy Possum	*Cercartetus nanus*	Vulnerable	Not listed	Low	No
Booroolong Frog	*Litoria booroolongensis*	Endangered	Endangered	Low	No
Davies' Tree Frog	*L.daviesae*	Vulnerable	Not listed	Low	No
New England Tree Frog	*L.subglandulosa*	Vulnerable	Not listed	Low	No
Peppered Tree Frog	*L.piperata*	Vulnerable	Vulnerable	Low	No
Tusked Frog	*Adelotus brevis*	Endangered Population	Not listed	Low	No

Figure 2-1 East Lynne property frog habitat

Figure 2-2 Ellandonan property frog habitat

2.2. Eastern Pygmy Possum Camera Locations

Four (4) sites were assessed for potential habitat for Eastern Pygmy Possums. Of these, the three sites with the highest quality habitat were selected, with six or seven cameras deployed at each site depending on the quality of habitat (refer to Table 2-2 below and Appendix B for photos and GPS co-ordinates). Suitable habitat was considered to be those sites with PCTs associated with the species and the best condition vegetation.

Table 2-2 Eastern Pygmy Possum camera trap locations

Site ID	Habitat description	Number of cameras
1	PCT 567	6
2	PCT 568	7
3	PCT 1194	7
Total cameras		**20**

2.3. Eastern Pygmy Possum camera results

A total of 14 species were captured on the cameras between 3rd October and 24th October (Table 2-3, Appendix C). This included one sighting of a Spotted-tailed Quoll (*Dasyurus maculatus*) which is shown in Figure 2-3. Characteristics such as exposure and brightness of the image have been altered to improve visibility of the quoll, which is within the yellow circle on the right side of the central tree climbing over a fallen log on the ground.

There were two potential photos of Eastern Pygmy Possum at camera 786, however these images were identified as a Bush Rat (*Rattus fuscipes*) on account of the base and taper of the tail and a Sugar Glider (*Petaurus breviceps*) on account of the large size, fat tail and large pointed ears.

Figure 2-3 Image of Spotted-tailed Quoll captured on 11th October 2023 at camera site 2.

Table 2-3 Species captured on cameras.

Site	Species Name	Common Name	BC Act Status	EPBC Act Status	Number of times seen
1	*Corvus sp.*	Raven			1
	Dasyurus maculatus	Spotted-tailed Quoll	V	E	1
	Felis catus	Feral Cat			1
	Macropus giganteus	Eastern Grey Kangaroo			16
		Eastern Grey Kangaroo with Juvenile			1
	Macropus rufogriseus	Red-necked Wallaby			9
		Red-necked Wallaby Juvenile			1
		Red-necked Wallaby with Juvenile			2
	Trichosurus vulpecula	Common Brushtail Possum			10
		Common Brushtail Possum with Juvenile			4
	Vulpes vulpes	Red Fox			2
	Wallabia bicolor	Swamp Wallaby			6

Site	Species Name	Common Name	BC Act Status	EPBC Act Status	Number of times seen
	Arachnids	Spider			1
	Unknown	Unknown Large Animal			1
2	*Corvus sp.*	Raven			1
	Macropus giganteus	Eastern Grey Kangaroo			5
	Platycercus elegans	Crimson Rosella			1
	Platycercus eximius	Eastern Rosella			3
	Trichosurus vulpecula	Common Brushtail Possum			14
		Common Brushtail Possum with Juvenile			4
	Wallabia bicolor	Swamp Wallaby			1
	Arachnids	Spider			1
	Acridotheres tristis	Common Myna			1
3	*Macropus giganteus*	Eastern Grey Kangaroo			2
	Petaurus breviceps	Sugar Glider			1
	Rattus fuscipes	Bush Rat			1
	Trichosurus vulpecula	Common Brushtail Possum			6

3. Limitations

No Glossy Black-Cockatoo or Little Eagle were observed during the vantage point surveys. As such, species presence could not be utilised to prioritise habitat areas to survey. Due to the large area to cover, greater survey effort was undertaken within areas containing patches of large trees (>60cm diameter-at-breast-height - DBH). As such, limited habitat transects were undertaken within woodland patches dominated by younger trees (<60cm DBH) or scattered paddock trees, unless time permitted a higher survey effort.

The days leading up to and during the frog surveys were mostly dry which may have reduced the detectability of the frog species surveyed.

While every effort has been made to obtain accurate and reliable data about presence of hollows, it is difficult to be certain about whether an apparent hollow is actually hollow, and vice versa, without physical inspection. Thus, it is likely that some hollows have been overlooked while others have been recorded when they are in fact not hollow. The figures obtained are considered to be a reliable estimation of type and number of hollows located within the study area. Hollows less than 10 cm diameter may have been overlooked as they are too small to be utilised by Glossy Black-Cockatoos and were outside of the scope of work.

4. Recommendations

Frog surveys were not able to be completed at the Mount View property due to issues with site accessibility; potential habitat for Booroolong Frog, Davies' Tree Frog, Glandular Tree Frog, Peppered Tree Frog and Tusked Frog may occur here. It is recommended that surveys are undertaken within these patches during the next October survey effort.

5. References

DPE. (2020). *NSW Survey Guide for Threatened Frogs.* Department of Planning and Environment.

Harris, J. M., & Goldingay, R. L. (2005). Detection of the eastern pygmy-possum Cercartetus nanus (Marsupialia: Burramyidae) at Barren Grounds Nature Reserve, New South Wales. *Australian Mammalogy*, 27: 85-88.

APPENDIX A MAPS

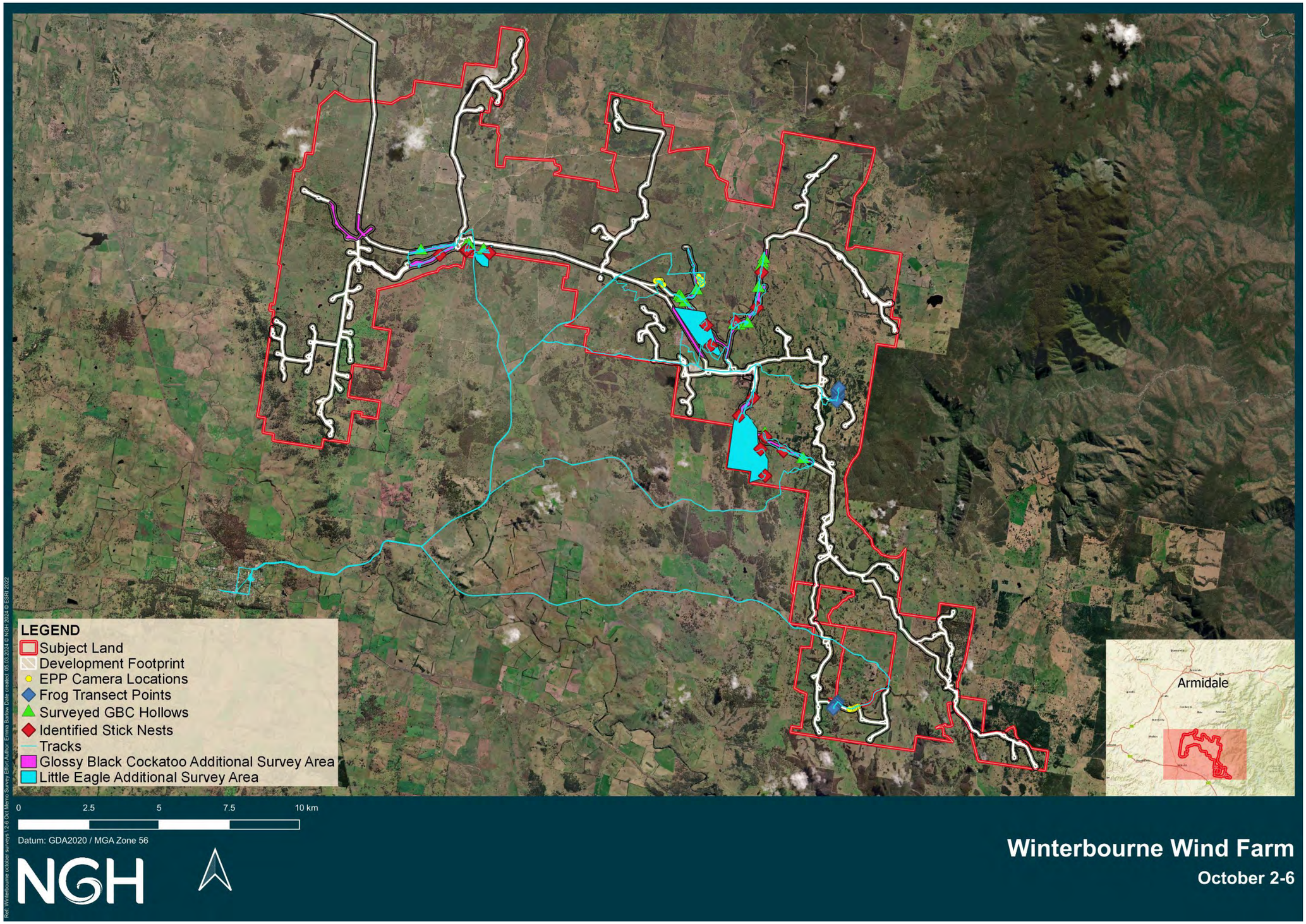

Figure 5-1 Overview of survey effort

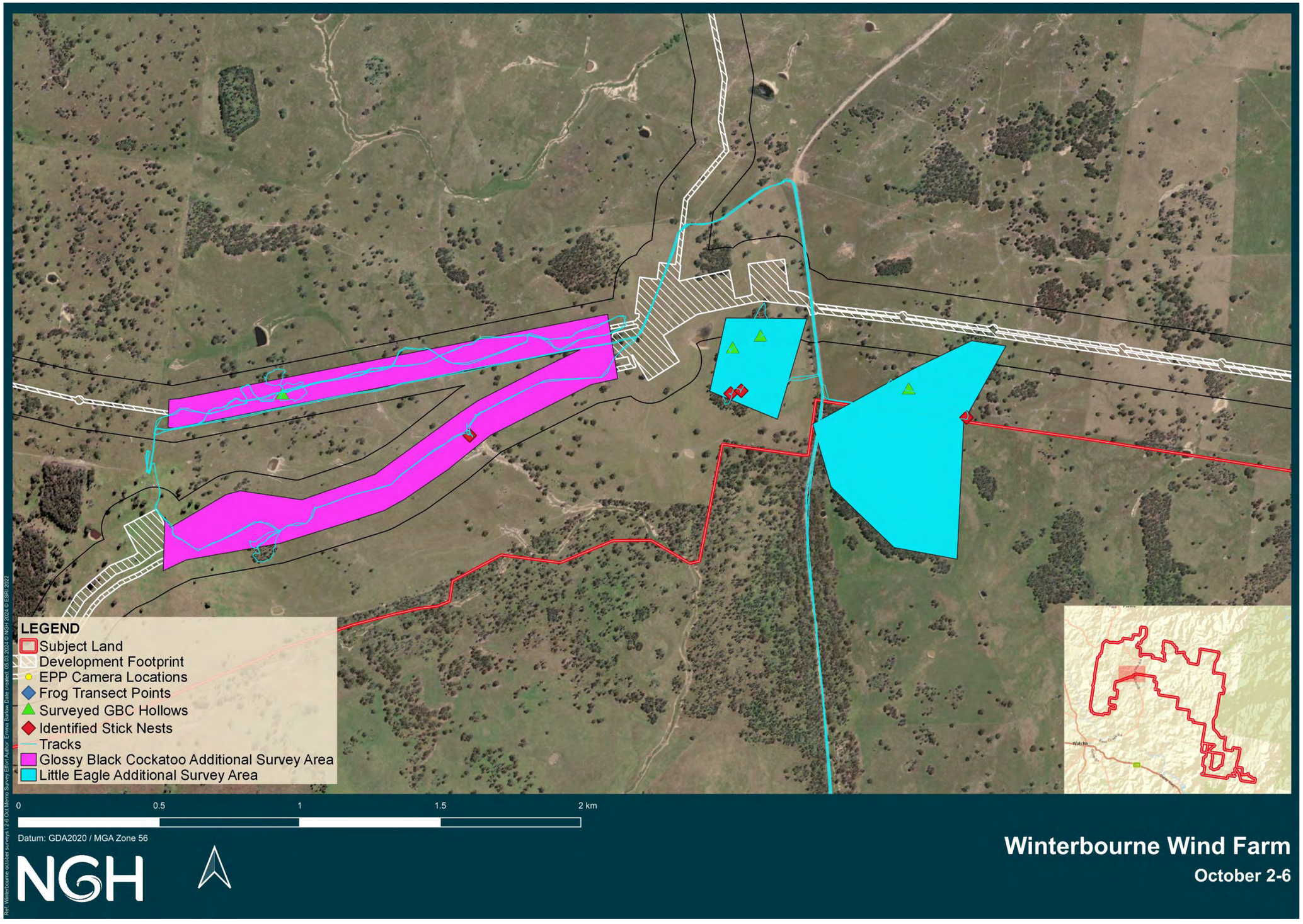

Figure 5-2 Survey effort map 1 of 4

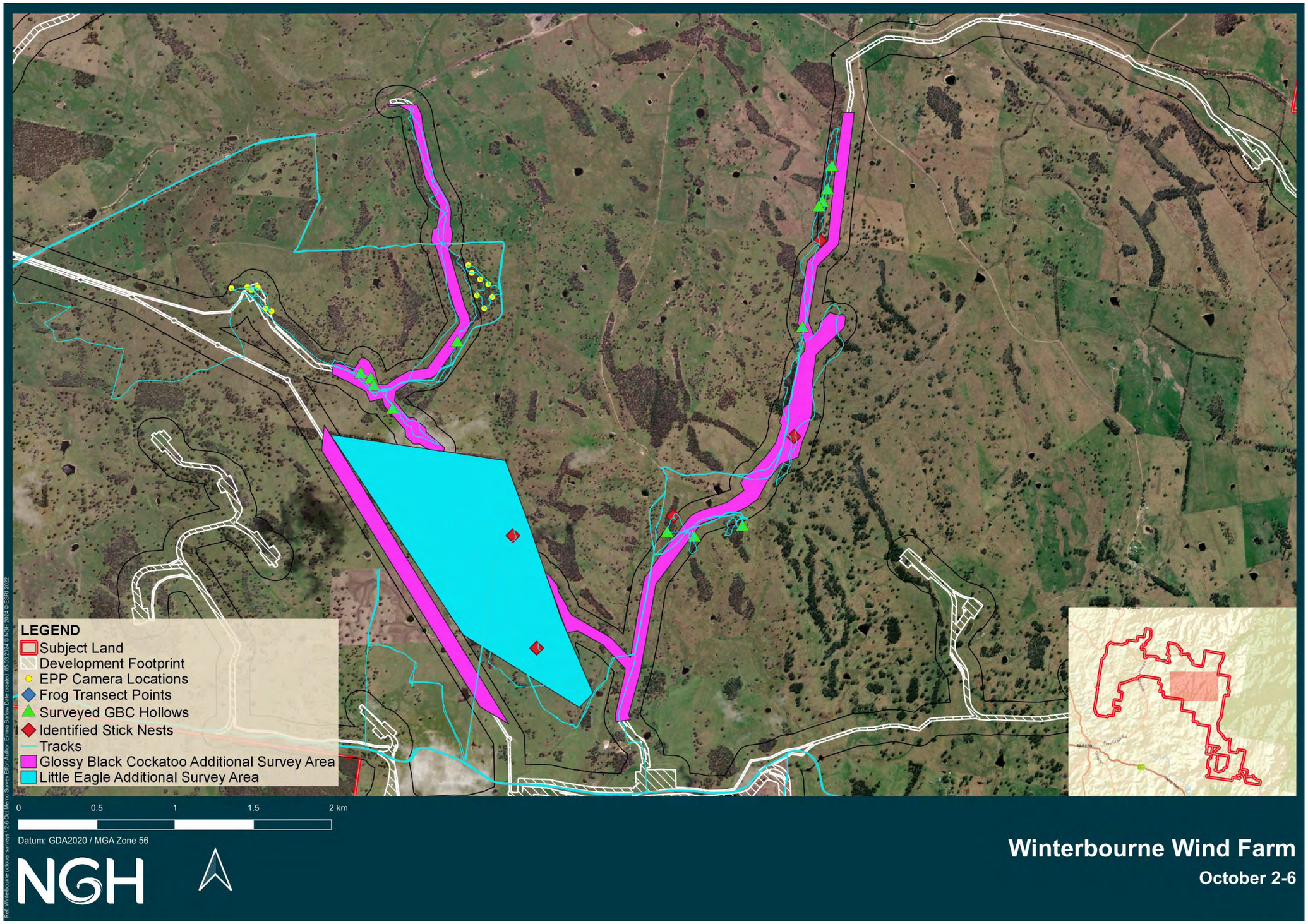

Figure 5-3 Survey effort map 2 of 4 / Site 1 and 2 of EPP cameras

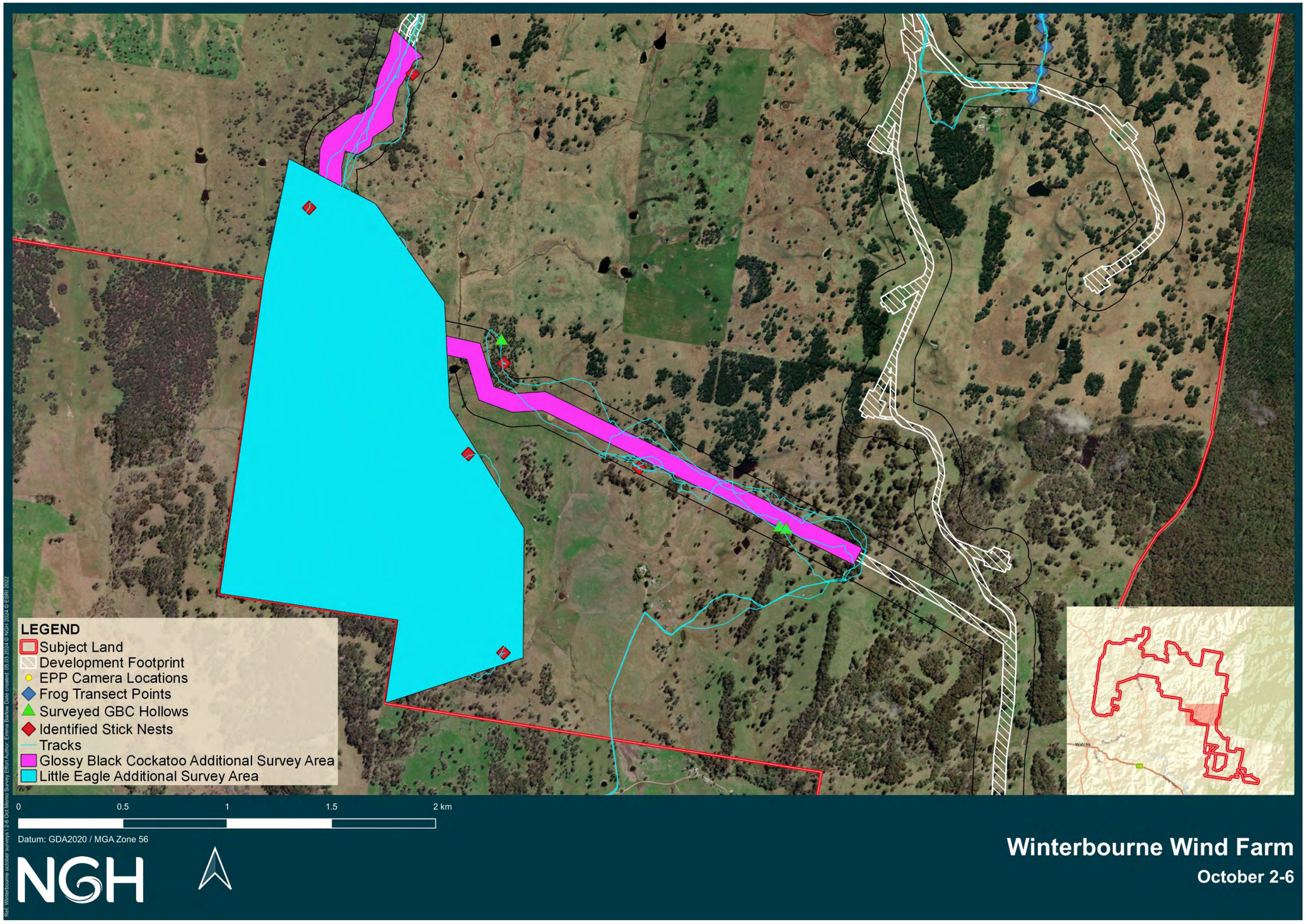

Figure 5-4 Survey effort map 3 of 4

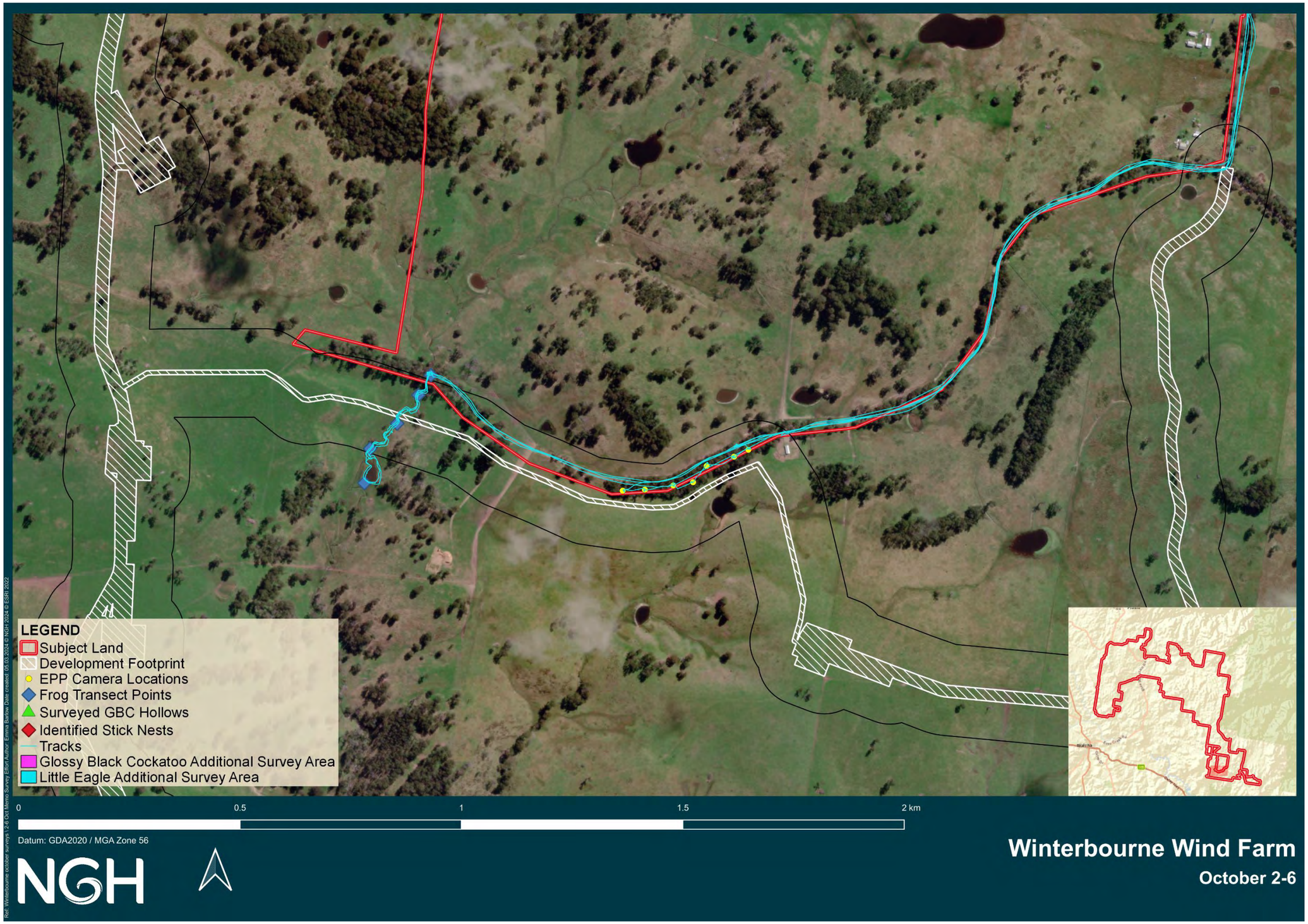

Figure 5-5 Survey effort map 4 of 4 / Site 3 of EPP cameras

APPENDIX B EASTERN PYGMY POSSUM CAMERA LOCATIONS

Coordinates	Photo
Site 1	
382166.9615870167, 6582445.122530098	

382188.545803293, 6582394.906949577	

382241.95437966706, 6582353.192316955

382293.72156542365, 6582322.175079588	

382221.45302980655, 6582250.47396831

382320.420526245, 6582239.899457542	

382268.4254549099, 6582167.922368823	
Site 2	

380909.46963841416, 6582149.415013174	

380872.7701029342,
6582168.465929311

380821.1361841351, 6582303.206098083	

380652.7338071133, 6582296.6283017155	
Site 3	

387834.3694029192,
6567139.254728265

387802.0017707169, 6567123.627406336	

387740.16181698954, 6567102.541936137

387709.5435637416, 6567065.874572336	

387664.7045595491,
6567058.574919308

387600.64086347376, 6567049.096328562	

387550.54456991213, 6567046.683431469

APPENDIX C EASTERN PYGMY POSSUM CAMERA RESULTS

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
643	3	100RCNX	10/16/2023	Common Brushtail Possum	*Trichosurus vulpecula*			97-99
645	3	100MEDIA	10/21/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2696-2701
645	3	100MEDIA	10/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4087-4098
647	3	100MEDIA	10/4/2023	Common Brushtail Possum	*Trichosurus vulpecula*			16-19
647	3	100MEDIA	10/6/2023	Common Brushtail Possum	*Trichosurus vulpecula*			466-478
647	3	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			3415-3421
648	3			No animals captured on camera				
649	3			No animals captured on camera				
785	1	100MEDIA	3/10/2023-5/10/2023	Common Brushtail Possum	*Trichosurus vulpecula*			36
785	1	100MEDIA	10/5/2023	Common Brushtail Possum	*Trichosurus vulpecula*			43-44
785	1	100MEDIA	10/10/2023	Common Brushtail Possum	*Trichosurus vulpecula*			43-102
785	1	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			124-126
785	1	100MEDIA	10/6/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			58-84
785	1	100MEDIA	10/10/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			112-117
785	1	100MEDIA	10/17/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			151-165
785	1	100MEDIA	10/21/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			169-183
785	1	100MEDIA	10/10/2023	Eastern Grey Kangaroo	*Macropus giganteus*			107-108
785	1	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			128-135

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
785	1	100MEDIA	10/15/2023	Eastern Grey Kangaroo	*Macropus giganteus*			136-141
785	1	100MEDIA	10/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			184-191
786	3	100MEDIA	10/17/2023	Bush Rat	*Rattus fuscipes*			145-150
786	3	100MEDIA	10/3/2023	Common Brushtail Possum	*Trichosurus vulpecula*			4 to 13
786	3	100MEDIA	10/20/2023	Sugar Glider	*Petaurus breviceps*			151-153
787	1	100MEDIA	10/5/2023	Common Brushtail Possum	*Trichosurus vulpecula*			34-36
787	1	100MEDIA	10/19/2023	Common Brushtail Possum	*Trichosurus vulpecula*			523-525
787	1	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			52-58
787	1	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			68-72
787	1	100MEDIA	10/9/2023	Eastern Grey Kangaroo	*Macropus giganteus*			118-120
787	1	100MEDIA	10/10/2023	Eastern Grey Kangaroo	*Macropus giganteus*			124-126
787	1	100MEDIA	10/15/2023	Eastern Grey Kangaroo	*Macropus giganteus*			229-234
787	1	100MEDIA	10/16/2023	Eastern Grey Kangaroo	*Macropus giganteus*			262-267
787	1	100MEDIA	10/16/2023	Eastern Grey Kangaroo	*Macropus giganteus*			430-432
787	1	100MEDIA	10/21/2023	Eastern Grey Kangaroo	*Macropus giganteus*			589-592
787	1	100MEDIA	10/8/2023	Eastern Grey Kangaroo with Juvenile	*Macropus giganteus*			109-117
787	1	100MEDIA	10/6/2023	Feral Cat	*Felis catus*			49-51
787	1	100MEDIA	10/6/2023	Red Fox	*Vulpes vulpes*			46-48
787	1	100MEDIA	10/14/2023	Red Fox	*Vulpes vulpes*			205-207
787	1	100MEDIA	10/7/2023	Red-necked Wallaby	*Macropus rufogriseus*			82-87
787	1	100MEDIA	10/10/2023	Red-necked Wallaby	*Macropus rufogriseus*			127-129

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
787	1	100MEDIA	10/12/2023	Red-necked Wallaby	*Macropus rufogriseus*			157-171
787	1	100MEDIA	10/13/2023	Red-necked Wallaby	*Macropus rufogriseus*			196-204
787	1	100MEDIA	10/14/2023	Red-necked Wallaby	*Macropus rufogriseus*			208-210
787	1	100MEDIA	10/17/2023	Red-necked Wallaby	*Macropus rufogriseus*			511-513
787	1	100MEDIA	10/19/2023	Red-necked Wallaby	*Macropus rufogriseus*			526-531
787	1	100MEDIA	10/20/2023	Red-necked Wallaby	*Macropus rufogriseus*			544-546
787	1	100MEDIA	10/14/2023	Red-necked Wallaby Juvenile	*Macropus rufogriseus*			214
787	1	100MEDIA	10/23/2023	Red-necked Wallaby with Juvenile	*Macropus rufogriseus*			895-897
787	**1**	**100MEDIA**	**10/11/2023**	**Spotted-tailed Quoll**	***Dasyurus maculatus***	**V**	**E**	**154-156**
787	1	100MEDIA	10/4/2023	Swamp Wallaby	*Wallabia bicolor*			22-24
787	1	100MEDIA	10/8/2023	Swamp Wallaby	*Wallabia bicolor*			88-102
787	1	100MEDIA	10/11/2023	Swamp Wallaby	*Wallabia bicolor*			139-153
787	1	100MEDIA	10/14/2023	Swamp Wallaby	*Wallabia bicolor*			217-220
787	1	100MEDIA	10/22/2023	Swamp Wallaby	*Wallabia bicolor*			595-597
788	1	100MEDIA	10/12/2023	Raven	*Corvus sp.*			70
789	2	106MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			289-300
789	2	103MEDIA	10/5/2023	Eastern Rosella	*Platycercus eximius*			919-927
789	2	103MEDIA	10/5/2023	Eastern Rosella	*Platycercus eximius*			946-954
789	2	103MEDIA	10/5/2023	Eastern Rosella	*Platycercus eximius*			961-975
789	2	106MEDIA	10/5/2023	Raven	*Corvus sp.*			285
789	2	106MEDIA	10/6/2023	Swamp Wallaby	*Wallabia bicolor*			289-300

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
790	2	100MEDIA	3/18/2023	Common Brushtail Possum	*Trichosurus vulpecula*			127-156
790	2	100MEDIA	3/11/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			52-54
790	2	100MEDIA	3/12/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			82-87
790	2	100MEDIA	3/20/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			169-171
790	2	100MEDIA	3/21/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			178-183
790	2	100MEDIA	3/13/2023	Crimson Rosella	*Platycercus elegans*			88-90
790	2	100MEDIA	3/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			91-93
790	2	100MEDIA	3/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			97-99
790	2	100MEDIA	3/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			160-162
791	1	101MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			429-434
791	1	101MEDIA	10/9/2023	Spider	*Arachnids*			213-218
793	3	100MEDIA	10/5/2023	Common Brushtail Possum	*Trichosurus vulpecula*			7 to 12
795	1	100MEDIA	10/11/2023	Common Brushtail Possum	*Trichosurus vulpecula*			187-189
795	1	100MEDIA	10/16/2023	Common Brushtail Possum	*Trichosurus vulpecula*			235-237
795	2	101MEDIA	10/4/2023	Common Brushtail Possum	*Trichosurus vulpecula*			550-564
795	1	100MEDIA	10/8/2023	Swamp Wallaby	*Wallabia bicolor*			163-165
796	1	100MEDIA	10/16/2023	Common Brushtail Possum	*Trichosurus vulpecula*			64-66
796	1	100MEDIA	10/10/2023	Eastern Grey Kangaroo	*Macropus giganteus*			19-21
796	1	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			68-69
796	1	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			77-78
796	1	100MEDIA	10/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			97-108

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
796	1	100MEDIA	10/17/2023	Red-necked Wallaby	*Macropus rufogriseus*			70
796	1	100MEDIA	10/19/2023	Unknown Large Animal	Unknown			85-87
798	2	100MEDIA	10/8/2023	Common Brushtail Possum	*Trichosurus vulpecula*			0007-0009
798	2	100MEDIA	10/23/2023	Common Myna	*Acridotheres tristis*			0160-0162
810	2	100MEDIA	10/6/2023	Common Brushtail Possum	*Trichosurus vulpecula*			4627
810	2	100MEDIA	10/8/2023	Common Brushtail Possum	*Trichosurus vulpecula*			4831-4842
810	2	100MEDIA	10/12/2023	Common Brushtail Possum	*Trichosurus vulpecula*			5104-5109
810	2	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			5428-5429
810	2	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			5569-5571
810	2	100MEDIA	10/19/2023	Common Brushtail Possum	*Trichosurus vulpecula*			7831-7833
810	2	100MEDIA	10/22/2023	Common Brushtail Possum	*Trichosurus vulpecula*			8773-8775
810	2	100MEDIA	10/19/2023	Common Brushtail Possum	*Trichosurus vulpecula*			7585-7611
810	2	100MEDIA	10/16/2023	Spider	*Arachnids*			5707-5715
811	2	100MEDIA	10/6/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1825-1830
818	2	100MEDIA	10/11/2023	Common Brushtail Possum	*Trichosurus vulpecula*			107-109
818	2	100MEDIA	10/16/2023	Common Brushtail Possum	*Trichosurus vulpecula*			119-121
818	2	100MEDIA	10/20/2023	Eastern Grey Kangaroo	*Macropus giganteus*			128-130

Field Survey Technical Memo 4

Winterbourne Wind Farm

December 2023

Project Number: 23-247

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Document verification

Survey	Winterbourne Wind Farm
Project Number:	23-247
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Revision	Date	Prepared by	Reviewed by	Approved by
Draft V1.0	18/12/2023	Izaak Graham-Higgs	Bianca Heinze	Bianca Heinze
Draft V1.01	14/03/2024	Emma Barlow	Bianca Heinze	Bianca Heinze

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1. Methods

1.1. Desktop assessment

The following guidelines are relevant to the survey:

- Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (DPE, 2020).

1.2. Field survey

The purpose of the December 2023 survey was to identify and map PCTs and undertake BAM plots and targeted flora surveys in new areas. The target species for December 2023 was Streamside Greenhood (*Pterostylis riparia*), an orchid which occurs in association with PCT 766 on the edge of small streams under shrubs. The area was classified 'open vegetation' thus the distance between parallel field traverses was 10m.

1.2.1. Survey team and dates

The survey was undertaken over 4 – 7 December by two ecologists lead by Dr John Hunter (Table 1-1).

Table 1-1 Survey Team

Name	Role	Fieldwork Conducted	Survey dates
Dr John Hunter	Senior Ecologist (Team Leader)	PCT mapping and zoning, BAM plots (1 per PCT), habitat assessments and targeted flora surveys looking for *Pterostylis riparia*.	4th – 7th December 2023
Izaak Graham-Higgs	Ecologist	PCT mapping and zoning, BAM plots (1 per PCT), habitat Assessments and targeted flora surveys looking for *Pterostylis riparia*.	4th – 7th December 2023

1.2.2. Survey conditions

Conditions were predominantly mild, dry, and calm. Table 1-2 below provides temperature and other conditions recorded in the field during the survey week. No rain was recorded during the survey.

Table 1-2 Survey weather conditions over the survey period

Date	Min. temp (°C)	Max temp (°C)	Max. wind gust (km/h)	Weather conditions, recorded on site
4th	12	25.9	43	Partly cloudy, warm temperatures
5th	8.4	27.8	31	Partly cloudy, warm temperatures

Date	Min. temp (°C)	Max temp (°C)	Max. wind gust (km/h)	Weather conditions, recorded on site
6th	15	31.6	37	Partly cloudy, Hot temperatures
7th	14	32.2	52	Partly cloudy, Hot temperatures

1.2.3. Survey effort

Where possible all parts of the additional investigation areas were surveyed by two staff on foot or vehicle depending on access and vegetation complexity.

Rapid Assessment Points

Where possible all patches allocated a PCT by the State Vegetation Type Mapping were visited and a rapid assessment point (RAP) was undertaken whereby the three dominant flora species in each structural layer were recorded along with a photograph of each location. These taxa were then used to determine a likely PCT at each RAP.

BAM plots in Category 1 Land

BAM plots were randomly allocated prior to the site visit within likely Category 1 (Cat 1) land locations. Each of these potential BAM plots were visited and assessed for Cat 1 status. If the lands were obviously of Cat 1 status (i.e. obviously improved pasture with little or on native vegetation cover), BAM plots were not conducted. If the site was found to be at, near or greater than 50% native vegetation cover, a BAM plot was conducted. Only two locations were considered not to be clearly pasture improved and had a sufficient component of native species for BAM plots to be undertaken (i.e. two BAM plots were conducted).

Targeted Flora Surveys

An a-priori desktop assessment was made of locations where drainage lines crossed the new targeted survey areas. These areas were considered prime habitat for *Pterostylis riparia*. Each of these locations was visited and an assessment made of habitat quality. Where locations were obviously of low quality, generally assessed by being intensively pasture improved, no surveys were conducted. If the location was considered potential habitat a walking survey was conducted by two staff walking in parallel transects across the potential habitat polygon. All targeted locations were photographed. Where other threatened species were found, in particular *Eucalyptus nicholii,* these were recorded.

Eight targeted flora surveys were undertaken across a total of 4.2 ha.

Habitat Feature Surveys

Across all parts of the additional investigation area, any hollow-bearing trees or large hollow-bearing logs were recorded, and any stick nest with a radius larger than 0.5m was recorded.

2. Results

2.1. PCT Identification

A total of 306 RAPs were undertaken and used to determine the most likely PCTs. Assessment of PCTs was hampered in many locations by the highly modified condition of the landscape with much of the native vegetation cleared and improved pasture both in open areas and under scattered trees. Many stands were of secondary regrowth and may not have the original combination of dominants *in-situ*. Some PCTs share similar dominants and distinguishing which PCT is the most relevant is problematic as the relative dominance may have changed at this local site due to selective clearing and different regeneration capacities along with the removal of understorey species which are often used for PCT identification.

A total of 12 native PCTs were identified, including two newly identified PCTs that are listed in Table 2-1. Newly identified PCTs in all instances covered comparatively small areas. Of note were small areas dominated by *Eucalyptus dives* which forms a new northern limit of distribution of this species which is generally known from only as far north as the Barrington region in the southern parts of the New England Plateau. The areas in which this species was found dominating were heavily modified by pasture improvement and the removal of structural layers. Both the removal of understorey dominants, potential overstorey-co-dominants and the range extension makes PCT identification of these areas with *E. dives* problematic within the current system. BAM plots will be undertaken in future field surveys to determine PCTs in these areas.

Table 2-1 Newly identified PCTs determined from RAPs

PCT Name	BC Act TEC	EPBC Act TEC
518 - Heath swamps wetland on leucogranite and granite of the New England Tableland Bioregion	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions **Endangered** Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion **Endangered**	N/A
934 - Messmate open forest of the tableland edge of the NSW North Coast Bioregion and New England Tableland Bioregion	N/A	N/A

2.2. BAM Plots

BAM plots were conducted at two (2) of nineteen (19) randomly allocated points to determine Land Category status. The BAM plots conducted were characterized by 100% vegetation cover; absence of leaf litter; and a predominant 60%-65% coverage of *Poa sieberiana.* This data will inform future land category assessment.

2.3. Targeted Flora

Almost all targeted survey locations were found to be of intensively improved pasture with all natives removed (poisoned) and the areas planted with exotic pasture species. Many areas considered to have been native dominated during past inspections had been converted at the time of this current survey. Only eight locations were found to be less modified and have the potential for the target species to occur. Where on-ground transects were conducted there were no indications of the presence of *Pterostylis riparia*.

Several RAPs recorded *Eucalyptus nichollii* (Table 2-2).

Table 2-2 Flora species targeted and recorded in December 2023

Scientific name	Common name	Status		Potential occurrence (Low, Moderate, High, Recorded)
		BC Act	EPBC Act	
Pterostylis riparia	Streamside Greenhood	Vulnerable	Vulnerable	Low
Eucalyptus nichollii	Narrow-leaved Black Peppermint	Vulnerable	Vulnerable	Recorded

3. Limitations

Pterostylis riparia was not observed during targeted surveys at the eight locations considered suitable habitat for the orchid. As such, species presence could not be utilised to prioritise further habitat areas to survey. Due to the large area to cover, greater survey effort was undertaken within areas containing patches of native grass. As such, limited habitat transects were undertaken in pasture improved paddocks.

Only two locations had a sufficient component of native species for BAM plots to be undertaken; other locations were pasture improved paddocks. As such, few new BAM plots were undertaken.

The limitations of the PCT mapping includes difficulties in accurate identification and classification of PCTs due to landscape modifications, altered dominance of species, challenges in differentiating between similar PCTs and the emergence of new types that don't match with the previous classification system.

APPENDIX A MAPS

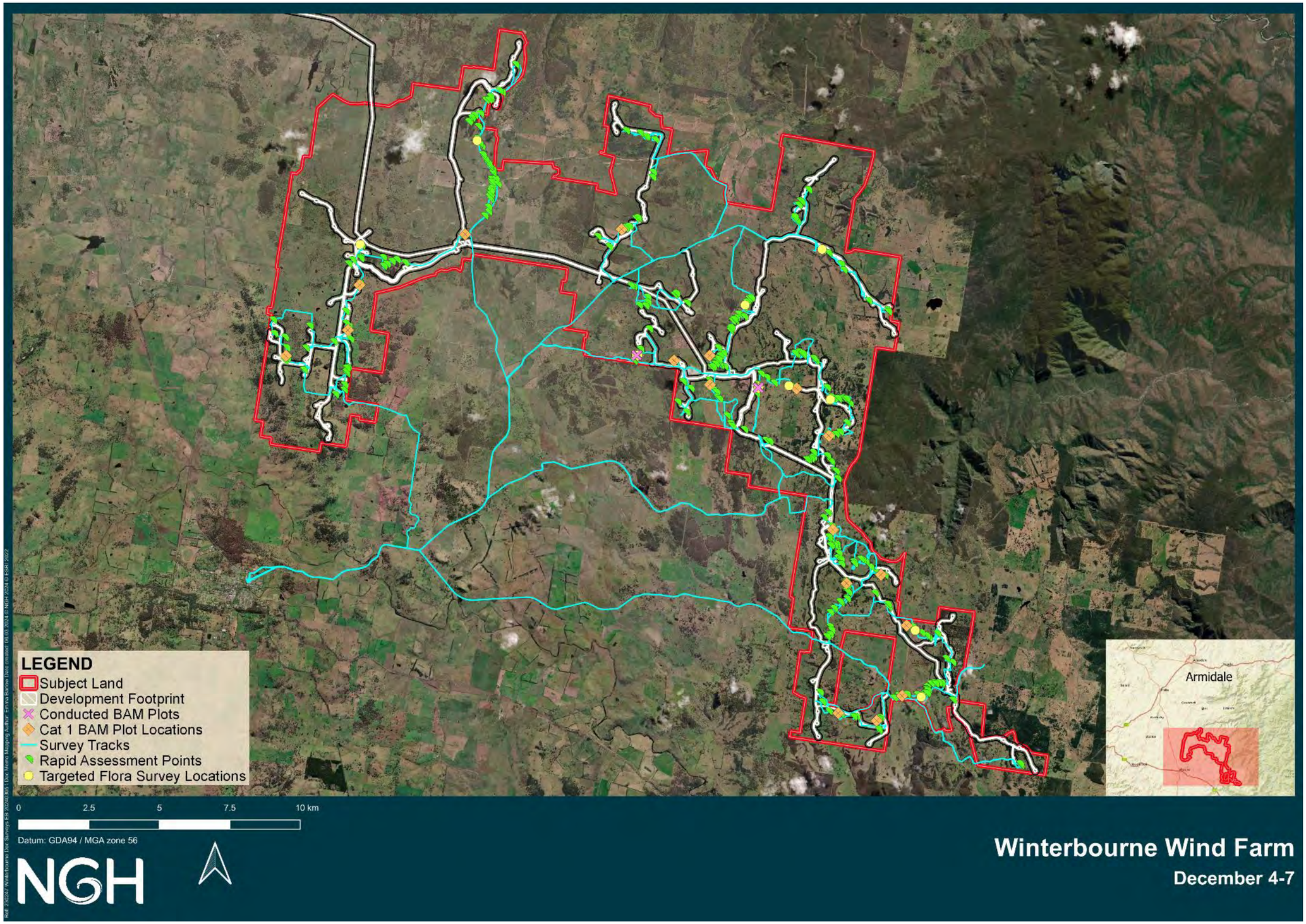

Figure 3-1 Overview of survey effort

Figure 3-2 Survey effort map 1 of 5

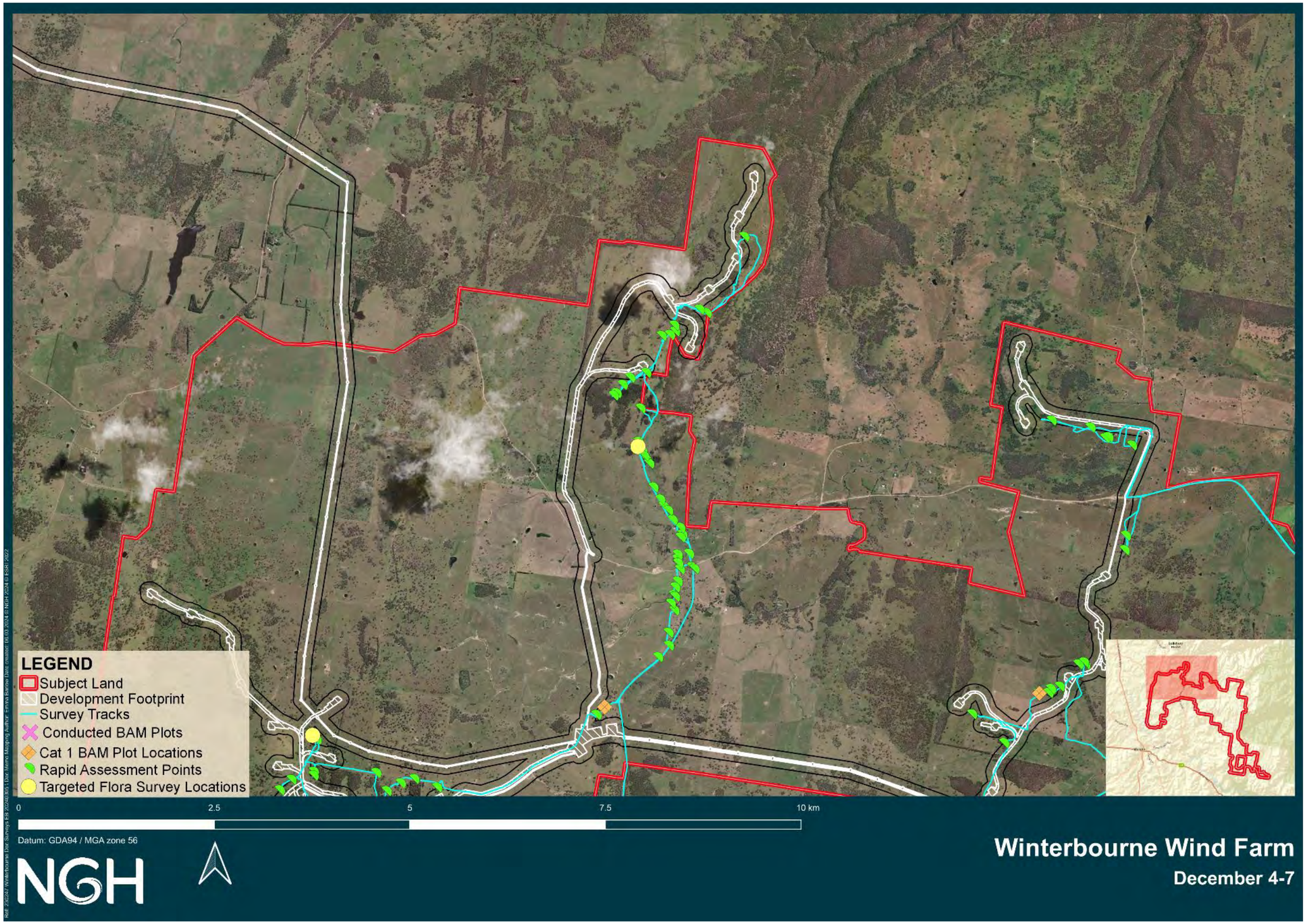

Figure 3-3 Survey effort map 2 of 5

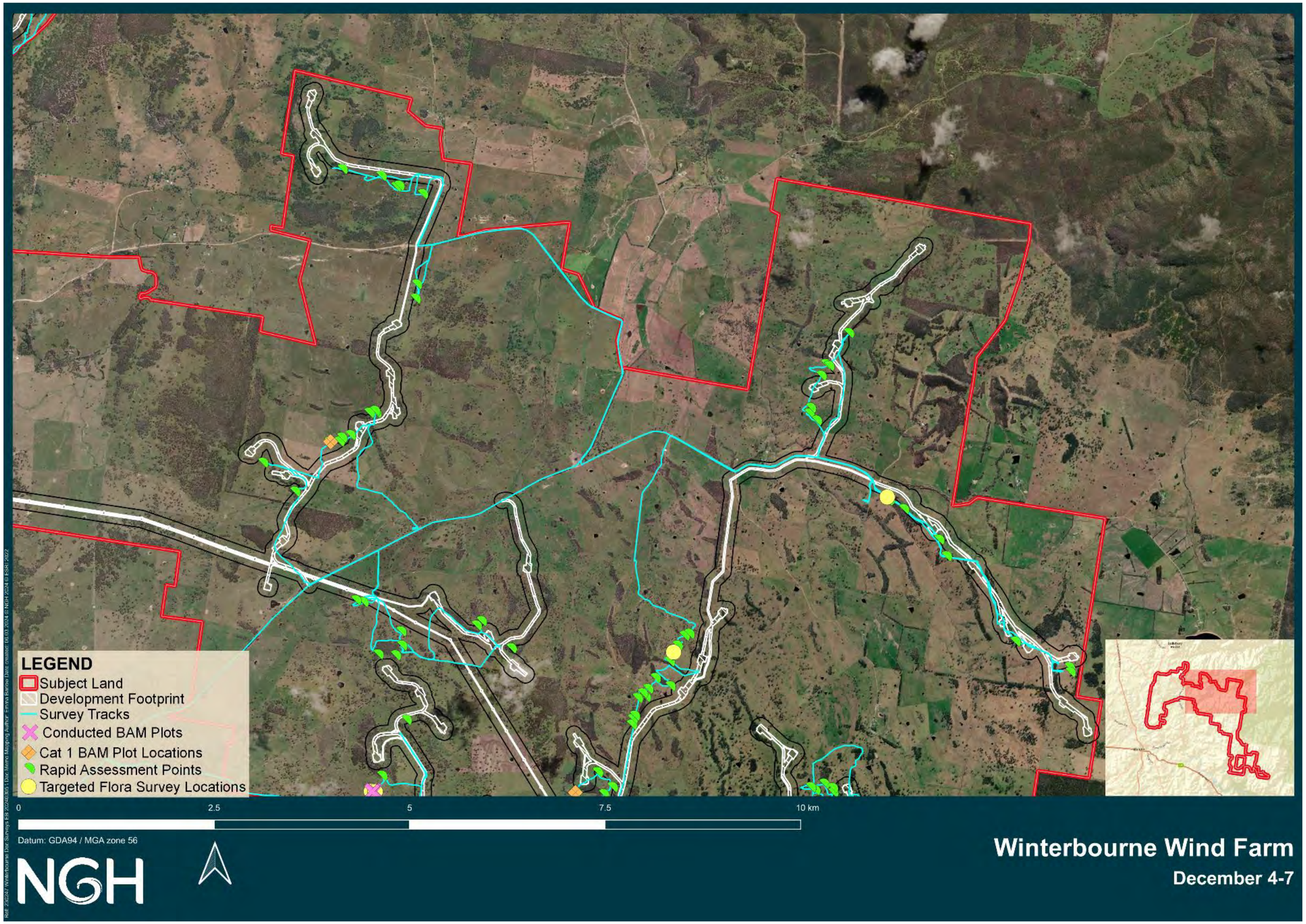

Figure 3-4 Survey effort map 3 of 5

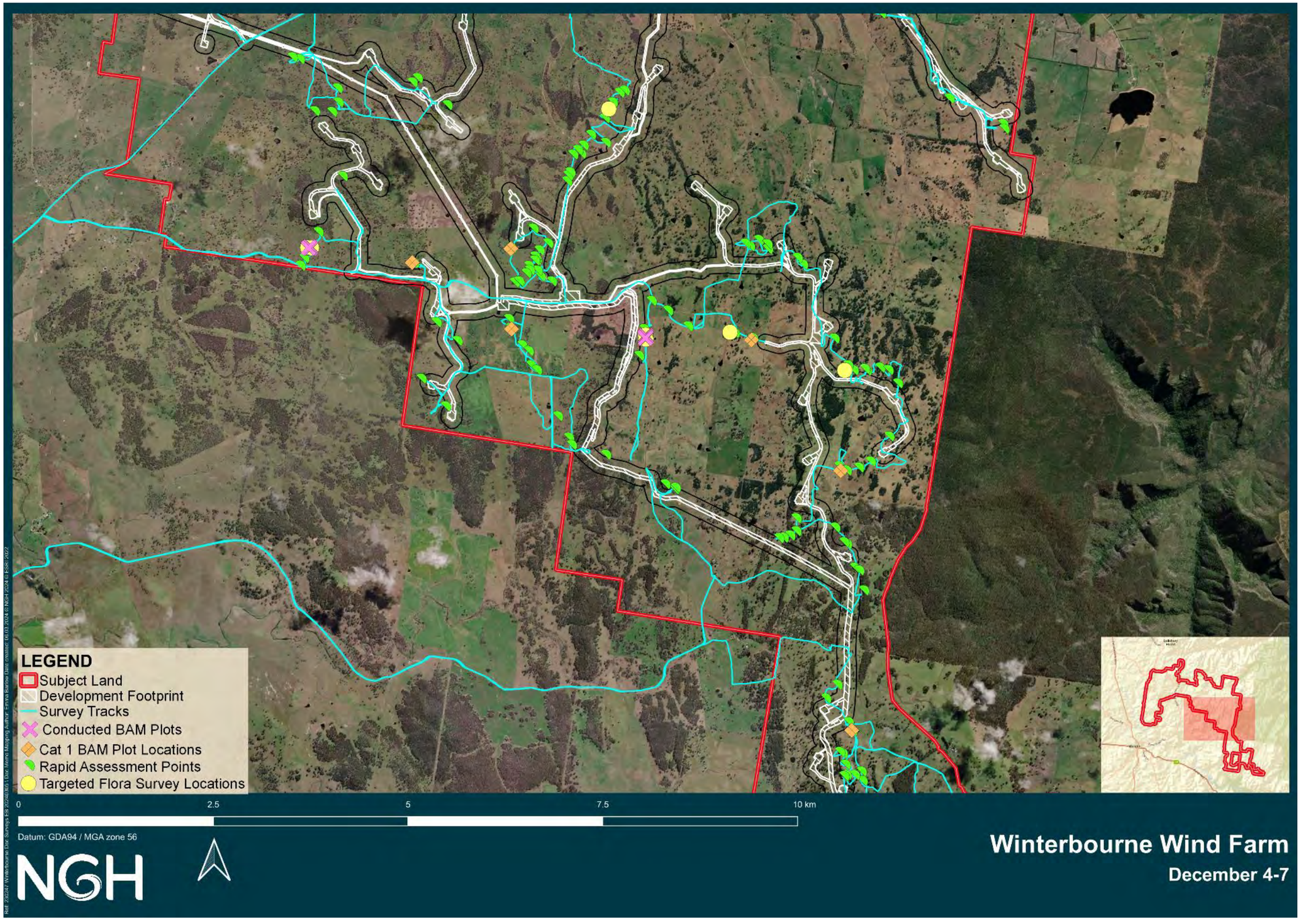

Figure 3-5 Survey effort map 4 of 5 \ Location of two conducted BAM plots

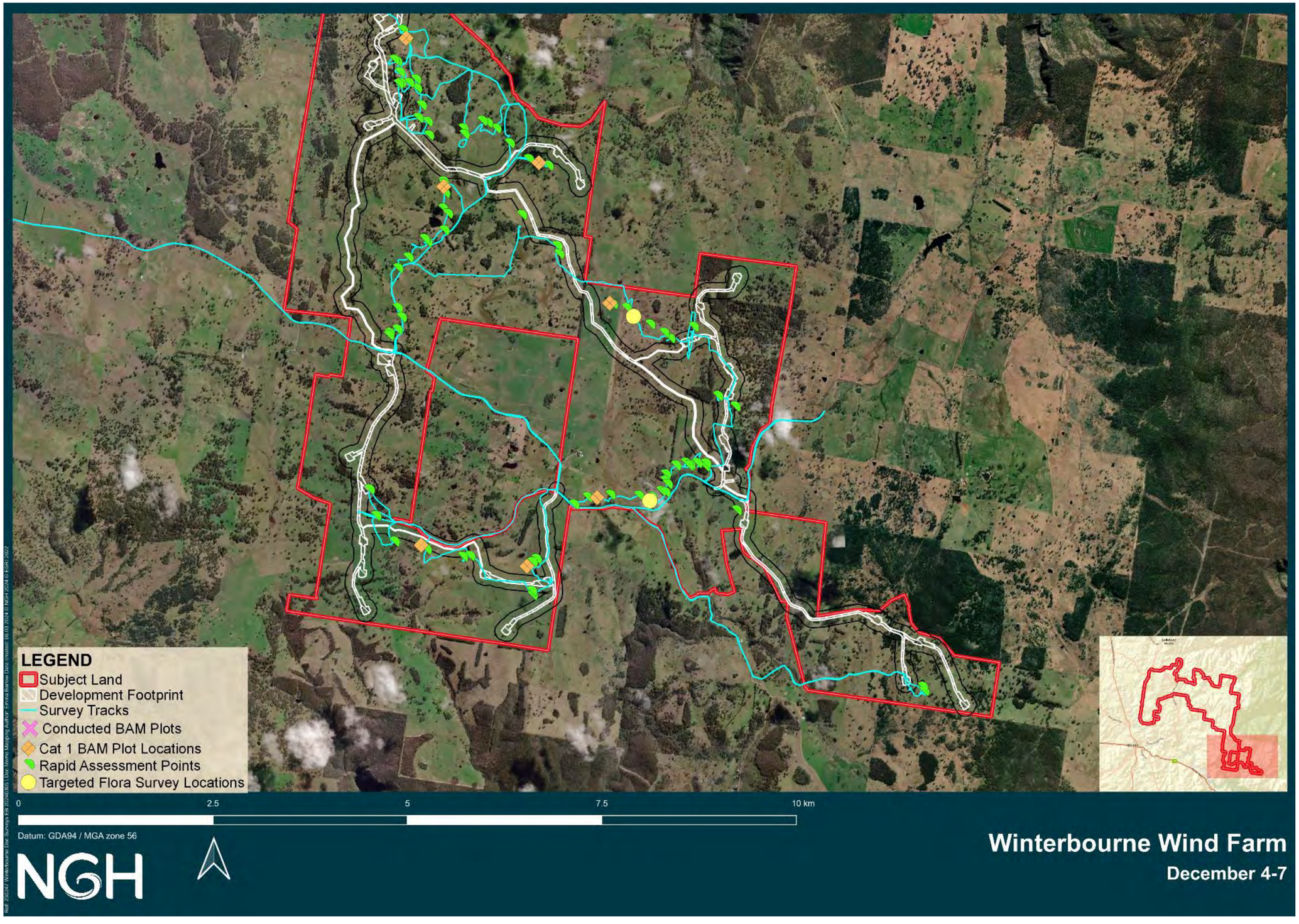

Figure 3-6 Survey effort map 5 of 5

Field Survey Technical Memo 3

Winterbourne Wind Farm

October 2023

Project Number: 23-247

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Document verification

Survey	Winterbourne Wind Farm
Project Number:	23-247
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Final V1.0	26/10/23	Izaak Graham-Higgs	Bianca Heinze	Bianca Heinze
Final V1.01	14/03/2024	Emma Barlow	Bianca Heinze	Bianca Heinze

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Executive Summary

Surveys were undertaken across the entire Winterbourne Wind Farm study area to determine if Singleton Mint Bush (*Prostanthera cineolifera*) and the Small-snake Orchid (*Diuris pedunculata*) was present. Four areas on the following properties were surveyed:

- Milbank
- Queenlee,
- Monavale
- Glenoak.

Available habitat in all four areas were not suitable for either species due to disturbance from grazing of livestock and human activity. None of the target species were identified across any of the transects.

All 35 Rufous Bettong and Eastern Pygmy-possum camera traps that were deployed in round 1 and 2 surveys were collected.

1. Methods

1.1. Desktop assessment

The following guidelines are relevant to the survey:

- Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (DPE, 2020).

1.2. Field survey

The two (2) species surveyed for include an orchid and a shrub. Due to the area being classified as open vegetation, the maximum distance between parallel field traverses was 10m.

1.2.1. Survey team and dates

Survey date and team listed in Table 1-1.

Table 1-1 Survey Team

Name	Role	Fieldwork Conducted	Survey dates
Greg Clarke	Ecologist (Team Leader)	Targeted flora surveys for Singleton Mint bush and Small Snake Orchid, camera retrieval for Rufous Bettong and Eastern Pygmy possums.	23rd – 25th Oct 2023
Izaak Graham-Higgs	Ecologist	Targeted flora surveys for Singleton Mint bush and Small Snake Orchid, camera retrieval for Rufous Bettong and Eastern Pygmy possums.	23rd – 25th Oct 2023

1.2.2. Survey conditions

Conditions were predominantly mild, dry, and calm during surveys. Weather data from Woolbrook (BOM) is provided in Table 1-2 below.

Table 1-2 Survey weather conditions over the survey period

Date	Min. temp (°C)	Max temp (°C)	Max. wind gust (km/h)	Weather conditions, recorded on site
23rd	1.5	26.5	Calm	Clear day, warm temperatures
24th	2	31	Calm	Clear day, hot temperatures,
25th	2	31	NW 4	Clear day, hot temperatures

1.2.3. Survey effort

Due to hot weather being forecast for the following days, the majority of the fieldwork was conducted on the first survey day: all 35 camera traps were collected, and Areas 2-4 flora transects were completed. The remaining Area 1 flora transect was completed the following day. Table 1-3 shows survey type and effort. Table 1-4 shows species and habitats targeted.

Table 1-3 Plant Community Types and/or native vegetation composition survey effort

Target	Survey type	Survey locations/areas	Effort
Singleton Mint Bush, Small Snake Orchid	Parallel field traverse	Area 1 PCT 970: 7.02 ha Area 2 PCT 766: 0.99 ha Area 3 PCT 568: 0.88 ha Area 4 PCT 565: 1.57 ha	5 hours of walking for two Ecologists.
Camera Retrieval	Collecting Eastern Pygmy Possum and Rufous Bettong cameras	35 camera locations as per previous deployment	7 hours for two ecologists.

Table 1-4 Species and habitats targeted

Common name	Scientific Name	BC Act	EPBC Act	Habitats targeted
Singleton Mint Bush	*Prostanthera cineolifera*	Vulnerable	Vulnerable	PCT 970, 766, 658 and 565 Grassland
Small Snake Orchid	*Diuris pedunculata*	Endangered	Endangered	PCT 970, 766, 658 and 565 Grassland

2. Results

2.1. Threatened Species

No targeted species were detected in the area. The habitat was heavily grazed and impacted by humans with rubbish and car tracks present, not suitable for the two species. Table 2-1 shows likelihood of occurrence for each threatened species targeted.

Table 2-1 Targeted threatened species surveyed for and the likelihood of occurrence

Scientific name	Common name	Status		Potential occurrence (Low, Moderate, High, Recorded)
		BC Act	EPBC Act	
Prostanthera cineolifera	Singleton Mint Bush	Vulnerable	Vulnerable	Low
Diuris pedunculata	Small Snake Orchid	Endangered	Endangered	Low

2.2. Rufous Bettong camera trap results

A total of 22 species were identified on the cameras between 20th September and 24th October 2023 (Table 2-2, Appendix B). There was one potential sighting of a Rufous Bettong (*Aepyprymnus rufescens*) at camera 812, however this was later confirmed as a Long-nosed Potoroo (*Potorous tridactylus*) on account of the skinny, short tail and sleek dark fur. Two species were identified that are listed as threatened on the BC Act and/or EPBC Act which include:

- Long-nosed Potoroo (*Potorous tridactylus*), listed as Vulnerable on the BC and EPBC Act
- Flame Robin (*Petroica phoenicea*), listed as Vulnerable on the BC Act only.

Table 2-2 Species captured on cameras

Site	Species Name	Common Name	BC Act Status	EPBC Act Status	Number of times seen
1	*Felis catus*	Feral Cat			2
	Gymnorhina tibicen	Australian Magpie			2
	Macropus giganteus	Eastern Grey Kangaroo			19
	Macropus robustus	Common Wallaroo			3
	Macropus rufogriseus	Red-necked Wallaby			47
		Red-necked Wallaby Juvenile			2
	Oryctolagus cuniculus	European Rabbit			9
	Tachyglossus aculeatus	Short-beaked Echidna			5
	Trichosurus vulpecula	Common Brushtail Possum			28
	Vulpes vulpes	Red Fox			2

Site	Species Name	Common Name	BC Act Status	EPBC Act Status	Number of times seen
	Wallabia bicolor	Swamp Wallaby			22
	Unknown	Unknown			1
		Unknown Wallaby sp.			2
2	*Antechinus sp.*	Antechinus sp.			1
	Dama dama	Fallow Deer			8
	Macropus giganteus	Eastern Grey Kangaroo			15
		Eastern Grey Kangaroo with Juvenile			1
	Macropus robustus	Common Wallaroo			12
	Mus musculus	Mouse			2
	Sus scrofa	Feral Pig			1
	Tachyglossus aculeatus	Short-beaked Echidna			1
	Trichosurus vulpecula	Common Brushtail Possum			8
	Wallabia bicolor	Swamp Wallaby			4
	Unknown	Unknown			4
		Unknown Possum sp.			1
3	*Bos taurus*	Cow			4
	Corvus sp.	Crow			1
		Currawong sp.			1
	Felis catus	Feral Cat			13
	Gymnorhina tibicen	Australian Magpie			4
	Macropus giganteus	Eastern Grey Kangaroo			68
		Eastern Grey Kangaroo with Juvenile			1
	Macropus rufogriseus	Red-necked Wallaby			2
	Platycercus elegans	Crimson Rosella			2
	Podargus strigoides	Tawny Frogmouth			1
	Tachyglossus aculeatus	Short-beaked Echidna			1
	Trichosurus vulpecula	Common Brushtail Possum			9
	Vombatus ursinus	Common Wombat			1
	Wallabia bicolor	Swamp Wallaby			2
	Unknown	Unknown Owl sp.			1
4	*Bos taurus*	Cow			19
		Calf			2
	Corvus sp.	Currawong sp.			2
		Raven			1

Site	Species Name	Common Name	BC Act Status	EPBC Act Status	Number of times seen
	Gymnorhina tibicen	Australian Magpie			1
	Macropus giganteus	Eastern Grey Kangaroo			22
	Ovis aries	Sheep			10
	Trichosurus vulpecula	Common Brushtail Possum with Juvenile			1
	Vulpes vulpes	Red Fox			20
	Wallabia bicolor	Swamp Wallaby			3
	Unknown	Unknown			1
		Unknown Bird sp.			1
		Unknown Possum sp.			2
		Unknown Wallaby sp.			3
		Unknown Kangaroo sp.			19
5	*Felis catus*	Feral Cat			3
	Macropus giganteus	Eastern Grey Kangaroo			21
	Macropus rufogriseus	Red-necked Wallaby			9
		Red-necked Wallaby Juvenile			1
	Oryctolagus cuniculus	European Rabbit			10
	Petroica phoenicea	Flame Robin	V		1
	Potorous tridactylus	Long-nosed Potoroo	V	V	1
	Tachyglossus aculeatus	Short-beaked Echidna			2
	Trichosurus vulpecula	Common Brushtail Possum			4
	Vulpes vulpes	Red Fox			2
	Wallabia bicolor	Swamp Wallaby			6
	Unknown	Unknown Bird sp.			3
		Unknown Marsupial			3
		Unknown Wallaby sp.			10
		Unknown Kangaroo sp.			18

3. Limitations

The areas shown on Figure 3-1 (Appendix A) could not be accessed to carry out the surveys due to access and time constraint reasons.

No Singleton Mint Bush and Small Snake Orchid were observed during the Flora transects. As such, species presence could not be utilised to prioritise habitat areas to survey. Due to the large area to cover, greater survey effort was undertaken within areas containing patches of grass. As such, limited habitat transects were undertaken in paddocks.

APPENDIX A MAPS

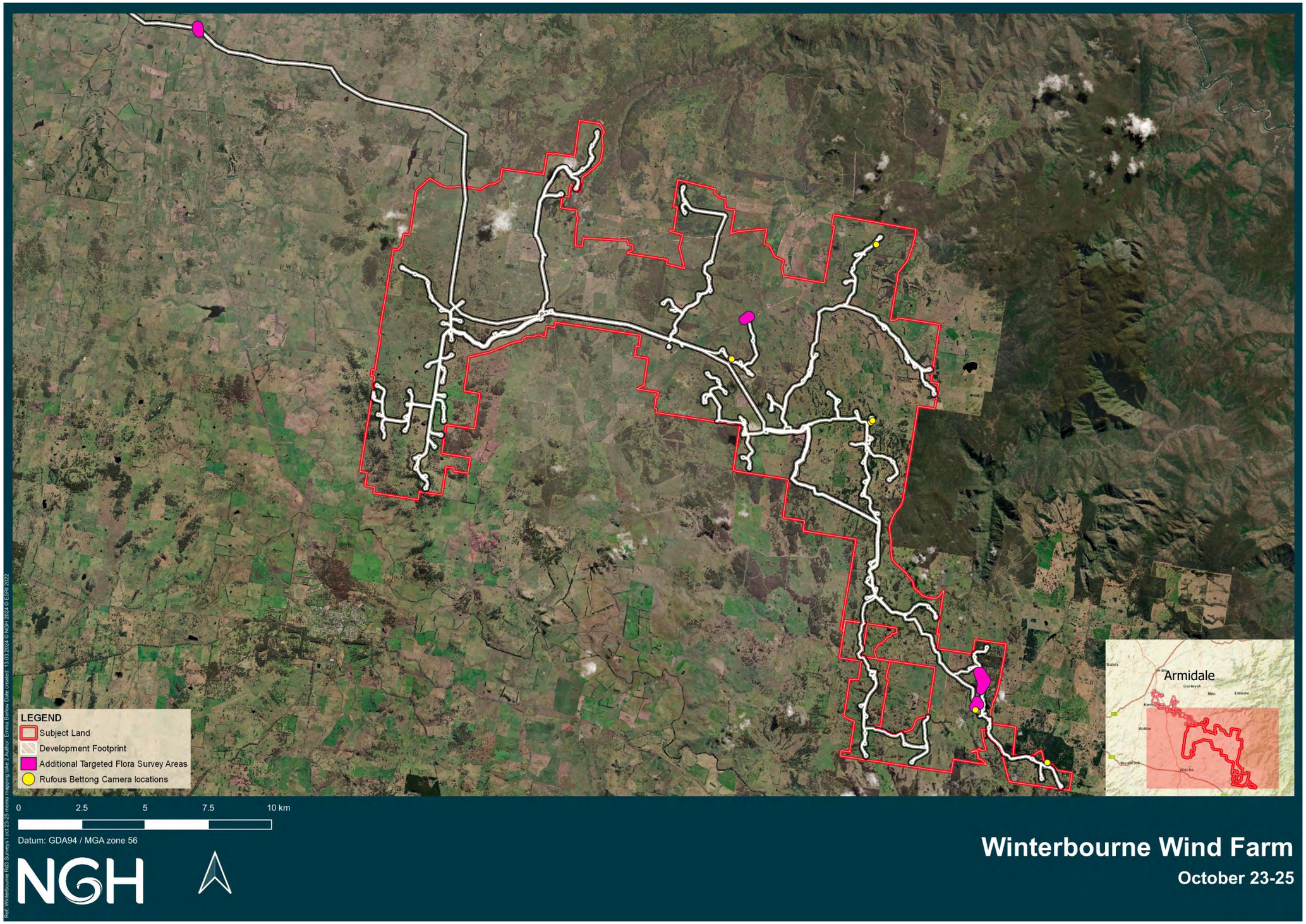

Figure 3-1 Overview of survey effort

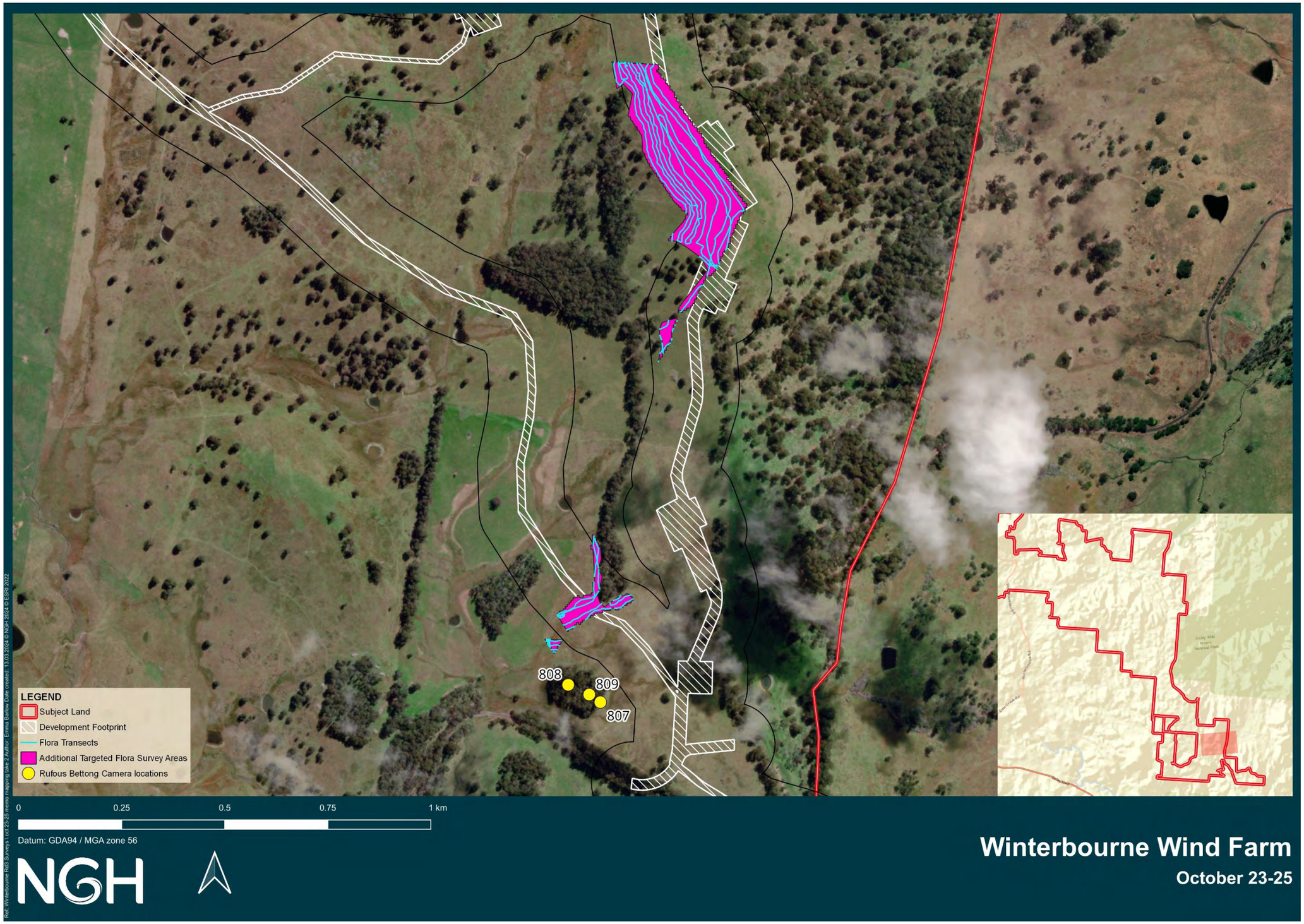

Figure 3-2 Targeted Flora Survey Transect 1 and 2

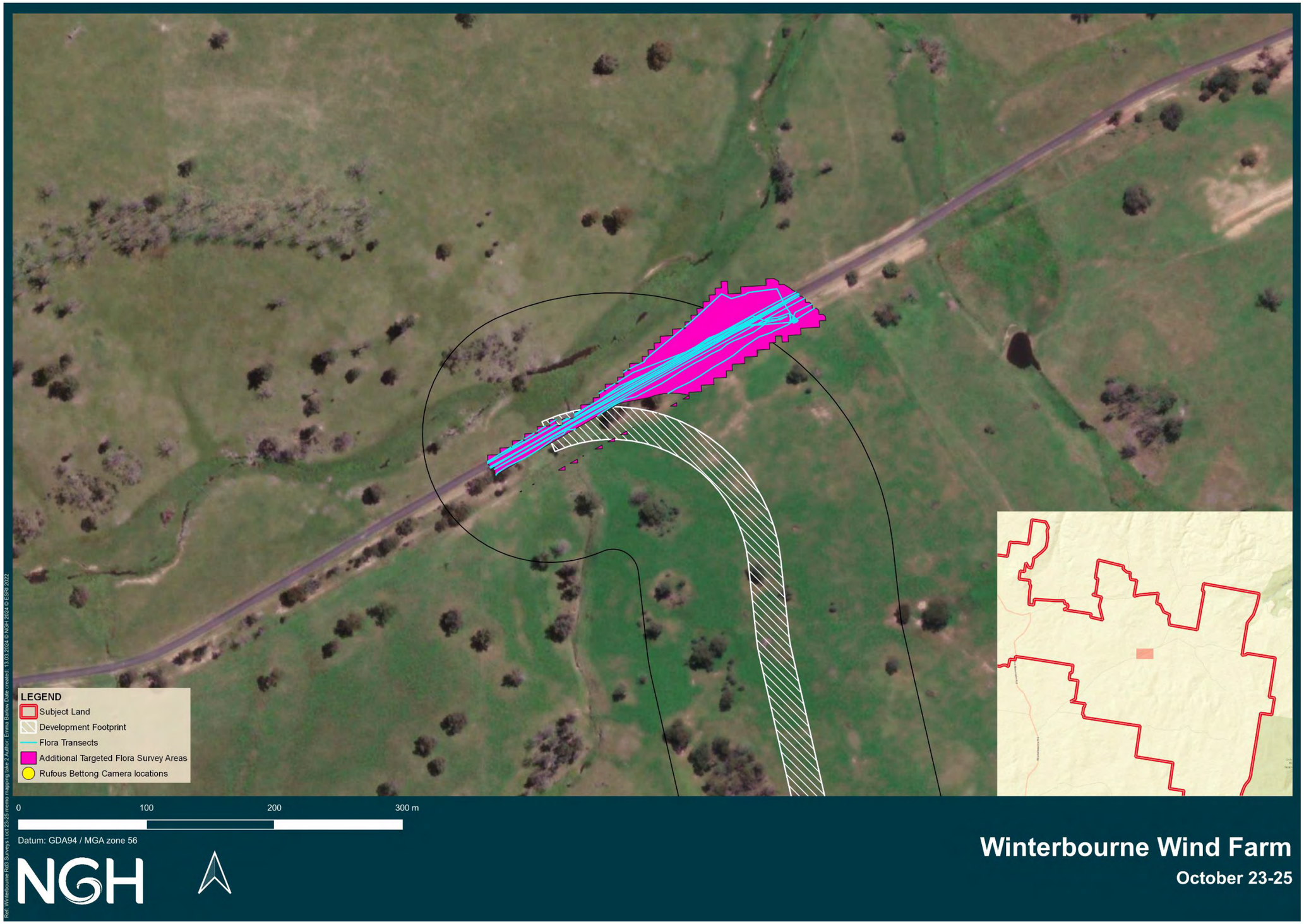

Figure 3-3 Targeted Flora Survey Transect 3

Figure 3-4 Targeted Flora Survey Transect 4

APPENDIX B RUFOUS BETTONG CAMERA LOCATIONS

Figure 3-5 Rufous Bettong camera site 1

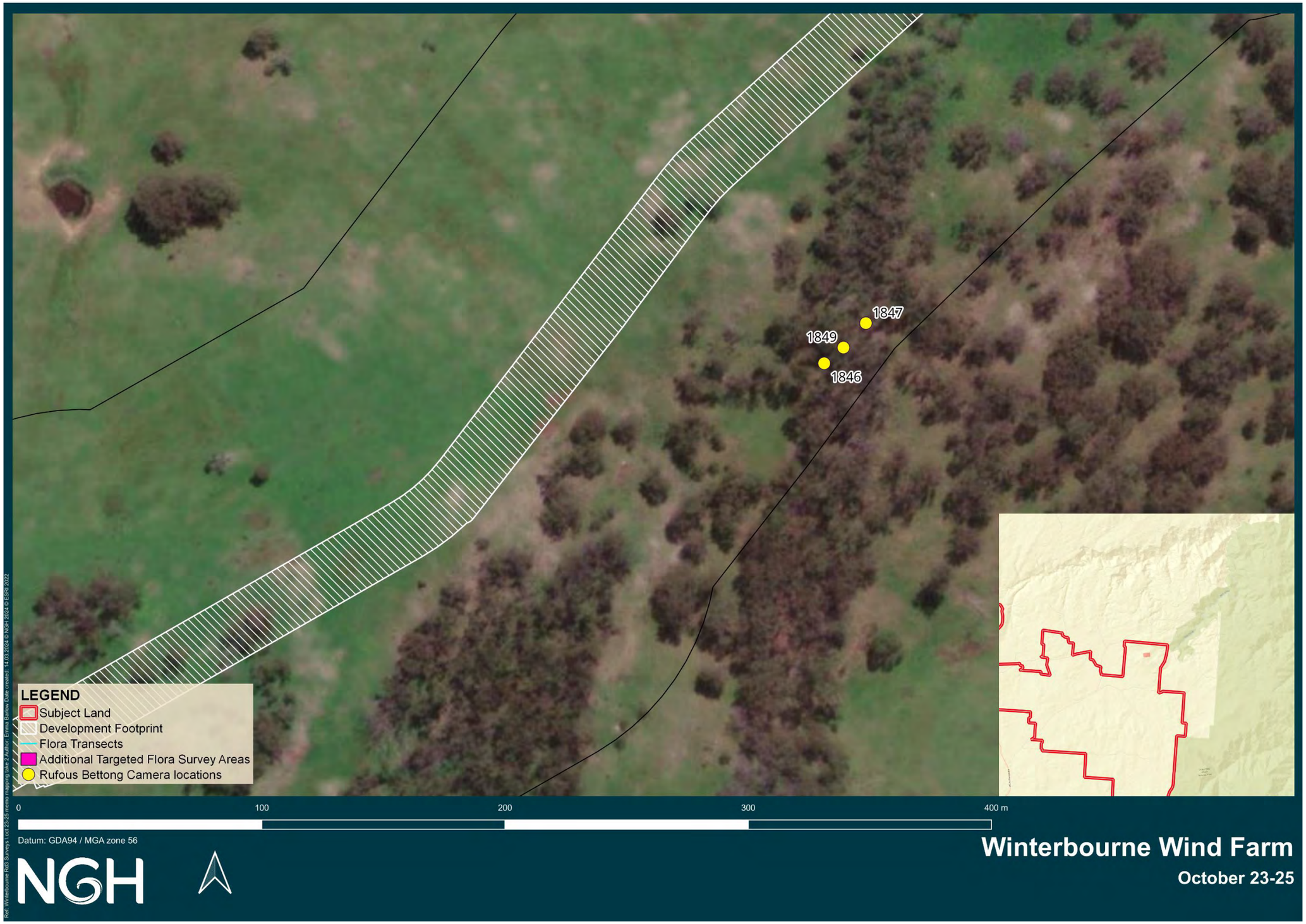

Figure 3-6 Rufous Bettong camera site 2

Figure 3-7 Rufous Bettong camera site 3

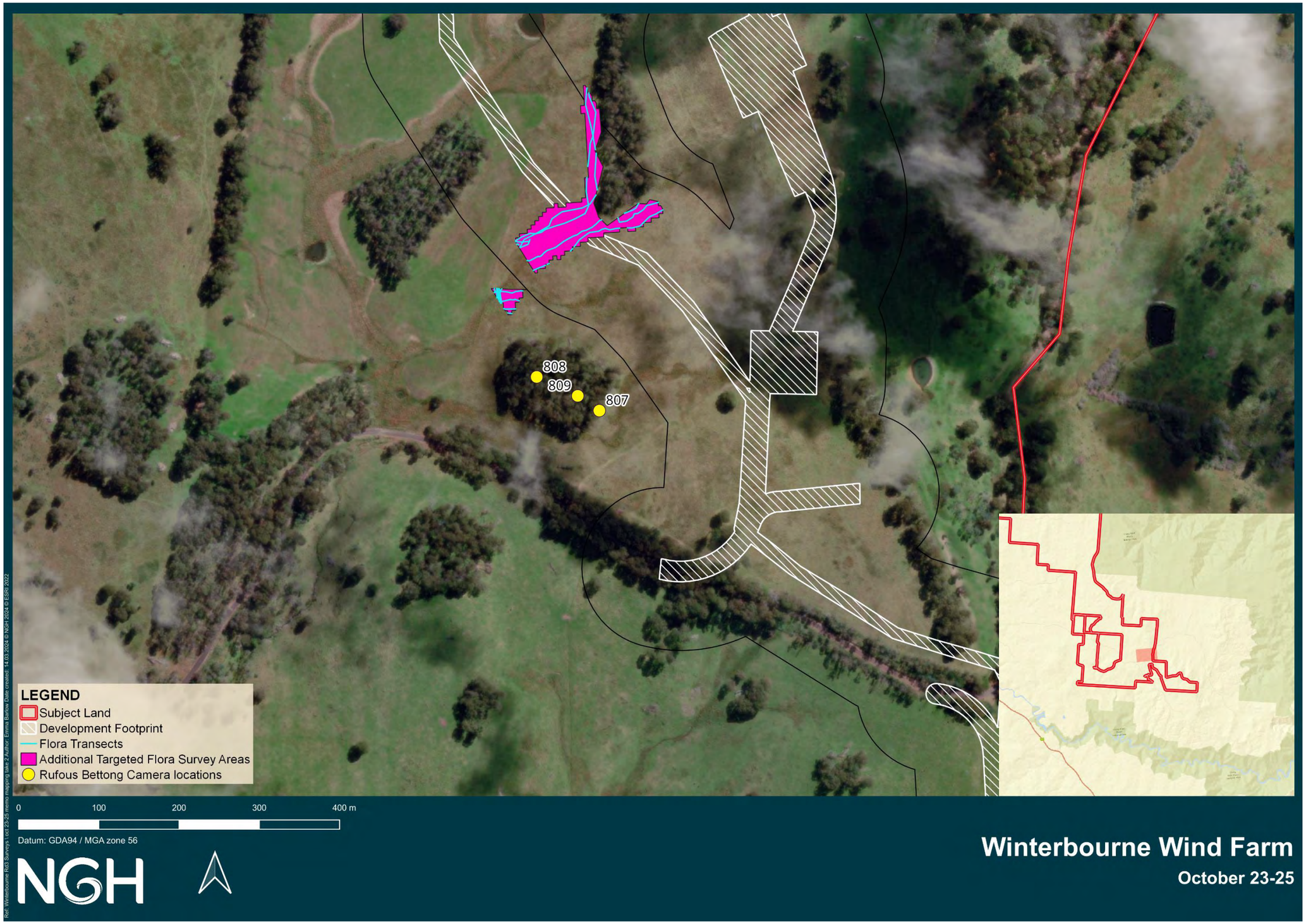

Figure 3-8 Rufous Bettong camera site 4

Figure 3-9 Rufous Bettong camera site 5

APPENDIX C RUFOUS BETTONG CAMERA RESULTS

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
694	5	100MEDIA	9/30/2023	Feral Cat	*Felis catus*			4003-4004
694	5	100MEDIA	9/26/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			2249-2253
694	5	100MEDIA	10/14/2023	Red Fox	*Vulpes vulpes*			9745-9746
694	5	100MEDIA	10/4/2023	Swamp Wallaby	*Wallabia bicolor*			4672-4675
694	5	101MEDIA	10/18/2023	Swamp Wallaby	*Wallabia bicolor*			4219-4239
807	4	100MEDIA	10/6/2023	Cow	*Bos taurus*			2526-2528
807	4	100MEDIA	10/11/2023	Cow	*Bos taurus*			2724-2726
807	4	100MEDIA	10/11/2023	Cow	*Bos taurus*			2772-2774
807	4	100MEDIA	10/17/2023	Cow	*Bos taurus*			3423-3425
807	4	100MEDIA	10/17/2023	Cow	*Bos taurus*			3432-3434
807	4	100MEDIA	10/6/2023	Australian Magpie	*Gymnorhina tibicen*			2520-2522
807	4	100MEDIA	9/28/2023	Eastern Grey Kangaroo	*Macropus giganteus*			966-992
807	4	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2508-2517
807	4	100MEDIA	10/7/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2596-2598
807	4	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3402-3414
807	4	100MEDIA	10/18/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3525-3533
807	4	100MEDIA	10/2/2023	Unknown Kangaroo sp.	*Unknown*			2274
807	4	100MEDIA	9/29/2023	Sheep	*Ovis aries*			1041-1043
807	4	100MEDIA	9/29/2023	Sheep	*Ovis aries*			1122-1124

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
807	4	100MEDIA	10/2/2023	Sheep	*Ovis aries*			1770-1772
807	4	100MEDIA	10/21/2023	Common Brushtail Possum with Juvenile	*Trichosurus vulpecula*			3720-3728
807	4	100MEDIA	9/26/2023	Unknown Bird sp.	*Unknown*			495
807	4	100MEDIA	10/2/2023	Red Fox	*Vulpes vulpes*			1752-1753
807	4	100MEDIA	10/3/2023	Red Fox	*Vulpes vulpes*			2469-2470
807	4	100MEDIA	10/5/2023	Red Fox	*Vulpes vulpes*			2490-2496
807	4	100MEDIA	10/5/2023	Red Fox	*Vulpes vulpes*			2505-2507
808	4	100MEDIA	23/09/2023-26/09/2023	Cow	*Bos taurus*			0136-0153
808	4	100MEDIA	9/30/2023	Cow	*Bos taurus*			0220-0252
808	4	100MEDIA	10/6/2023	Cow	*Bos taurus*			0286-0306
808	4	100MEDIA	10/13/2023	Cow	*Bos taurus*			0394-0420
808	4	100MEDIA	9/23/2023	Cow	*Bos taurus*			0124-0129
808	4	100MEDIA	10/10/2023	Cow	*Bos taurus*			0379-0384
808	4	100MEDIA	10/11/2023	Cow	*Bos taurus*			0385-0390
808	4	100MEDIA	10/16/2023	Cow	*Bos taurus*			0466-0468
808	4	100MEDIA	10/23/2023	Cow	*Bos taurus*			898-903
808	4	100MEDIA	10/19/2023	Calf	*Bos taurus*			0586-0891
808	4	100MEDIA	9/29/2023	Calf	*Bos taurus*			0184-0189
808	4	100MEDIA	10/8/2023	Currawong sp.	*Corvus sp.*			0376-0378
808	4	100MEDIA	10/12/2023	Currawong sp.	*Corvus sp.*			391

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
808	4	100MEDIA	10/24/2023	Raven	*Corvus sp.*			955-957
808	4	100MEDIA	9/26/2023	Unknown Kangaroo sp.	*Unknown*			0154-0156
808	4	100MEDIA	9/27/2023	Unknown Kangaroo sp.	*Unknown*			0157-0159
808	4	100MEDIA	9/28/2023	Unknown Kangaroo sp.	*Unknown*			0160-0165
808	4	100MEDIA	10/1/2023	Unknown Kangaroo sp.	*Unknown*			0262-0263
808	4	100MEDIA	10/6/2023	Unknown Kangaroo sp.	*Unknown*			0303-0312
808	4	100MEDIA	10/7/2023	Unknown Kangaroo sp.	*Unknown*			0313-0336
808	4	100MEDIA	10/14/2023	Unknown Kangaroo sp.	*Unknown*			0424-0425
808	4	100MEDIA	10/15/2023	Unknown Kangaroo sp.	*Unknown*			0451-0465
808	4	100MEDIA	17/10/2023-19/10/2023	Unknown Kangaroo sp.	*Unknown*			472-585
808	4	100MEDIA	9/23/2023	Unknown Kangaroo sp.	*Unknown*			0115-0116
808	4	100MEDIA	9/24/2023	Unknown Kangaroo sp.	*Unknown*			118
808	4	100MEDIA	9/25/2023	Unknown Kangaroo sp.	*Unknown*			0121-0122
808	4	100MEDIA	9/23/2023	Unknown Kangaroo sp.	*Unknown*			133
808	4	100MEDIA	9/28/2023	Unknown Kangaroo sp.	*Unknown*			0172-0177
808	4	100MEDIA	9/30/2023	Unknown Kangaroo sp.	*Unknown*			0259-0261
808	4	100MEDIA	10/5/2023	Unknown Kangaroo sp.	*Unknown*			280
808	4	100MEDIA	10/23/2023	Unknown Kangaroo sp.	*Unknown*			925-939
808	4	100MEDIA	10/24/2023	Unknown Kangaroo sp.	*Unknown*			940-954
808	4	100MEDIA	10/8/2023	Unknown Wallaby sp.	*Unknown*			0367-0372

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
808	4	100MEDIA	10/7/2023	Unknown Wallaby sp.	*Unknown*			0337-0339
808	4	100MEDIA	9/29/2023	Sheep	*Ovis aries*			0190-0216
808	4	100MEDIA	10/14/2023	Sheep	*Ovis aries*			0430-0450
808	4	100MEDIA	10/23/2023	Sheep	*Ovis aries*			904-924
808	4	100MEDIA	10/7/2023	Unknown	*Unknown*			346
808	4	100MEDIA	10/22/2023	Unknown Possum sp.	*Unknown*			895
808	4	100MEDIA	10/7/2023	Unknown Possum sp.	*Unknown*			0351-0359
808	4	100MEDIA	9/29/2023	Red Fox	*Vulpes vulpes*			0217-0218
808	4	100MEDIA	10/2/2023	Red Fox	*Vulpes vulpes*			0265-0266
808	4	100MEDIA	10/2/2023	Red Fox	*Vulpes vulpes*			628
808	4	100MEDIA	10/2/2023	Red Fox	*Vulpes vulpes*			0271-0274
808	4	100MEDIA	10/5/2023	Red Fox	*Vulpes vulpes*			0283-0284
808	4	100MEDIA	10/7/2023	Red Fox	*Vulpes vulpes*			0340-0344
808	4	100MEDIA	10/7/2023	Red Fox	*Vulpes vulpes*			0361-0366
808	4	100MEDIA	10/16/2023	Red Fox	*Vulpes vulpes*			469
809	4	100MEDIA	9/29/2023	Cow	*Bos taurus*			2049-2077
809	4	100MEDIA	9/30/2023	Cow	*Bos taurus*			2109-2114
809	4	100MEDIA	10/6/2023	Cow	*Bos taurus*			2247-02249
809	4	100MEDIA	10/11/2023	Cow	*Bos taurus*			2577-2579
809	4	100MEDIA	10/17/2023	Cow	*Bos taurus*			3234-3247
809	4	100MEDIA	10/18/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3625-3653

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
809	4	100MEDIA	10/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3657-3686
809	4	100MEDIA	10/8/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2415-2417
809	4	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3180-3232
809	4	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3597-3609
809	4	100MEDIA	9/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1881-1894
809	4	100MEDIA	9/26/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1932-1973
809	4	100MEDIA	9/27/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2013-2015
809	4	100MEDIA	10/1/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2152-2168
809	4	100MEDIA	10/1/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2178-2183
809	4	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2250-2258
809	4	100MEDIA	9/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1821-1857
809	4	100MEDIA	9/26/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1917-1928
809	4	100MEDIA	9/28/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2046-2048
809	4	100MEDIA	9/30/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2137-2146
809	4	100MEDIA	10/5/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2229-2230
809	4	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2277
809	4	100MEDIA	10/7/2023	Unknown Wallaby sp.	*Unknown*			2341
809	4	100MEDIA	9/29/2023	Sheep	*Ovis aries*			2097-2105
809	4	100MEDIA	9/30/2023	Sheep	*Ovis aries*			2133-2135
809	4	100MEDIA	10/6/2023	Sheep	*Ovis aries*			2328-2330
809	4	100MEDIA	10/14/2023	Sheep	*Ovis aries*			2928-2938

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
809	4	100MEDIA	10/1/2023	Red Fox	*Vulpes vulpes*			2148
809	4	100MEDIA	10/3/2023	Red Fox	*Vulpes vulpes*			2208-2216
809	4	100MEDIA	10/5/2023	Red Fox	*Vulpes vulpes*			2241 and 2244-2245
809	4	100MEDIA	10/6/2023	Red Fox	*Vulpes vulpes*			2331-2335
809	4	100MEDIA	10/6/2023	Red Fox	*Vulpes vulpes*			2337-2339
809	4	100MEDIA	10/8/2023	Red Fox	*Vulpes vulpes*			2412-2414
809	4	100MEDIA	10/16/2023	Red Fox	*Vulpes vulpes*			3174-3179
809	4	100MEDIA	10/21/2023	Red Fox	*Vulpes vulpes*			4233-4235
809	4	100MEDIA	10/7/2023	Swamp Wallaby	*Wallabia bicolor*			2343-2378
809	4	100MEDIA	10/21/2023	Swamp Wallaby	*Wallabia bicolor*			4074-4084
809	4	100MEDIA	10/21/2023	Swamp Wallaby	*Wallabia bicolor*			4086-4088
812	5	100MEDIA	9/22/2023	Feral Cat	*Felis catus*			1274-1284
812	5	100MEDIA	10/9/2023	Feral Cat	*Felis catus*			4889-4902
812	5	100MEDIA	10/20/2023	Eastern Grey Kangaroo	*Macropus giganteus*			7877-7886
812	5	100MEDIA	9/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1331-1356
812	5	100MEDIA	9/25/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1427-1441
812	5	100MEDIA	9/28/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2054
812	5	100MEDIA	10/2/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2480-2488
812	5	100MEDIA	10/4/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3224
812	5	100MEDIA	10/5/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3782-3784

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
812	5	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4484
812	5	100MEDIA	10/7/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4766-4801
812	5	100MEDIA	10/9/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4868-4882
812	5	100MEDIA	10/9/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5051-5063
812	5	100MEDIA	10/11/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5234-5243
812	5	100MEDIA	10/12/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5399
812	5	100MEDIA	10/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5411-5412
812	5	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5514-5516
812	5	100MEDIA	10/15/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5690-5729
812	5	100MEDIA	10/15/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5783-5794
812	5	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6213-6214
812	5	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			7457
812	5	100MEDIA	10/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			7730-7734
812	5	100MEDIA	9/27/2023	Red-necked Wallaby	*Macropus rufogriseus*			2012-2014
812	5	100MEDIA	9/28/2023	Red-necked Wallaby	*Macropus rufogriseus*			2021
812	5	100MEDIA	10/5/2023	Red-necked Wallaby	*Macropus rufogriseus*			4154-4159
812	5	100MEDIA	10/15/2023	Red-necked Wallaby	*Macropus rufogriseus*			5798-5800
812	5	100MEDIA	10/18/2023	Red-necked Wallaby	*Macropus rufogriseus*			7517-7579
812	5	100MEDIA	10/21/2023	Red-necked Wallaby	*Macropus rufogriseus*			7889-7892
812	5	100MEDIA	10/23/2023	Red-necked Wallaby	*Macropus rufogriseus*			8405-8413
812	5	100MEDIA	9/25/2023	Red-necked Wallaby Juvenile	*Macropus rufogriseus*			1532-1534

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
812	5	100MEDIA	9/23/2023	European Rabbit	*Oryctolagus cuniculus*			1346-1366
812	5	100MEDIA	9/30/2023	European Rabbit	*Oryctolagus cuniculus*			2261-2275
812	5	100MEDIA	10/1/2023	European Rabbit	*Oryctolagus cuniculus*			2354-2362
812	5	100MEDIA	10/4/2023	European Rabbit	*Oryctolagus cuniculus*			3758
812	5	100MEDIA	10/8/2023	European Rabbit	*Oryctolagus cuniculus*			4808-4818
812	5	100MEDIA	10/12/2023	European Rabbit	*Oryctolagus cuniculus*			5402-5470
812	5	100MEDIA	10/19/2023	European Rabbit	*Oryctolagus cuniculus*			7583-7589
812	5	100MEDIA	10/21/2023	European Rabbit	*Oryctolagus cuniculus*			7898-7900
812	5	100MEDIA	10/22/2023	European Rabbit	*Oryctolagus cuniculus*			8045-8047
812	5	100MEDIA	10/23/2023	European Rabbit	*Oryctolagus cuniculus*			8249-8251
812	5	100MEDIA	10/12/2023	Flame Robin	*Petroica phoenicea*	V		5393
812	5	100MEDIA	10/16/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			6197-6199
812	5	100MEDIA	9/29/2023	Red Fox	*Vulpes vulpes*			2246-2254
812	5	100MEDIA	9/22/2023	Swamp Wallaby	*Wallabia bicolor*			1286-1319
812	5	100MEDIA	10/7/2023	Swamp Wallaby	*Wallabia bicolor*			4493
812	5	100MEDIA	10/13/2023	Swamp Wallaby	*Wallabia bicolor*			5504
812	5	100MEDIA	10/14/2023	Swamp Wallaby	*Wallabia bicolor*			5648-5674
812	5	100MEDIA	9/22/2023	Long-nosed Potoroo	*Potorous tridactylus*	V	V	1322-1326
815	5	101MEDIA	10/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5528-5614
815	5	100MEDIA	9/30/2023	Red-necked Wallaby	*Macropus rufogriseus*			5195-5206
815	5	100MEDIA	10/13/2023	Red-necked Wallaby	*Macropus rufogriseus*			9932-9937

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
815	5	100MEDIA	9/22/2023	Unknown Kangaroo sp.	*Unknown*			1836-1841
815	5	100MEDIA	9/26/2023	Unknown Kangaroo sp.	*Unknown*			2648-2692
815	5	100MEDIA	9/27/2023	Unknown Kangaroo sp.	*Unknown*			3068
815	5	100MEDIA	9/28/2023	Unknown Kangaroo sp.	*Unknown*			4292-4321
815	5	100MEDIA	9/30/2023	Unknown Kangaroo sp.	*Unknown*			5207-5273
815	5	100MEDIA	10/3/2023	Unknown Kangaroo sp.	*Unknown*			6281-6283
815	5	100MEDIA	10/7/2023	Unknown Kangaroo sp.	*Unknown*			8168
815	5	100MEDIA	10/8/2023	Unknown Kangaroo sp.	*Unknown*			8177-8179
815	5	100MEDIA	10/8/2023	Unknown Kangaroo sp.	*Unknown*			8186-8187
815	5	100MEDIA	10/9/2023	Unknown Kangaroo sp.	*Unknown*			8315-8316
815	5	100MEDIA	10/10/2023	Unknown Kangaroo sp.	*Unknown*			8429
815	5	100MEDIA	10/10/2023	Unknown Kangaroo sp.	*Unknown*			8432-8440
815	5	100MEDIA	10/12/2023	Unknown Kangaroo sp.	*Unknown*			8693-8698
815	5	100MEDIA	10/14/2023	Unknown Kangaroo sp.	*Unknown*			9947
815	5	101MEDIA	10/20/2023	Unknown Kangaroo sp.	*Unknown*			4079
815	5	101MEDIA	10/21/2023	Unknown Kangaroo sp.	*Unknown*			4247-4249
815	5	101MEDIA	10/21/2023	Unknown Kangaroo sp.	*Unknown*			4330-4447
815	5	101MEDIA	10/21/2023	Unknown Kangaroo sp.	*Unknown*			4553-4559
815	5	100MEDIA	9/25/2023	Unknown Wallaby sp.	*Unknown*			2637-2647
815	5	100MEDIA	9/27/2023	Unknown Wallaby sp.	*Unknown*			3034-3064
815	5	100MEDIA	9/27/2023	Unknown Wallaby sp.	*Unknown*			4208-4288

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
815	5	100MEDIA	9/29/2023	Unknown Wallaby sp.	*Unknown*			5159-5191
815	5	100MEDIA	10/6/2023	Unknown Wallaby sp.	*Unknown*			8108-8132
815	5	100MEDIA	10/14/2023	Unknown Wallaby sp.	*Unknown*			9938-9946
815	5	101MEDIA	10/15/2023	Unknown Wallaby sp.	*Unknown*			1751-1753
815	5	101MEDIA	10/16/2023	Unknown Wallaby sp.	*Unknown*			1766-1771
815	5	101MEDIA	10/17/2023	Unknown Wallaby sp.	*Unknown*			3929-3947
815	5	101MEDIA	10/18/2023	Unknown Wallaby sp.	*Unknown*			3968-4015
815	5	100MEDIA	9/22/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1883-1896
815	5	100MEDIA	10/10/2023	Common Brushtail Possum	*Trichosurus vulpecula*			8447-8473
815	5	100MEDIA	10/11/2023	Common Brushtail Possum	*Trichosurus vulpecula*			8540-8557
815	5	100MEDIA	10/2/2023	Common Brushtail Possum	*Trichosurus vulpecula*			5774-5789
815	5	100MEDIA	9/28/2023	Unknown Bird sp.	*Unknown*			4374
815	5	100MEDIA	9/28/2023	Unknown Bird sp.	*Unknown*			4402
815	5	101MEDIA	10/15/2023	Unknown Bird sp.	*Unknown*			1637
815	5	101MEDIA	10/14/2023	Unknown Marsupial	*Unknown*			866-874
815	5	101MEDIA	10/20/2023	Unknown Marsupial	*Unknown*			4118-4120
815	5	101MEDIA	10/22/2023	Unknown Marsupial	*Unknown*			4604
1838	1	100MEDIA	9/23/2023	Feral Cat	*Felis catus*			555-568
1838	1	100MEDIA	10/4/2023	Australian Magpie	*Gymnorhina tibicen*			1491-1492
1838	1	100MEDIA	10/5/2023	Australian Magpie	*Gymnorhina tibicen*			1506
1838	1	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1059-1064

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1838	1	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1401-1409
1838	1	100MEDIA	10/11/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1821
1838	1	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2139-2144
1838	1	100MEDIA	10/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2829-2863
1838	1	100MEDIA	10/2/2023	Common Wallaroo	*Macropus robustus*			1035
1838	1	100MEDIA	10/4/2023	Common Wallaroo	*Macropus robustus*			1497-1502
1838	1	100MEDIA	10/12/2023	Common Wallaroo	*Macropus robustus*			1929-1937
1838	1	100MEDIA	9/20/2023	Red-necked Wallaby	*Macropus rufogriseus*			417-441
1838	1	100MEDIA	9/24/2023	Red-necked Wallaby	*Macropus rufogriseus*			570-575
1838	1	100MEDIA	9/25/2023	Red-necked Wallaby	*Macropus rufogriseus*			609-636
1838	1	100MEDIA	9/26/2023	Red-necked Wallaby	*Macropus rufogriseus*			644
1838	1	100MEDIA	10/9/2023	Red-necked Wallaby	*Macropus rufogriseus*			1710-1718
1838	1	100MEDIA	10/11/2023	Red-necked Wallaby	*Macropus rufogriseus*			1854-1859
1838	1	100MEDIA	10/12/2023	Red-necked Wallaby	*Macropus rufogriseus*			1881-1907
1838	1	100MEDIA	10/12/2023	Red-necked Wallaby	*Macropus rufogriseus*			1984-2018
1838	1	100MEDIA	10/18/2023	Red-necked Wallaby	*Macropus rufogriseus*			2520-2535
1838	1	100MEDIA	10/20/2023	Red-necked Wallaby	*Macropus rufogriseus*			2601- 2604
1838	1	100MEDIA	10/21/2023	Red-necked Wallaby	*Macropus rufogriseus*			2646-2651
1838	1	100MEDIA	10/22/2023	Red-necked Wallaby	*Macropus rufogriseus*			2682
1838	1	100MEDIA	10/23/2023	Red-necked Wallaby	*Macropus rufogriseus*			2802-2804
1838	1	100MEDIA	10/23/2023	Red-necked Wallaby	*Macropus rufogriseus*			2949-2960

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1838	1	100MEDIA	10/3/2023	Red-necked Wallaby Juvenile	*Macropus rufogriseus*			1050
1838	1	100MEDIA	10/14/2023	Unknown Wallaby sp.	*Unknown*			2220-2234
1838	1	100MEDIA	10/17/2023	European Rabbit	*Oryctolagus cuniculus*			2448-2459
1838	1	100MEDIA	10/18/2023	European Rabbit	*Oryctolagus cuniculus*			2547- 2549
1838	1	100MEDIA	10/20/2023	European Rabbit	*Oryctolagus cuniculus*			2607-2609
1838	1	100MEDIA	10/22/2023	European Rabbit	*Oryctolagus cuniculus*			2790-2798
1838	1	100MEDIA	10/23/2023	European Rabbit	*Oryctolagus cuniculus*			2913-2939
1838	1	100MEDIA	10/13/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			2040-2042
1838	1	100MEDIA	9/22/2023	Common Brushtail Possum	*Trichosurus vulpecula*			543-554
1838	1	100MEDIA	9/24/2023	Common Brushtail Possum	*Trichosurus vulpecula*			585-587
1838	1	100MEDIA	9/27/2023	Common Brushtail Possum	*Trichosurus vulpecula*			696-704
1838	1	100MEDIA	9/27/2023	Common Brushtail Possum	*Trichosurus vulpecula*			723-725
1838	1	100MEDIA	10/3/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1425-1490
1838	1	100MEDIA	10/6/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1602-1622
1838	1	100MEDIA	10/10/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1767-1787
1838	1	100MEDIA	10/11/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1809-1820
1838	1	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			2211-2218
1838	1	100MEDIA	10/20/2023	Common Brushtail Possum	*Trichosurus vulpecula*			2583-2585
1838	1	100MEDIA	10/22/2023	Common Brushtail Possum	*Trichosurus vulpecula*			2652-2673
1838	1	100MEDIA	10/6/2023	Red Fox	*Vulpes vulpes*			1575-1577
1838	1	100MEDIA	9/21/2023	Swamp Wallaby	*Wallabia bicolor*			447-466

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1838	1	100MEDIA	9/30/2023	Swamp Wallaby	*Wallabia bicolor*			804-887
1838	1	100MEDIA	10/1/2023	Swamp Wallaby	*Wallabia bicolor*			921-1016
1838	1	100MEDIA	10/3/2023	Swamp Wallaby	*Wallabia bicolor*			1065-1395
1838	1	100MEDIA	10/11/2023	Swamp Wallaby	*Wallabia bicolor*			1842-1850
1838	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			1872-1875
1838	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			1939-1981
1838	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			2034-2039
1838	1	100MEDIA	10/22/2023	Swamp Wallaby	*Wallabia bicolor*			2697-2747
1838	1	100MEDIA	10/23/2023	Swamp Wallaby	*Wallabia bicolor*			2805-2828
1839	3	100MEDIA	9/22/2023	Cow	*Bos taurus*			1930-1960
1839	3	100MEDIA	9/25/2023	Cow	*Bos taurus*			2153-2173
1839	3	100MEDIA	9/26/2023	Feral Cat	*Felis catus*			2201-2215
1839	3	101MEDIA	10/20/2023	Feral Cat	*Felis catus*			671-673
1839	3	101MEDIA	10/23/2023	Australian Magpie	*Gymnorhina tibicen*			3626-3649
1839	3	100MEDIA	9/21/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1901-1902
1839	3	100MEDIA	9/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1961
1839	3	100MEDIA	9/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1980-2051
1839	3	100MEDIA	9/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2063-2096
1839	3	100MEDIA	9/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2108-2135
1839	3	100MEDIA	9/25/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2138-2143
1839	3	100MEDIA	9/26/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2216-2218

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1839	3	100MEDIA	9/26/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2244-2275
1839	3	100MEDIA	9/27/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3281-3286
1839	3	100MEDIA	9/28/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3296-3328
1839	3	100MEDIA	9/30/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3479-3529
1839	3	100MEDIA	9/30/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3542-3566
1839	3	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4922-4927
1839	3	100MEDIA	10/5/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4952
1839	3	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			987
1839	3	100MEDIA	10/7/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5999-6013
1839	3	100MEDIA	10/8/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6017-6019
1839	3	100MEDIA	10/9/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6056-6094
1839	3	100MEDIA	10/10/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6272
1839	3	100MEDIA	10/10/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6290-6322
1839	3	100MEDIA	10/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			7811-7819
1839	3	101MEDIA	10/16/2023	Eastern Grey Kangaroo	*Macropus giganteus*			464
1839	3	101MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			479-481
1839	3	101MEDIA	10/18/2023	Eastern Grey Kangaroo	*Macropus giganteus*			482-489
1839	3	101MEDIA	10/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			506-536
1839	3	101MEDIA	10/21/2023	Eastern Grey Kangaroo	*Macropus giganteus*			674-677
1839	3	101MEDIA	10/21/2023	Eastern Grey Kangaroo	*Macropus giganteus*			998-1016
1839	3	101MEDIA	10/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1022-1024

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1839	3	101MEDIA	10/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2747-2749
1839	3	101MEDIA	10/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			42864306
1839	3	101MEDIA	10/20/2023	Eastern Grey Kangaroo with Juvenile	*Macropus giganteus*			542-551
1839	3	100MEDIA	9/29/2023	Swamp Wallaby	*Wallabia bicolor*			3455
1841	1	100MEDIA	9/23/2023	Feral Cat	*Felis catus*			415-420
1841	1	100MEDIA	9/20/2023	Eastern Grey Kangaroo	*Macropus giganteus*			294-300
1841	1	100MEDIA	9/30/2023	Eastern Grey Kangaroo	*Macropus giganteus*			952-966
1841	1	100MEDIA	10/2/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1054-1059
1841	1	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1093-1095
1841	1	100MEDIA	10/16/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2716-2721
1841	1	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2725-2730
1841	1	100MEDIA	10/20/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3142-3144
1841	1	100MEDIA	10/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			3394-3400
1841	1	100MEDIA	9/25/2023	Red-necked Wallaby	*Macropus rufogriseus*			469-474
1841	1	100MEDIA	9/26/2023	Red-necked Wallaby	*Macropus rufogriseus*			592-600
1841	1	100MEDIA	9/30/2023	Red-necked Wallaby	*Macropus rufogriseus*			871-897
1841	1	100MEDIA	10/2/2023	Red-necked Wallaby	*Macropus rufogriseus*			1030-1051
1841	1	100MEDIA	10/4/2023	Red-necked Wallaby	*Macropus rufogriseus*			1198-1224
1841	1	100MEDIA	10/9/2023	Red-necked Wallaby	*Macropus rufogriseus*			1462-1470
1841	1	100MEDIA	10/12/2023	Red-necked Wallaby	*Macropus rufogriseus*			1606-1642
1841	1	100MEDIA	10/12/2023	Red-necked Wallaby	*Macropus rufogriseus*			1792-1818

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1841	1	100MEDIA	10/12/2023	Red-necked Wallaby	*Macropus rufogriseus*			1826-1827
1841	1	100MEDIA	10/14/2023	Red-necked Wallaby	*Macropus rufogriseus*			2071-2085
1841	1	100MEDIA	10/15/2023	Red-necked Wallaby	*Macropus rufogriseus*			2287
1841	1	100MEDIA	10/16/2023	Red-necked Wallaby	*Macropus rufogriseus*			2427-2482
1841	1	100MEDIA	10/18/2023	Red-necked Wallaby	*Macropus rufogriseus*			2932-2935
1841	1	100MEDIA	10/20/2023	Red-necked Wallaby	*Macropus rufogriseus*			3082-3129
1841	1	100MEDIA	10/20/2023	Red-necked Wallaby	*Macropus rufogriseus*			3151-3156
1841	1	100MEDIA	10/21/2023	Red-necked Wallaby	*Macropus rufogriseus*			3247-3271
1841	1	100MEDIA	10/21/2023	Red-necked Wallaby	*Macropus rufogriseus*			3277-3288
1841	1	100MEDIA	10/22/2023	Red-necked Wallaby	*Macropus rufogriseus*			3418-3453
1841	1	100MEDIA	10/22/2023	Red-necked Wallaby	*Macropus rufogriseus*			3478
1841	1	100MEDIA	10/22/2023	Red-necked Wallaby	*Macropus rufogriseus*			3625-3636
1841	1	100MEDIA	10/23/2023	Red-necked Wallaby	*Macropus rufogriseus*			3655-3735
1841	1	100MEDIA	10/24/2023	Red-necked Wallaby	*Macropus rufogriseus*			3922
1841	1	100MEDIA	9/23/2023	Unknown Wallaby sp.	*Unknown*			439
1841	1	100MEDIA	10/18/2023	European Rabbit	*Oryctolagus cuniculus*			2926-2928
1841	1	100MEDIA	10/19/2023	European Rabbit	*Oryctolagus cuniculus*			2947
1841	1	100MEDIA	10/19/2023	European Rabbit	*Oryctolagus cuniculus*			3079-3081
1841	1	100MEDIA	10/20/2023	European Rabbit	*Oryctolagus cuniculus*			3223
1841	1	100MEDIA	9/22/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			409-411
1841	1	100MEDIA	9/21/2023	Common Brushtail Possum	*Trichosurus vulpecula*			304-306

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1841	1	100MEDIA	9/24/2023	Common Brushtail Possum	*Trichosurus vulpecula*			466
1841	1	100MEDIA	9/26/2023	Common Brushtail Possum	*Trichosurus vulpecula*			562-564
1841	1	100MEDIA	9/30/2023	Common Brushtail Possum	*Trichosurus vulpecula*			865-869
1841	1	100MEDIA	10/1/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1024-1029
1841	1	100MEDIA	10/2/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1087-1089
1841	1	100MEDIA	10/6/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1366-1368
1841	1	100MEDIA	10/7/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1402-1404
1841	1	100MEDIA	10/9/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1531
1841	1	100MEDIA	10/13/2023	Common Brushtail Possum	*Trichosurus vulpecula*			2059-2063
1841	1	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			2281-2286
1841	1	100MEDIA	10/21/2023	Common Brushtail Possum	*Trichosurus vulpecula*			3388-3390
1841	1	100MEDIA	10/23/2023	Common Brushtail Possum	*Trichosurus vulpecula*			3646-3649
1841	1	100MEDIA	10/23/2023	Common Brushtail Possum	*Trichosurus vulpecula*			3910-3918
1841	1	100MEDIA	10/17/2023	Unknown	*Unknown*			2722
1841	1	100MEDIA	9/28/2023	Red Fox	*Vulpes vulpes*			820-821
1841	1	100MEDIA	9/21/2023	Swamp Wallaby	*Wallabia bicolor*			307-340
1841	1	100MEDIA	9/25/2023	Swamp Wallaby	*Wallabia bicolor*			475-532
1841	1	100MEDIA	9/27/2023	Swamp Wallaby	*Wallabia bicolor*			748-771
1841	1	100MEDIA	10/1/2023	Swamp Wallaby	*Wallabia bicolor*			976-1014
1841	1	100MEDIA	10/2/2023	Swamp Wallaby	*Wallabia bicolor*			1084
1841	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			1661

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1841	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			1723-1781
1841	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			1831-1847
1841	1	100MEDIA	10/21/2023	Swamp Wallaby	*Wallabia bicolor*			3226-3243
1843	3	100MEDIA	10/5/2023	Crow	*Corvus sp.*			5179-5181
1843	3	101MEDIA	10/20/2023	Australian Magpie	*Gymnorhina tibicen*			1249-1251
1843	3	100MEDIA	9/25/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1858-1938
1843	3	100MEDIA	9/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1831-1842
1843	3	100MEDIA	9/26/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1966-2031
1843	3	100MEDIA	9/30/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2083-2127
1843	3	100MEDIA	9/30/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2137-2141
1843	3	100MEDIA	10/1/2023	Eastern Grey Kangaroo	*Macropus giganteus*			2251-2253
1843	3	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4393-4398
1843	3	100MEDIA	10/4/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5142
1843	3	100MEDIA	10/4/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5167
1843	3	100MEDIA	10/10/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6034-6047
1843	3	100MEDIA	10/12/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6112-6169
1843	3	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6739-6755
1843	3	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			6760-6764
1843	3	100MEDIA	10/16/2023	Eastern Grey Kangaroo	*Macropus giganteus*			7069-7081
1843	3	101MEDIA	10/18/2023	Eastern Grey Kangaroo	*Macropus giganteus*			977-988
1843	3	101MEDIA	10/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1186-1189

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1843	3	101MEDIA	10/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1600-1621
1843	3	100MEDIA	10/3/2023	Red-necked Wallaby	*Macropus rufogriseus*			2314-2334
1843	3	100MEDIA	9/24/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1843-1855
1843	3	100MEDIA	9/26/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1945-1951
1844	1	100MEDIA	9/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1441-1458
1844	1	100MEDIA	10/4/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4663-4674
1844	1	100MEDIA	10/5/2023	Eastern Grey Kangaroo	*Macropus giganteus*			4678-4686
1844	1	100MEDIA	10/6/2023	Eastern Grey Kangaroo	*Macropus giganteus*			5069
1844	1	100MEDIA	10/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			7579-7586
1844	1	101MEDIA	10/15/2023	Eastern Grey Kangaroo	*Macropus giganteus*			781-815
1844	1	100MEDIA	9/21/2023	Red-necked Wallaby	*Macropus rufogriseus*			1258-1299
1844	1	100MEDIA	9/26/2023	Red-necked Wallaby	*Macropus rufogriseus*			2077-2109
1844	1	100MEDIA	9/27/2023	Red-necked Wallaby	*Macropus rufogriseus*			2326-2352
1844	1	100MEDIA	9/29/2023	Red-necked Wallaby	*Macropus rufogriseus*			2692-2698
1844	1	100MEDIA	9/30/2023	Red-necked Wallaby	*Macropus rufogriseus*			2908
1844	1	100MEDIA	10/2/2023	Red-necked Wallaby	*Macropus rufogriseus*			3358-3360
1844	1	100MEDIA	10/2/2023	Red-necked Wallaby	*Macropus rufogriseus*			3376-3390
1844	1	100MEDIA	10/10/2023	Red-necked Wallaby	*Macropus rufogriseus*			6469-6493
1844	1	100MEDIA	10/11/2023	Red-necked Wallaby	*Macropus rufogriseus*			6502-6513
1844	1	100MEDIA	10/11/2023	Red-necked Wallaby	*Macropus rufogriseus*			6916-6933
1844	1	100MEDIA	10/15/2023	Red-necked Wallaby	*Macropus rufogriseus*			9715-9717

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1844	1	100MEDIA	10/1/2023	Red-necked Wallaby Juvenile	*Macropus rufogriseus*			2914-2919
1844	1	100MEDIA	9/22/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			1654-1659
1844	1	100MEDIA	10/9/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			6208-6210
1844	1	101MEDIA	10/15/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			778-780
1844	1	100MEDIA	9/22/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1438
1844	1	100MEDIA	9/23/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1837-1839
1844	1	101MEDIA	10/19/2023	Common Brushtail Possum	*Trichosurus vulpecula*			4363-46364
1844	1	100MEDIA	9/25/2023	Swamp Wallaby	*Wallabia bicolor*			1933-1939
1844	1	100MEDIA	9/29/2023	Swamp Wallaby	*Wallabia bicolor*			2809-2820
1844	1	100MEDIA	10/12/2023	Swamp Wallaby	*Wallabia bicolor*			7567-7573
1846	2	100MEDIA	10/1/2023	Antechinus sp.	*Antechinus sp.*			265-267
1846	2	100MEDIA	10/20/2023	Fallow Deer	*Dama dama*			1117-1129
1846	2	100MEDIA	10/2/2023	Eastern Grey Kangaroo	*Macropus giganteus*			277-288
1846	2	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			304
1846	2	100MEDIA	10/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			568-590
1846	2	100MEDIA	10/10/2023	Common Wallaroo	*Macropus robustus*			496-505
1846	2	100MEDIA	10/12/2023	Common Wallaroo	*Macropus robustus*			565-567
1846	2	100MEDIA	9/23/2023	Common Brushtail Possum	*Trichosurus vulpecula*			142-144
1846	2	100MEDIA	9/26/2023	Common Brushtail Possum	*Trichosurus vulpecula*			148-153
1846	2	100MEDIA	10/4/2023	Common Brushtail Possum	*Trichosurus vulpecula*			307-309
1846	2	100MEDIA	10/15/2023	Common Brushtail Possum	*Trichosurus vulpecula*			673-678

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1846	2	100MEDIA	10/19/2023	Common Brushtail Possum	*Trichosurus vulpecula*			955-957
1846	2	100MEDIA	10/22/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1315-1338
1846	2	100MEDIA	9/30/2023	Unknown	*Unknown*			223-225
1846	2	100MEDIA	10/1/2023	Swamp Wallaby	*Wallabia bicolor*			239-259
1846	2	100MEDIA	10/4/2023	Swamp Wallaby	*Wallabia bicolor*			331-336
1846	2	100MEDIA	10/6/2023	Mouse	*Mus musculus*			368-369
1846	2	100MEDIA	10/7/2023	Mouse	*Mus musculus*			418-420
1847	2	100MEDIA	9/25/2023	Fallow Deer	*Dama dama*			346-360
1847	2	100MEDIA	9/26/2023	Fallow Deer	*Dama dama*			388-393
1847	2	100MEDIA	10/13/2023	Fallow Deer	*Dama dama*			679-681
1847	2	100MEDIA	10/22/2023	Fallow Deer	*Dama dama*			1432
1847	2	100MEDIA	10/1/2023	Eastern Grey Kangaroo	*Macropus giganteus*			418-420
1847	2	100MEDIA	10/2/2023	Eastern Grey Kangaroo	*Macropus giganteus*			424-459
1847	2	100MEDIA	10/12/2023	Eastern Grey Kangaroo	*Macropus giganteus*			613-636
1847	2	100MEDIA	10/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			676
1847	2	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			575
1847	2	100MEDIA	10/17/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1354-1356
1847	2	100MEDIA	10/20/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1375
1847	2	100MEDIA	9/23/2023	Common Wallaroo	*Macropus robustus*			298-306
1847	2	100MEDIA	9/25/2023	Common Wallaroo	*Macropus robustus*			364-380
1847	2	100MEDIA	9/26/2023	Common Wallaroo	*Macropus robustus*			385-387

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1847	2	100MEDIA	10/3/2023	Common Wallaroo	*Macropus robustus*			460
1847	2	100MEDIA	10/3/2023	Common Wallaroo	*Macropus robustus*			463-514
1847	2	100MEDIA	10/4/2023	Common Wallaroo	*Macropus robustus*			523-552
1847	2	100MEDIA	10/4/2023	Common Wallaroo	*Macropus robustus*			553-554
1847	2	100MEDIA	10/11/2023	Common Wallaroo	*Macropus robustus*			589-609
1847	2	100MEDIA	10/12/2023	Common Wallaroo	*Macropus robustus*			637-649
1847	2	100MEDIA	10/21/2023	Common Wallaroo	*Macropus robustus*			1396-1428
1847	2	100MEDIA	9/24/2023	Unknown	*Unknown*			310-344
1847	2	100MEDIA	9/21/2023	Swamp Wallaby	*Wallabia bicolor*			55-78
1849	2	100MEDIA	10/20/2023	Fallow Deer	*Dama dama*			473-502
1849	2	100MEDIA	10/3/2023	Fallow Deer	*Dama dama*			401
1849	2	100MEDIA	10/6/2023	Fallow Deer	*Dama dama*			
1849	2	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			380-382
1849	2	100MEDIA	10/3/2023	Eastern Grey Kangaroo	*Macropus giganteus*			392-399
1849	2	100MEDIA	10/4/2023	Eastern Grey Kangaroo	*Macropus giganteus*			404-418
1849	2	100MEDIA	10/13/2023	Eastern Grey Kangaroo	*Macropus giganteus*			434-436
1849	2	100MEDIA	10/20/2023	Eastern Grey Kangaroo	*Macropus giganteus*			503- 505
1849	2	100MEDIA	9/23/2023	Eastern Grey Kangaroo with Juvenile	*Macropus giganteus*			286-322
1849	2	100MEDIA	9/26/2023	Feral Pig	*Sus scrofa*			347-350
1849	2	100MEDIA	10/2/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			372-373
1849	2	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			437-441

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1849	2	100MEDIA	10/23/2023	Common Brushtail Possum	*Trichosurus vulpecula*			536-538
1849	2	100MEDIA	9/27/2023	Unknown	*Unknown*			356-358
1849	2	100MEDIA	9/25/2023	Unknown	*Unknown*			326-334
1849	2	100MEDIA	10/1/2023	Unknown Possum sp.	*Unknown*			368
1849	2	100MEDIA	10/20/2023	Swamp Wallaby	*Wallabia bicolor*			473-502
1852	3	100MEDIA	9/23/2023	Cow	*Bos taurus*			358-503
1852	3	100MEDIA	9/25/2023	Cow	*Bos taurus*			580-655
1852	3	100MEDIA	9/24/2023	Currawong sp.	*Corvus sp.*			508-513
1852	3	100MEDIA	9/21/2023	Feral Cat	*Felis catus*			337-339
1852	3	100MEDIA	9/26/2023	Feral Cat	*Felis catus*			697-702
1852	3	100MEDIA	10/6/2023	Feral Cat	*Felis catus*			982-987
1852	3	100MEDIA	10/8/2023	Feral Cat	*Felis catus*			1003-1005
1852	3	100MEDIA	10/9/2023	Feral Cat	*Felis catus*			1057-1061
1852	3	100MEDIA	10/10/2023	Feral Cat	*Felis catus*			1180-1184
1852	3	100MEDIA	10/12/2023	Feral Cat	*Felis catus*			1282-1287
1852	3	100MEDIA	10/12/2023	Feral Cat	*Felis catus*			1291-1292
1852	3	100MEDIA	10/12/2023	Feral Cat	*Felis catus*			1297-1299
1852	3	100MEDIA	10/12/2023	Feral Cat	*Felis catus*			1297-1302
1852	3	100MEDIA	10/18/2023	Feral Cat	*Felis catus*			1411-1413
1852	3	100MEDIA	10/20/2023	Australian Magpie	*Gymnorhina tibicen*			1594-1608
1852	3	100MEDIA	10/22/2023	Australian Magpie	*Gymnorhina tibicen*			1639-1650

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1852	3	100MEDIA	9/23/2023	Eastern Grey Kangaroo	*Macropus giganteus*			505-507
1852	3	100MEDIA	9/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			538-571
1852	3	100MEDIA	9/25/2023	Eastern Grey Kangaroo	*Macropus giganteus*			574
1852	3	100MEDIA	9/26/2023	Eastern Grey Kangaroo	*Macropus giganteus*			712-723
1852	3	100MEDIA	9/28/2023	Eastern Grey Kangaroo	*Macropus giganteus*			742-780
1852	3	100MEDIA	9/29/2023	Eastern Grey Kangaroo	*Macropus giganteus*			796-826
1852	3	100MEDIA	10/1/2023	Eastern Grey Kangaroo	*Macropus giganteus*			844-867
1852	3	100MEDIA	10/8/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1030-1053
1852	3	100MEDIA	10/9/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1063-1138
1852	3	100MEDIA	10/9/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1153-1171
1852	3	100MEDIA	10/11/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1192-1196
1852	3	100MEDIA	10/11/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1219-1279
1852	3	100MEDIA	10/14/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1327-1332
1852	3	100MEDIA	10/18/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1414
1852	3	100MEDIA	10/18/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1417
1852	3	100MEDIA	10/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1423-1428
1852	3	100MEDIA	10/19/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1477-1575
1852	3	100MEDIA	10/21/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1615-1620
1852	3	100MEDIA	10/22/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1684
1852	3	100MEDIA	10/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1696-1701
1852	3	100MEDIA	10/24/2023	Eastern Grey Kangaroo	*Macropus giganteus*			1705-1728

Camera	Site	Folder	Date	Common Name	Species Name	BC Act Status	EPBC Act Status	Photo number
1852	3	100MEDIA	10/9/2023	Red-necked Wallaby	*Macropus rufogriseus*			1144-1152
1852	3	100MEDIA	9/25/2023	Crimson Rosella	*Platycercus elegans*			685-686
1852	3	100MEDIA	10/19/2023	Crimson Rosella	*Platycercus elegans*			1432-1449
1852	3	100MEDIA	9/26/2023	Tawny Frogmouth	*Podargus strigoides*			694-696
1852	3	100MEDIA	10/11/2023	Short-beaked Echidna	*Tachyglossus aculeatus*			1213-1218
1852	3	100MEDIA	9/28/2023	Common Brushtail Possum	*Trichosurus vulpecula*			730-732
1852	3	100MEDIA	10/8/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1000-1002
1852	3	100MEDIA	10/10/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1186-1188
1852	3	100MEDIA	10/11/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1198-1203
1852	3	100MEDIA	10/14/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1321-1323
1852	3	100MEDIA	10/20/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1576-1578
1852	3	100MEDIA	10/24/2023	Common Brushtail Possum	*Trichosurus vulpecula*			1702-1704
1852	3	100MEDIA	10/20/2023	Unknown Owl sp.	*Unknown*			1612-1614
1852	3	100MEDIA	10/19/2023	Common Wombat	*Vombatus ursinus*			1429-1431
1852	3	100MEDIA	10/3/2023	Swamp Wallaby	*Wallabia bicolor*			925-928

Prepared for ERM

Survey Technical Memo

Winterbourne Targeted Flora & BAM Plots Jan/Feb 2024

February 2024

Project Number: 230247

Document verification

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Acronyms and abbreviations

AWS	Automatic weather station
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCD	Biodiversity and Conservation Division
BOM	Australian Bureau of Meteorology
CE	Critically endangered
Cwth	Commonwealth
E	Endangered
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
ha	hectares
km	kilometres
LGA	Local government area
m	metres
PCT	Plant Community Type
TEC	Threatened ecological community
V	Vulnerable

1. Methods

1.1. BAM Plots

The BAM plot survey effort was a combination of plots to determine whether land mapped as Category 1 (Cat 1) was Cat 1 land (leftover from December 2023 survey effort), and BAM Plots in areas of vegetation that were unable to be assigned a PCT based on rapid assessment data taken in December. The total BAM plot survey effort was 27: 7 plots were to determine PCT; 20 plots were to determine Cat 1 status.

BAM Plots were completed in teams of two, using the "BAM Plot" form in MerginMaps to record their completion and using a BAM Data Sheet to record the data.

1.2. Targeted Threatened Flora Survey

Targeted flora surveys were undertaken for the following eight threatened species:

- Austral Toadflax (*Thesium austral)*
- Bluegrass (*Dichanthium setosum)*
- Dungowan Starbush (*Asterolasia beckersii)* SAII species
- *Euphrasia arguta*
- Narrow-leaved Black Peppermint (*Eucalyptus nicholii)*
- Pygmy Cypress-pine (*Callitris oblonga)*
- Rainforest Senna (Senna acclinis)
- Small-fruited Mountain Gum (*Eucalyptus oresbia*)

Targeted flora surveys were conducted only in PCTs mapped within the development footprint that were associated to the threatened species listed above. These PCTs included:

- **PCT 565** - Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- **PCT 568** - Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- **PCT 766** - Carex sedgeland of the slopes and tablelands
- **PCT 934** - Messmate open forest of the tableland edge of the NSW North Coast Bioregion and New England Tableland Bioregion
- **PCT 970** - Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

In alignment with the Threated Flora Survey Guidelines (2020), there were two survey methods used for targeted flora surveys. The grid point method was used in PCTs that occurred over more than 50ha across the site (PCT 565, 568, 766, 970). Walking transects were undertaken in PCTs that occurred over less than 50ha across the site (PCT 934).

1.2.1. Grid Point Method

Using QGIS, grid points were overlayed the project area in a 100x100m grid pattern. These grid points were clipped to the relevant PCTs that the threatened flora were associated with (listed above). Each grid point

was buffered by 20m creating a 40m diameter circle which was used as the survey area. There were a total of 204 grid points.

Surveys were completed in pairs, where parallel traverses were conducted within this circle at a separation distance of 10 metres, at the recommendation of the Biodiversity and Conservation Division (BCD) described in Section 1.2.3.

Within MerginMaps, completion of grid points was recorded with "Flora Fauna Survey Locations" point. Presence of a targeted threatened species was recorded depending on whether it was an area or count species (three count species & five area species were surveyed for). Area species were mapped to their full extent with "Threatened Flora Fauna Incidental Sightings Polygon", and count species were recorded with "Threatened Flora Fauna Incidental Sightings" points.

1.2.2. Walking Transect Method

PCT 934 was the only PCT on site that needed to be surveyed for threatened species with a total area less than 50ha. Within PCT 934, parallel transects were mapped 10m apart, totalling 854m of walking transects.

In a team of two, one transect line was walked once by each person at the recommendation of the Biodiversity and Conservation Division (BCD) described in Section 1.2.3.

1.2.3. Targeted Species

Surveying eight species simultaneously deviates from the recommendation of five species per search in Section 5.1 of NSW Survey Guidelines for threatened plants. After consulting with BCD, it was decided upon that the approach of individual observers being limited to searching for a maximum of five species in the same stratum per transect, e.g. five ground layer species only. This approach was implemented into the survey effort by having one person survey for ground/mid stratum and one person survey for canopy species at each grid point or walking transect. Table 1-1 below details the stratum of each targeted flora species, along with their associated PCTs and growth forms.

GIS data and results stored in the following folder. \\10.0.18.1\Active\Projects\2023\230247 Winterbourne BDAR amendments\Fieldwork\Results 2024 surveys\RAW MERGIN DATA do not delete

Table 1-1 Targeted flora species surveyed

PCT	Growth Form	Stratum	Species
565	Herbs and forbs	Ground	*Dichanthium setosum*
565	Herbs and forbs	Ground	*Euphrasia arguta*
565	Herbs and forbs	Ground	*Thesium australe*
568	Herbs and forbs	Ground	*Dichanthium setosum*
568	Herbs and forbs	Ground	*Euphrasia arguta*
568	Herbs and forbs	Ground	*Thesium australe*
766	Herbs and forbs	Ground	*Dichanthium setosum*

PCT	Growth Form	Stratum	Species
766	Herbs and forbs	Ground	*Euphrasia arguta*
766	Herbs and forbs	Ground	*Thesium australe*
766	Shrub	Mid	*Callitris oblonga*
766	Tree	Canopy	*Eucalyptus nicholii*
934	Shrub	Mid	*Senna acclinis*
934	Shrub	Mid	*Asterolasia beckersii*
934	Tree	Canopy	*Eucalyptus oresbia*
970	Herbs and forbs	Ground	*Dichanthium setosum*
970	Herbs and forbs	Ground	*Euphrasia arguta*
970	Herbs and forbs	Ground	*Thesium australe*
970	Tree	Canopy	*Eucalyptus nicholii*

1.3. Threatened Fauna Habitat Assessment

Habitat assessment surveys were conducted for two species:

- Sphagnum Frog (*Philoria sphagnicolus*) – NSW – V, Cwth - V
- Stephen's Banded Snake (*Hoplocephalus stephensii*) – NSW - V

Habitat for these species was surveyed for due to their association with PCT 934, which was newly identified during the December 2023 fieldwork.

PCT 934 was searched for the following suitable micro habitat:

- Rocky outcrops with seeps and/or soaks
- Fallen timber, vine thickets
- Moss, seepages, slopes, soil looseness
- Leaf litter, logs
- Moistness

This micro habitat was also surveyed for within a presumed gully identified using Strahler mapping, occurring 63 metres east of PCT 934 outside of the development footprint. The total survey effort covered was 1.09ha of associated habitat.

Two ecologists conducted a random meander of the survey area to assess the presence of the micro habitat for the species (listed above). Rapid Assessment points were taken to document the suitability of microhabitat in the area, whether it was present or absent.

1.4. Effort

Table 1-2 below describes the survey effort and presence of each targeted species. Note that *Dichanthium setosum* and *Eucalyptus nicholii* samples are yet to have their identification confirmed by the Herbarium.

Table 1-2 Threatened species surveys for candidate flora species on subject land

Common name	Scientific name	Threatened species surveys			Present?
		Survey method	Timing	Effort	
Bluegrass	*Dichanthium setosum*	Grid Point Transect	Jan/Feb (Summer)	204 grid points	Potentially
	Euphrasia arguta	Grid Point Transect	Jan/Feb (Summer)	204 grid points	No
Austral Toadflax	*Thesium australe*	Grid Point Transect	Jan/Feb (Summer)	204 grid points	No
Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	Grid Point Transect	Jan/Feb (Summer)	204 grid points	YES
Small-fruited Mountain Gum	*Eucalyptus oresbia*	Walking Transect	Jan/Feb (Summer)	854m	No
Rainforest Cassia	*Senna acclinis*	Walking Transect	Jan/Feb (Summer)	854m	No
Dungowan Starbush	*Asterolasia beckersii*	Walking Transect	Jan/Feb (Summer)	854m	No
Pygmy Cypress Pine	*Callitris oblonga*	Grid Point Transect	Jan/Feb (Summer)	5 grid points	No

1.5. Weather conditions

Weather conditions of the field survey are documented in Table 1-3. Conditions are taken from the town of Walcha and often varied to what was experienced on site (e.g. lower temperature and higher rainfall to what was recorded in Walcha). Conditions also vary onsite depending what area the teams were working in.

Table 1-3 Survey weather conditions

Survey undertaken	Date	Time (24hrs)	Temp. min (C°)	Temp. max (C°)	Wind	Rainfall	Other conditions relevant to species
BAM Plots	29/01/2024	0830- 1800	17.6	27.8	ENE (39km/h)	0.2	N/A
BAM Plots & Targeted Flora	30/01/2024	0830- 1800	19.2	28.2	ESE (41km/h)	43.8	N/A
BAM Plots & Targeted Flora	31/01/2024	0830- 1800	15.9	27.3	E (31km/h)	0	N/A
Targeted Flora & Fauna Habitat Assessment	01/02/2024	0830- 1800	14.2	29.3	ENE (31km/h)	0	N/A
Targeted Flora	02/02/2024	0830- 1900	15.5	31.3	W (41km/h)	0	N/A
Targeted Flora	03/02/2024	0830- 1800	17.7	31.6	E (33km/h)	0	N/A

1.6. Limitations

Limitations to the survey effort include:

- Staff changes during surveys
- Differing experience levels amongst field staff
- Inconsistency between subjective assessments across staff (e.g. measure of % cover)

1.7. Survey team

Table 1-1-4 - Survey Team

Name	Role	Fieldwork Conducted	Survey dates
James Hagan	Ecologist (Team Leader)	Threatened Flora Transects	30 Jan – 3 Feb 2024
Stella O'Dwyer	Biodiversity Consultant (Team Leader)	Threatened Flora Transects	30 Jan – 3 Feb 2024
Tom Fletcher	Ecologist	BAM Plots, Threatened Flora Transects & Threatened Species Habitat Assessment (Sphagnum Frog and Stephen's Banded Snake)	29 Jan – 2 Feb 2024
Ben Sloggett	Ecologist	BAM Plots, Threatened Flora Transects & Threatened Species Habitat Assessment (Sphagnum Frog and Stephen's Banded Snake)	1 – 2 Feb 2024
Dr John Hunter (Hewlett Hunter Pty Ltd)	Director/Principal Ecologist (Team Leader)	BAM Plots	29 – 30 Jan 2024
Damian Licari (Ascent Ecology)	Principal Ecologist (Team Leader)	BAM Plots & Threatened Flora Transects	29 Jan – 2 Feb 2024
Kaelen Were (Ascent Ecology)	Consultant	BAM Plots & Threatened Flora Transects	29 Jan – 2 Feb 2024
Timothy Callaghan (ERM)	Senior Ecologist	Threatened Flora Transects	30 Jan – 2 Feb 2024
Kai Henderson (ERM)	Ecologist	Threatened Flora Transects	30 Jan – 2 Feb 2024

2. Results

2.1. BAM Plots

A total of 27 BAM Plots were conducted during the January 2024 fieldwork. Ten of these BAM Plots were required to determine PCTs in areas where the vegetation was unable to be assigned a PCT based on Rapid Assessment Points taken during the December 2023 survey effort. After analysing the January BAM plot data, it was determined that no new PCTs were found onsite. These BAM plots aligned with pre-existing PCTs mapped during previous fieldtrips. The BAM Plots also contained no threatened flora species. The further 17 BAM Plots were conducted to determine Land Category status. Analysis of these plots is in progress.

2.1.1. Condition States & Vegetation Zones

BAM Plots were conducted within varying conditions of vegetation. The dominant vegetation condition was moderately to heavily grazed, while some areas showed signs of pasture improvement. Pasture management states ranged from recently treated with herbicide to recently seeded or in some cases having a dense cover of pasture species. The condition of vegetation within the BAM Plot was contingent upon the specific landowner, influencing factors such as grazing intensity, pasture management practices, and overall land stewardship.

2.1.2. Justification of PCT selection

Refer to Table 2-1 for PCTs that were determined from the BAM Plots conducted during fieldwork. PCT identification was achieved through an evidence based decision pathway that included the following:

- Referral to current PCT mapping in proximity to the BAM plots
- Analysing suitability of the species composition of existing PCTs to the undetermined areas using *BioNet Vegetation Classification*
    - Aligning key species with highest percent coverage to PCT descriptions
    - Assessing landscape position and geomorphology

PCT identification is to be reviewed by senior ecologist to ensure correctness.

2.1.3. Alignment with TECs

The PCTs determined from the BAM plots are associated with the TEC (Threatened Ecological Communities) detailed in Table 2-1. Further analysis is needed to determine whether the areas align with the TECs, which is in progress.

Table 2-1 PCTs determined from BAM Plots and associated TECs

PCT Name	BC Act TEC	EPBC Act TEC
518 - Heath swamps wetland on leucogranite and granite of the New England Tableland Bioregion	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions **Endangered**	N/A
	Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion **Endangered**	
526 - Mountain Ribbon Gum - Messmate - Broad-leaved Stringybark open forest on granitic soils of the New England Tableland Bioregion	N/A	N/A
567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions **Critically Endangered**	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland **Critically Endangered**
1194 - Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion **Endangered**	

2.2. Targeted Threatened Flora Survey

The targeted survey resulted in the detection of 46 *Eucalyptus nicholii* individuals in PCTs 568, 766, 970. Seven records of potential *Dichanthium setosum* were also taken; confirmation will be advised in due course as samples have been sent to the Sydney Herbarium for identification. None of the remaining target species

were detected during the surveys. The likelihood of targeted species detection is described below in Table 2-2.

Table 2-2 Threatened species targeted and their occurrence during survey

Scientific name	Common name	Status		Microhabitat constraints and potential occurrence (Moderate, High, Recorded)
		BC Act	EPBC Act	
Thesium austral	Austral Toadflax	V	V	Moderate - Associated with Kangaro Grass *(Themeda australis*), which was present at some locations on site.
Dichanthium setosum	Bluegrass	V	V	High – many associated species found, found in disturbed areas such as cleared woodland and disturbed pasture (alike to study area).
Asterolasia beckersii	Dungowan Starbush	CE (SAII)	CE	Moderate – grows along creekbanks dominated by River Oak or Manna Gum (not present onsite)
Euphrasia arguta		CE	CE	Moderate - Grows in grassy areas near rivers (not present onsite)
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	**RECORDED** – found largely on private property and roadsides (alike to study area)
Callitris oblonga	Pygmy Cypress-pine	V	V	Moderate – usually grows in sand along watercourses (not present onsite)
Senna acclinis	Rainforest Senna	E		Moderate - grows on the margins of subtropical, littoral and dry rainforests (not present onsite)
Eucalyptus oresbia	Small-fruited Mountain Gum	V		Moderate – found in very steep valleys and incised creek lines (not present onsite)

2.3. Threatened Fauna Habitat Assessment

Sphagnum Frog (*Philoria sphagnicolus*)

PCT 934 and the gully to the east do not provide suitable habitat for the Sphagnum Frog (*Philoria sphagnicolus*). Despite the presence of embedded rocks covered in moss, fallen timber, leaf litter and a marginally moist substrate, there was no evidence of permanent water including seeps and soaks or rocky outcrops which are the required breeding habitat for the species (DPE, 2020).

Stephens Banded Snake (*Hoplocephalus stephensii*)

PCT 934 and the gully to the east constitute suitable habitat for Stephen's Banded Snake (*Hoplocephalus stephensii*) due to the high abundance of fallen logs and hollow bearing trees within the area (DPE, 2022). No arboreal vine tangles were observed during the survey – this is a habitat constraint for this species and a justification for exclusion if none occur within 500m. The BDAR will include further analysis. Photos of Habitat to be provided in BDAR.

3. References

DPE. (2020). NSW Survey Guide for Threatened Frogs. Department of Planning and Environment.

DPE. (2022). Threatened reptiles - Biodiversity Assessment Method survey guide. State of NSW and Department of Planning and Environment.

DPE (2020) NSW survey guide for the Biodiversity Assessment Method Surveying threatened plants and their habitats, Department of Planning, Industry and Environment.

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APPENDIX C BAM FLORISTIC DATA

species	Exotic	JH029	BAMPlo	JH063	WWF12	WWF12	WWF13	WWF13	WWF13	WWF13	WWF13	JH050	WT153	JH121	JH077	JH026	JH027	WWF07	JH042	JH102	WWF11	JH108	JH107	WWF11	WWF11	JH061	JH059	JH013	WWF11	WWF11	WWF08	WWF09	WWF11	WWF12	WT143	JH101	MA07	MA08
Abildgaardia ovata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia dealbata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia deanei		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia falcata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia falciformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia filicifolia		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia implexa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Acacia leiocalyx		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia melanoxylon		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia rubida		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia ulicifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia venulosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena agnipila		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena novae-zelandiae		0	0	0	0	0	0	0	0	0	0	0	0.1	0.3	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0.2	0
Acaena ovina		0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Acaena spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Acetosella vulgaris	*	0	0	0	0.1	0.1	0	0.1	0	0	0	0	0	0	0	0	0	2	0	0	0.1	0	0	0.1	0.1	0	0	0	0.4	0.2	0	0	0.1	0.1	0	0	0	0
Adiantum aethiopicum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aira spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ajuga australis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Allocasuarina littoralis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternanthera denticulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus powellii	*	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Amaranthus spp.		0	0.1	0	0	0	0.1	0	0	0.2	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammi majus	*	0	0	0	0	0	0	0	0	0	0	1	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Ammobium alatum		0	0	0	0	0	0	0.3	0	0	0	0.1	0.1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0
Amyema miquelii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema pendula		5	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anagallis arvensis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Andropogon virginicus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
Angophora floribunda		0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthosachne scabra		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthoxanthum odoratum	*	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
Aristida jerichoensis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida personata		0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
Aristida ramosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Aristida spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida vagans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropodium milleflorum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asperula conferta		0.1	0	0	0.3	0.1	0	0.1	0	0.3	0	2	0.3	0.1	0	0.1	0	0	5	2	0.1	0.5	1	0.1	0	1	2	0.1	0.5	0.2	0.1	5	0	0	0.1	2	0	0
Asperula gunnii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asplenium flabellifolium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa bigeniculata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa densiflora		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa nodosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa puberula		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa pubescens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa ramosissima		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa rudis		0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	65	0	0	0	0.2	0	0	1	0	0	0	1	2	0.1	0	0	0	0	0	0	0	0	0	0
Austrostipa scabra		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa verticillata		0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12	2	0	10	0	0	0	0	0
Avena spp.	*	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Axonopus fissifolius	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baloskion stenocoleum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens pilosa	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billardiera scandens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blechnum cartilagineum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bothriochloa decipiens		0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	15	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	15	0	0	0
Bothriochloa macra		0	0	0	0	0	0	0	15	60	20	0	0	0	0	0	0	0	0	0	0	0	0	2	0.2	0	0	0	0	0	0.1	0.5	0.1	0	0	0	0	0
Brachyloma daphnoides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome diversifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome graminea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome multifida		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome scapigera		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spathulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spp.		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica rapa	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Briza minor	*	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus brevis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus catharticus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus diandrus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus spp.	*	0	0	0	0	25	15	0.7	0.3	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	15	4	0	0	35	0	0	0	0	0
Bulbine bulbosa		0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0
Bursaria longisepala		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bursaria spinosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Caesia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caladenia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis cuneata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis cuneifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Calotis lappulacea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capillipedium parviflorum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursapastoris	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursa-pastoris	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	Exotic	JH029	BAMPlo	JH063	WWF12	WWF12	WWF13	WWF13	WWF13	WWF13	WWF13	JH050	WT153	JH121	JH077	JH026	JH027	WWF07	JH042	JH102	WWF11	JH108	JH107	WWF11	WWF11	JH061	JH059	JH013	WWF11	WWF11	WWF08	WWF09	WWF11	WWF12	WT143	JH101	MA07	MA08
Cardamine hirsuta	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardamine lilacina		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carduus nutans	*	0.1	0	0.1	0	0	25	0.1	30	0.8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Carex appressa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Carex breviculmis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex echinata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex gaudichaudiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex inversa		1	0	0.1	0	0	0	0	0	0	0	0	0	1	3	0	0	0	5	0	0	1	0.1	0	0	2	1	1	0	0	0	0.1	0	25	1	10	0.2	0.2
Carex spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia leptocephala		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia quinquefaria		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus ciliaris	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus purpurascens		0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centaurea spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centaurium erythraea	*	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Centaurium spicatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centella asiatica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centipeda cunninghamii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium balearicum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium glomeratum	*	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium vulgare	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilanthes sieberi		0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium album	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium carinatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloris truncata		0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0.4	0.1	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Choretrum pauciflorum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysocephalum apiculatum		0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Chrysocephalum semipapposu		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0
Cichorium intybus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium arvense	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium vulgare	*	0.2	0.1	0.1	0.2	5	0	0.1	0.5	1	0.2	0	0.1	0	0.1	0.1	0	0	5	0	0.1	0.1	2	10	0.2	0	0.1	0.1	0.1	0.1	0	0	0	0.1	0.1	0	0.1	0	0.2
Clematis aristata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clematis microphylla		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conium maculatum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0
Convolvulus erubescens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Conyza bonariensis	*	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Conyza parva	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Conyza spp.	*	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.3	0.1	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0
Cotula australis		15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Craspedia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Craspedia variabilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassula sieberiana		0.1	0	0.1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0.5	0	2	0	0.4	0	0	0	0	0
Crataegus monogyna	*	0	0	0	0	0	2	5	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis capillaris	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptandra amara		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclospermum leptophyllum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbonotus lawsonianus		0.2	0	0.2	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0.1	1	0.1	0	0	1	0	0.1	0.1	0.1	0	0	0.2	0	0	0	0	0
Cymbopogon refractus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynara cardunculus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynodon dactylon		5	40	15	0.1	20	5	0	20	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cynoglossum australe		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynosurus echinatus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus eragrostis	*	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus exaltatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus gracilis		0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus sphaeroideus		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus vaginatus		0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dactylis glomerata	*	0	0.5	60	0.1	0	0	0	0	0	0	60	0	0.1	10	0	0	60	0	0.1	0	20	20	0	0	0	70	0	0	0	0	0	0	0	0	15	0	0
Datura stramonium	*	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus carota	*	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Daucus glochidiatus		0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	1	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Daviesia genistifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Daviesia latifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella caerulea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella longifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Dianella revoluta		0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Dianella spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianthus armeria	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Dichanthium sericeum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichanthium setosum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelachne crinita		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelachne micrantha		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Dichondra repens		5	0	0	0.1	0	0	0.5	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0.1	0.1	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0
Dichopogon fimbriatus		0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0
Dichopogon strictus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Drosera peltata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera spatulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania carinata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania pumilio		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinopogon caespitosus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinopogon ovatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echium plantagineum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia hastata		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia nutans		0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0

species	Exotic	JH029	BAMPlo	JH063	WWF12	WWF12	WWF13	WWF13	WWF13	WWF13	WWF13	JH050	WT153	JH121	JH077	JH026	JH027	WWF07	JH042	JH102	WWF11	JH108	JH107	WWF11	WWF11	JH061	JH059	JH013	WWF11	WWF11	WWF08	WWF09	WWF11	WWF12	WT143	JH101	MA07	MA08
Einadia polygonoides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia trigonos		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis acuta		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis atricha		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleusine spp.	*	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0.1	0.1	0	0	1	0	0	0	0
Eleusine tristachya	*	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus scaber		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilobium billardierianum		0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis brownii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis curvula	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	10
Eragrostis lacunaria		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptocarpa		0	0	0	30	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptostachya		0	0	0	0	5	0	0	1	0	0	0	0	0	2	10	10	0	3	0	0	0	0	0	0	0	5	0	0	0	0	20	1	0	0	5	0	0
Eragrostis pilosa	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis trachycarpa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium cicutarium	*	0	0	0	0.1	0	0	0	0.2	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium moschatum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus acaciiformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus andrewsii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus blakelyi		8	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	20	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus bridgesiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus calidissima		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus caliginosa		5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus campanulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus conica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus dalrympleana		0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus elliptica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus fastigata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus laevopinea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0
Eucalyptus malacoxylon		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus melliodora		10	20	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	15	10	18	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
Eucalyptus michaeliana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nicholii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nobilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nova-anglica		0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	10	0	0	15	25	10	0.1	10	20	0	0	0	0	0	0
Eucalyptus obliqua		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus pauciflora		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Eucalyptus radiata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus stellulata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus viminalis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus williamsiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus youmanii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton involucratus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton sphaericus		1	0	0	0	1	0	0	0	0	0	0	0	0.1	0	15	20	0.1	0.1	0	0	0	0.3	3	0.2	1	1	0	0.1	0	0	0.1	0	0	0	0.2	0	0
Euphorbia prostrata	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exocarpos cupressiformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca arundinacea	*	0	0	0	0	0	0	0	0	0	0	40	10	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Festuca nigrescens	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca rubra	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	*	0	0	0	0	0	0	0	0	0.5	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Fimbristylis dichotoma		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
Gahnia sieberiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium binifolium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium gaudichaudii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leiocarpum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leptogonium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium murale	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium propinquum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gamochaeta coarctata	*	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1
Gamochaeta spp.	*	0	0	0	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.2	0	0	0	2	0	0	0	0
Geranium molle subsp. molle	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geranium solanderi		0.2	0.1	0	2	0	1	1	0.1	0.1	0	0	0.1	0	0	0.1	0.1	0	0.1	0.2	0.6	0.3	1	0.2	0.1	0.1	0	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0	0	0	0.1
Glycine clandestina		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine microphylla		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine tabacina		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Gomphrena celosioides	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus elatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus tetragynus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus teucrioides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia bellidifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia hederacea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia heteromera		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia rotundifolia		0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grona varians		0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0.1	0	0	0.1	0	0
Hainardia cylindrica	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis aspera		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis heterophylla		0	0	0	0	0	0	0.9	0	0	0	0	0	0	1	0	0	0	0	0.5	0	0	0.1	0	0.1	1	0	0	0	0	0	0	0	0	2	0.3	8	0	0
Haloragis spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardenbergia violacea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heliotropium amplexicaule	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemarthria uncinata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibbertia obtusifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibbertia riparia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	Exotic	JH029	BAMPlo	JH063	WWF12	WWF12	WWF13	WWF13	WWF13	WWF13	WWF13	JH050	WT153	JH121	JH077	JH026	JH027	WWF07	JH042	JH102	WWF11	JH108	JH107	WWF11	WWF11	JH061	JH059	JH013	WWF11	WWF11	WWF08	WWF09	WWF11	WWF12	WT143	JH101	MA07	MA08
Holcus lanatus	*	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hordeum leporinum	*	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hordeum vulgare	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybanthus monopetalus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle laxiflora		0	0	0	0	0	0.1	0.8	0	0	0	0	0.1	0	0	0.1	0.1	0	0.1	0.3	0.1	0	0.1	0	0	0.2	1	0.5	0.1	0	0	0	0	0	0	0	0
Hydrocotyle pedicellosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle sibthorpioides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum gramineum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.1	0	0	0	0	0	0	1	0	0	0	0	0.1	0	0	0.2	0.1	0.1	0	0
Hypericum japonicum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum perforatum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Hypochaeris glabra	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris radicata	*	0.5	0.1	1	0	0.1	0	0.5	0	0.1	0.1	0	0.1	0.3	3	1	0	0.1	0	0.3	0.1	0.1	1	0.2	0.1	2	0	0.1	0	0.1	1	15	0.1	0.2	0.3	0	0.2	5
Hypoxis exilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0
Hypoxis hygrometrica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indigofera australis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isolepis hookeriana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus alexandri		0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus australis		0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	8	10	0.1	0	1	0	0	0.1	7	0.2	0.1	0.1	0.1	0	0	0	0	0	0	0	0.1	0.2	0.1
Juncus brevibracteus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus cognatus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus filicaulis		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus fockei		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus holoschoenus		0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus pauciflorus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Juncus remotiflorus		0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	7	4	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.2	0	0
Juncus spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Juncus subsecundus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus usitatus		0	0	0	0.1	0	0.1	0.1	0	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.2	35	0	0	0	0
Lachnagrostis aemula		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lachnagrostis filiformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Lactuca serriola	*	0	0	0	0	0	0.1	0.1	0	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0
Lagenophora stipitata		0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Lamium amplexicaule	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lemna spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leonotis leonurus	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon saxatilis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon taraxacoides	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium bonariense	*	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium spp.	*	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0.1	0	0	0	0.3	0.2	0	0	0.1	0	0	0	0	0
Lepidosperma laterale		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptorhynchos squamatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptospermum gregarium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leptospermum polygalifolium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leucopogon lanceolatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ligustrum lucidum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lissanthe strigosa		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	5	8	0	0	3	0.4	0	0	0	0	2	0.1	0	0.3	0	2	0	0	0	0.1	0	0	0
Lolium perenne	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lolium spp.	*	0	5	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra briggsiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra filiformis		0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	1	0	0.1	0	0	0	0.1	0	0.2	0	0	0	0	0	0	0	0	0	0
Lomandra longifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra multiflora		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0
Lomatia fraseri		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula flaccida		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1
Lysimachia arvensis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lythrum spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva neglecta	*	0	0.1	0	0	0	0.2	0	0	0.1	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva parviflora	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marrubium vulgare	*	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago minima	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago polymorpha	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Medicago spp.	*	0	0	0	0	1	1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.2	0	4	0	0	0	0	0	0
Melichrus procumbens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melichrus urceolatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha diemenica		0.2	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Mentha satureioides		0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrantheum ericoides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microlaena stipoides		60	20	5	5	0	40	10	5	0.2	15	0	2	0	30	0	0	0	20	30	50	40	30	50	58	10	6	5	40	4	25	0	20	0	0	10	0	0
Microseris lanceolata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0
Microtis spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola caroliniana	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Moenchia erecta	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myoporum montanum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myosotis discolor	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassella trichotoma	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia alpicola		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia argophylla		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia erubescens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia oppositifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia viscidula		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onopordum spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opercularia diphylla		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Opercularia hispida		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	Exotic	JH029	BAMPlo	JH063	WWF12	WWF12	WWF13	WWF13	WWF13	WWF13	WWF13	JH050	WT153	JH121	JH077	JH026	JH027	WWF07	JH042	JH102	WWF11	JH108	JH107	WWF11	WWF11	JH061	JH059	JH013	WWF11	WWF11	WWF08	WWF09	WWF11	WWF12	WT143	JH101	MA07	MA08
Opercularia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreomyrrhis eriopoda		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis exilis		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis perennans		0.1	0	0	0.6	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0.1	0	0	0	0.1	0	0.1	0.1	0.1	0	0.1	0	0	0
Oxalis spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum decompositum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum effusum		0	5	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1	0	0	3	2	0	0	0	0	8	30	0	5	20	0	0	0	0	0
Panicum simile		0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paronychia brasiliana	*	1	0.1	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0.1	0.2	0.1	0	0	0	0.3	0.1	0	0	0	0	0	0	0
Paspalidium distans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paspalum dilatatum	*	0	0	0	0	0	0	6	0	0.5	1	10	3	0	0.1	0	0	0	2	0.1	0	0	5	0.1	0.1	0	0	0	0	0	0	0	0	25	10	1	20
Paspalum distichum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea calidirupium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea falcata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pennisetum clandestinum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria hydropiper		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria prostrata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Persicaria spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petrorhagia nanteuilii	*	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Phalaris aquatica	*	0	0	0	0	0	0	0	3	1	0	10	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Phyllanthus virgatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Phytolacca octandra	*	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea curviflora		0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Pimelea linifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
Pimelea simplex		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea stricta		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea strigosa		0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Pinus radiata	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago debilis		0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago gaudichaudii		0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago lanceolata	*	0	0	2	0.2	0	0.1	0.7	0	0.1	0.5	2	0	1	0	0.2	0	2	0	0.5	0.1	1	0	0.5	0.1	2	2	0.1	0.4	0	0.2	0.1	0	0	0.2	1	0.2	0
Plantago varia		0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectranthus graveolens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa annua	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa labillardierei var. labillard		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa sieberiana		0	0	0	0	0	1	25	1	10	5	1	70	15	0	0	0	0	15	50	35	7	7	0	0.1	35	7	60	1	2	0	15	1	15	60	65	0	0
Polygonum aviculare	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum plebeium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomaderris betulina		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poranthera microphylla		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca filifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca oleracea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pratia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunella vulgaris	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunus persica	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteridium esculentum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pterostylis spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pultenaea microphylla		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Pultenaea subspicata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrrosia rupestris		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus inundatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus lappaceus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rapistrum rugosum	*	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romulea rosea	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Rorippa laciniata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa rubiginosa	*	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0.2	0	0	0	0	0	0.1	0	0	0
Rostellularia adscendens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus anglocandicans	*	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0.2	0	0
Rubus parvifolius		0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Rumex acetosella	*	0	0.1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.1
Rumex brownii		0.1	0.1	0	0.1	0	0.1	0.1	0	0.1	0	0	0.1	0	0	0	0	0	0.5	0.1	0	0.1	0	0.1	0	0.1	0	0	0.1	0	0.1	0	0	0	0	0	0	0
Rumex crispus	*	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0.1
Rytidosperma caespitosum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma indutum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma laeve		0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma pallidum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Rytidosperma pilosum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma racemosum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0
Rytidosperma richardsonii		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma spp.		0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma tenuius		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanguisorba minor subsp. mu	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaevola hookeri		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus validus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenus apogon		3	0	0.1	0	0	0	0	0	0	0	0	0	0	1	5	5	0	1	0	0	4	5	0	0	1	1	0	0	0	0	0	0	0.1	0	5	0	0
Scleranthus biflorus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Scleranthus sp. Fitzs Hill		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	0	0.2	0	0	0	0	0	0	0	0	0	0
Scleranthus spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scutellaria humilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Secale cereale	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio bipinnatisectus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio diaschides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lautus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	Exotic	JH029	BAMPlo	JH063	WWF12	WWF12	WWF13	WWF13	WWF13	WWF13	WWF13	JH050	WT153	JH121	JH077	JH026	JH027	WWF07	JH042	JH102	WWF11	JH108	JH107	WWF11	WWF11	JH061	JH059	JH013	WWF11	WWF11	WWF08	WWF09	WWF11	WWF12	WT143	JH101	MA07	MA08
Senecio madagascariensis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio minimus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio prenanthoides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio quadridentatus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria parviflora	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria pumila	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Sigesbeckia orientalis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silene spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silybum marianum	*	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium rosulatum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium sp. A	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smilax australis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum amblymerum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum americanum	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum brownii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum neoanglicum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum nigrum	*	0	0.1	0	0	0	0.2	0.5	0.1	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Solanum opacum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum prinophyllum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum pungetium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum semiarmatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum vicinum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solenogyne bellioides		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.2	0	0	0	0	0	0	0
Solenogyne gunnii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soliva sessilis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper	*	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus oleraceus	*	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.2	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sorghum leiocladum		0	0	0	0.2	0	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Sporobolus creber		0	0	5	0.1	0	0	0	0	2	0	1	0	2	0	30	30	0	20	1	0.1	20	10	0	15	5	2	10	12	20	0	25	10	0	10	0.2	0	10
Stachys arvensis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stackhousia viminea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria angustifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Stellaria media	*	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria pungens		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Stylidium graminifolium		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona galegifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tagetes minuta	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	*	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	3	0	0.1	0	0.1	0.1	0	0.1	0.5	0.1	0.1	0	0	0	0	0.1	0	0.1	0	0
Themeda triandra		0	0	0	25	0	0	0	0	0	0	0	0	75	0	0	0	0	5	10	0	0	0	0	0	5	0	0	0	0.1	0	0	0	0	0.2	3	0	0
Thysanotus tuberosus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tragopogon porrifolius subsp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribulus micrococcus		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium arvense	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium dubium	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium repens	*	0	0	10	0	0	0	0	0	0	0	1	0	0	2	10	15	0	0	0.2	0	10	8	0	0	0.2	0.1	1	0	0	0	0	0	0	0.1	0.2	0	0.2
Trifolium spp.	*	0	0.1	0	0.1	0	0	15.1	3	2.6	12.2	0	0	0	0	0	0	0	13	0	0	0	0	0	5	5	0	0	0	1.1	4	1.1	23	1	20.6	0	0	0	0
Tripogon loliiformis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urtica incisa		0.1	0.1	0	0	0	0.5	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urtica urens	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbascum spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbascum thapsus	*	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Verbascum virgatum	*	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena bonariensis	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica calycina		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica derwentiana		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica gracilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica plebeia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum tinus	*	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia sativa	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia villosa	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola betonicifolia		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Viola hederacea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia cuneata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia muelleri		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0
Vittadinia spp.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia sulcata		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vulpia myuros	*	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Vulpia spp.	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia communis		0	0	0	0	0.1	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0
Wahlenbergia gracilenta		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia gracilis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia luteola		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia multicaulis		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia planiflora		0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Wahlenbergia spp.		0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0
Wahlenbergia stricta		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wurmbea dioica subsp. dioica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthium occidentale	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthorrhoea johnsonii		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthosia pilosa		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xerochrysum bracteatum		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH040	JH033	JH034	JH060	JH039	JH036	JH084	JH037	JH041	WT149	JH094	WWF10	WWF10	JH018	JH08	WWF13	WWF07	JH117	JH069	WWF13	JH076	JH118	WWF02	WWF10	JH016	WWF05	WWF12	JH055	JH075	JH111	WWF06	WWF06	JH104	WWF08	WWF08	WWF07	WWF04	JH022
Abildgaardia ovata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0
Acacia dealbata	0	0	0	0	0	0	0	0	0	0	0	4	0.5	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia deanei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia falcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia falciformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia filicifolia	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia implexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.5	0	0	0
Acacia leiocalyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia melanoxylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia rubida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia ulicifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Acacia venulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena agnipila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0
Acaena novae-zelandiae	1	0.1	0	0	0	0	0	0.1	0.2	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena ovina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetosella vulgaris	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0.3	0	0	0	0	0	0.1	0	0	0	0
Adiantum aethiopicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aira spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ajuga australis	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Allocasuarina littoralis	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternanthera denticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus powellii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammi majus	5	0	0	0	2	0	0	0.1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammobium alatum	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema miquelii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema pendula	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Amyema spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anagallis arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Andropogon virginicus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Angophora floribunda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthosachne scabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthoxanthum odoratum	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida jerichoensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida personata	0	0	0	0	1	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1	0	0	0	0
Aristida ramosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida vagans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0
Arthropodium milleflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asperula conferta	0	0.1	10	1	0.2	0	0	0	0.1	0.1	0.1	0.1	0	0	0	0	0	0	5	0.6	0	1	0	0	0	0	0.4	0.1	0	0.1	0	0	0	0	0.1	0	0	0
Asperula gunnii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asplenium flabellifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa bigeniculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa densiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa nodosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
Austrostipa puberula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa ramosissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa rudis	0	2	0	0	0	0	1	2	0.1	0	0	0	0	1	1	0	0	10	20	0	0	0	0	0	2	0	0	0	2	0	0	0	20	0	0	0	0	3
Austrostipa scabra	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	30	0	0	0	0	0	0	1
Austrostipa verticillata	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	20	0
Avena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Axonopus fissifolius	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
Baloskion stenocoleum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billardiera scandens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blechnum cartilagineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bothriochloa decipiens	0	0	0	0	0.1	0	0	0.1	2	0	0	0	0	15	0	0	0	0	5	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Bothriochloa macra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0.3	0	0	0	0	0	0	0	0	0	15	17	0	0	0	0	0	0
Brachyloma daphnoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome diversifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome graminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome multifida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome scapigera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spathulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica rapa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Briza minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0
Bromus brevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus catharticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus diandrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	5	0	0	1	0	0	10	0.1	0	30	1	0	0	0	0	0	0	0	0	0	0.1	0
Bulbine bulbosa	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bursaria longisepala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Bursaria spinosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.1	0	0	2	0	0	0	0	0
Caesia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caladenia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Calotis cuneata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0
Calotis cuneifolia	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis lappulacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Capillipedium parviflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Capsella bursapastoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursa-pastoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH040	JH033	JH034	JH060	JH039	JH036	JH084	JH037	JH041	WT149	JH094	WWF10	WWF10	JH018	JH08	WWF13	WWF07	JH117	JH069	WWF13	JH076	JH118	WWF02	WWF10	JH016	WWF05	WWF12	JH055	JH075	JH111	WWF06	WWF06	JH104	WWF08	WWF08	WWF07	WWF04	JH022
Cardamine hirsuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardamine lilacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Carduus nutans	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.5	0	0.9	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Carex appressa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex breviculmis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex echinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex gaudichaudiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex inversa	5	1	1	0	0	7	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0.5	0	0	0	0	0	0.5	0	0	0	0	0.2
Carex spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia leptocephala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia quinquefaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus ciliaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus purpurascens	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	8	0	0	0	0	0	0	0	0.1	3	10	0	0.1	0	0	0	0	0	0
Centaurea spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centaurium erythraea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0
Centaurium spicatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centella asiatica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Centipeda cunninghamii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium balearicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Cerastium glomeratum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilanthes sieberi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0.7	0	0	0	0
Chenopodium album	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium carinatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloris truncata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choretrum pauciflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysocephalum apiculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0
Chrysocephalum semipapposu	1	0	0	0	0.1	0	0	10	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cichorium intybus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium vulgare	0.1	0	0	0	0.1	0.5	0	0	0.1	0.1	0.1	0.2	0	0.1	0	5	0.1	0.5	2	0.5	0	0.5	5	0.1	0.1	0.5	0.4	3	0	0	0	0	0.1	0.1	0.1	2	0.1	0.2
Clematis aristata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clematis microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conium maculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulus erubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conyza bonariensis	0	0	0.1	0	0	0.1	0	0	0.1	0.2	0	0	0	0	0	0	0	0.1	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Conyza parva	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conyza spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0
Cotula australis	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1	0	0	0
Craspedia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Craspedia variabilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassula sieberiana	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.1	0	0	0	0.1	0	0	0.1	0	0	0	0.5	0.1	0	0	0	0	0	0	0.1	0	0.1	5	0
Crataegus monogyna	0	0	0	0	0	0	0	0	0	0.2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptandra amara	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclospermum leptophyllum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbonotus lawsonianus	0	0	0	0.1	0	0	0	0	0.1	0	0	0.1	0.1	0	0.1	0	0	0.1	0.1	0.1	0	0.1	1	0.1	0	0	0	0.1	0.1	0.1	0.1	0	0	0	0.1	0.1	0	0
Cymbopogon refractus	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynara cardunculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynodon dactylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	60	0	0	0	5	0	0	0	0	30	0	0	0	0	0	0	0	0	15	0	2
Cynoglossum australe	0	0	0	0	0	0	0	0	2	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynosurus echinatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus eragrostis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus exaltatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Cyperus sphaeroideus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus vaginatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dactylis glomerata	10	0	0	0.2	0.2	0	65	0.2	3	5	50	20	10	0	0.1	0	0	0.1	10	0	0	0.1	0.1	0	0	0.1	0.1	0.5	0	0	0	0	0	0	0	0	0	0
Datura stramonium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus carota	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus glochidiatus	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daviesia genistifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daviesia latifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella caerulea	0	0	0	0	0	0	0	0.1	0	5	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella revoluta	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Dianthus armeria	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Dichanthium sericeum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichanthium setosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelachne crinita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
Dichelachne micrantha	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichondra repens	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0.1	0	0.1	0	0.1	0	0	4	0	0	0.7	2	0	0	0	0	0	0	0	0.2	0	0.1	0.1	0	0.5
Dichopogon fimbriatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0
Dichopogon strictus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera peltata	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera spatulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Dysphania carinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania pumilio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinopogon caespitosus	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0.3	0.2	0	0	0	0	0	2	0	0	1	0	0	0	0
Echinopogon ovatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Echium plantagineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia hastata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Einadia nutans	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0

species	JH040	JH033	JH034	JH060	JH039	JH036	JH084	JH037	JH041	WT149	JH094	WWF10	WWF10	JH018	JH08	WWF13	WWF07	JH117	JH069	WWF13	JH076	JH118	WWF02	WWF10	JH016	WWF05	WWF12	JH055	JH075	JH111	WWF06	WWF06	JH104	WWF08	WWF08	WWF07	WWF04	JH022
Einadia polygonoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia trigonos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0
Eleocharis acuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis atricha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleusine spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleusine tristachya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus scaber	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilobium billardierianum	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis brownii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0
Eragrostis curvula	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis lacunaria	0	0	0	10	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	1	0	0	0	0	0	0	25	0	0	0	0
Eragrostis leptostachya	0	5	0	0	0	0	0	10	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0
Eragrostis pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis trachycarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Erodium cicutarium	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium moschatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus acaciiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0
Eucalyptus andrewsii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus blakelyi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus bridgesiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus calidissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus caliginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	20	50	3	30	0	0	0	0	0	0	15	30	5	0	0	25
Eucalyptus campanulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus conica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus dalrympleana	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus fastigata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus laevopinea	0	0	0	0	0	0	0	0	0	0	0	35	14	0	40	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
Eucalyptus malacoxylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Eucalyptus melliodora	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	5	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	5	0	0	0	0
Eucalyptus michaeliana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nicholii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nobilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nova-anglica	0	0	0	0	0	0	0	30	15	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus obliqua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
Eucalyptus pauciflora	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus radiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	20	0
Eucalyptus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus stellulata	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
Eucalyptus viminalis	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus williamsiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus youmanii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton involucratus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton sphaericus	0.1	3	3	2	0.2	1	0	0	0	0.1	0	0	0	3	0.2	0	0	0	0.2	0	0	0	0	0	0.2	0	0.2	0.1	1	4	5	8	1	0.1	0.1	0	0	0.2
Euphorbia prostrata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exocarpos cupressiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca arundinacea	30	0	0	0	0.1	0	0	1	3	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca nigrescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fimbristylis dichotoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Gahnia sieberiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium binifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium gaudichaudii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leiocarpum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Galium leptogonium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium murale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium propinquum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0
Galium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gamochaeta coarctata	0	0	0	0	0.1	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	2	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
Gamochaeta spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	1	0.1	0	0	0.1	0	0	0	0	0	0	0.2	0.1	0	0	0
Geranium molle subsp. molle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geranium solanderi	0.1	0	0.1	0.1	0	0	0	0	0	0.2	0	1	4	0.1	0.2	0.1	0.1	2	1	2	2	0	5	1	0	0.1	1	0	0	0	0.1	0.1	1	0	2	1	0	0
Glycine clandestina	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.3	0	0	0	0
Glycine microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine tabacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0.1	0	0	0	0	0	0
Gomphrena celosioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus elatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus tetragynus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
Gonocarpus teucrioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia bellidifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia hederacea	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia heteromera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Goodenia rotundifolia	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grona varians	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hainardia cylindrica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis aspera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis heterophylla	0	1	3	1	1	3	0	0	0.2	0	0	0	0	3	0.5	0	0	0.1	0	0	0	2	0	0	0.1	0	0.5	0	0	2	0	5	0.2	0.2	0	0	0	0.1
Haloragis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardenbergia violacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Heliotropium amplexicaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemarthria uncinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibbertia obtusifolia	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibbertia riparia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH040	JH033	JH034	JH060	JH039	JH036	JH084	JH037	JH041	WT149	JH094	WWF10	WWF10	JH018	JH08	WWF13	WWF07	JH117	JH069	WWF13	JH076	JH118	WWF02	WWF10	JH016	WWF05	WWF12	JH055	JH075	JH111	WWF06	WWF06	JH104	WWF08	WWF08	WWF07	WWF04	JH022
Holcus lanatus	0	0	0.2	0	0	10	0	0.1	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hordeum leporinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
hordeum vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybanthus monopetalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle laxiflora	0	0	0	0	0	0	0	0	15	0.3	0	1	0.4	0.2	0.1	0	0	0.2	0	0	0.1	0	2	0.1	0.1	0	0	3	0	0	0	0	0.1	0	0.1	0	0	0
Hydrocotyle pedicellosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle sibthorpioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum gramineum	0.2	0.1	0.1	0.1	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0.1	0	0	0.1	0.1	0	0	0	0
Hypericum japonicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum perforatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris glabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris radicata	0	5	0	2	2	20	0	0.1	0	0.1	0	0.1	0.1	0	1	0.1	0	0	3	0	0	2	0	0.1	1	0	0.1	20	3	0.5	0.1	0.1	0	0.2	0	0	0	0
Hypoxis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypoxis hygrometrica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indigofera australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Isolepis hookeriana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus alexandri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus australis	0	0	15	0	0	0.1	0	0	0	0	0.1	0	0	10	0	0	0	0	0	15	0	0	0.1	0	0	0.1	0	0	55	0	0	0	0	0	0	0	0	0.1
Juncus brevibracteus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus cognatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus filicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0
Juncus fockei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus holoschoenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Juncus pauciflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Juncus remotiflorus	0	0	1	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	10	0	0	0	0	0	0.2	0	0.1	0	0	0	0	0	0	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus subsecundus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus usitatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lachnagrostis aemula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1	0	0	0	0
Lachnagrostis filiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lactuca serriola	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Lagenophora stipitata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamium amplexicaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lemna spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leonotis leonurus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon saxatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon taraxacoides	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium bonariense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Lepidium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidosperma laterale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptorhynchos squamatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptospermum gregarium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leptospermum polygalifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lespedeza juncea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leucopogon lanceolatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ligustrum lucidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lissanthe strigosa	0	3	0	0	0	0	0	0.1	0.2	0	0	0	0.1	1	0.2	0	0	0	1	0	0	0	0	0	0.1	0	0.7	0	5	0.1	1	0	0.1	1	1	0.1	0	0.2
Lolium perenne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Lolium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0
Lomandra briggsiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra filiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0
Lomandra longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra multiflora	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
Lomandra spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomatia fraseri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula flaccida	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lysimachia arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1
Lythrum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva neglecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Marrubium vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago minima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago polymorpha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago spp.	0	0	0	0	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0
Melichrus procumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melichrus urceolatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha diemenica	0	0	0	0.1	0	0	0	0	3	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha satureioides	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Micrantheum ericoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microlaena stipoides	0	5	0	5	0	5	5	15	50	15	0	60	60	45	50	10	20	70	60	0	10	60	20	60	10	0	30	20	5	15	20	0.1	40	0	0	30	0	15
Microseris lanceolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola caroliniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moenchia erecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myoporum montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myosotis discolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassella trichotoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia alpicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia argophylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia erubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia oppositifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia viscidula	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.2	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0.8	5	5	0	15
Onopordum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opercularia diphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opercularia hispida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0

species	JH040	JH033	JH034	JH060	JH039	JH036	JH084	JH037	JH041	WT149	JH094	WWF10	WWF10	JH018	JH08	WWF13	WWF07	JH117	JH069	WWF13	JH076	JH118	WWF02	WWF10	JH016	WWF05	WWF12	JH055	JH075	JH111	WWF06	WWF06	JH104	WWF08	WWF08	WWF07	WWF04	JH022
Opercularia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreomyrrhis eriopoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0
Oxalis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis perennans	0	0	0	0.1	0	0	0	0.1	0	0.1	0	0.1	0	0.1	0.1	0.1	0	0.5	0.1	0	0	0.1	2	0.1	0	0	0	0	0	0	0	0	0.1	0.1	0	0.1	0.2	0	0.1
Oxalis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum decompositum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum effusum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	0	0.5	0	0	0.2	0	0	0	0	15	0	0.7	0	0	0	0
Panicum simile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paronychia brasiliana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0.1	0	0	0	0	0.1	0	0	1	0	0	2
Paspalidium distans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paspalum dilatatum	15	0	20	0.2	15	2	0	0.1	2	0	0	0	0	0	0	5	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0.1
Paspalum distichum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea calidirupium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea falcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pennisetum clandestinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria hydropiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria prostrata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petrorhagia nanteuilii	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phalaris aquatica	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllanthus virgatus	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phytolacca octandra	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	10	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Pimelea curviflora	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea linifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea simplex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Pimelea strigosa	0	0	0	0	1	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Pinus radiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago debilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago gaudichaudii	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	2	0	0	0
Plantago lanceolata	2	0	5	3	3	3	5	0.2	2	0.1	0	0.2	0	0	0.1	0	0	0	0.1	1	0	1	0	0	0	0	0	0	2	0	0	0.1	0.1	0	0	1	0	1
Plantago varia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectranthus graveolens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa annua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa labillardierei var. labillard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0
Poa pratensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa sieberiana	10	20	10	30	25	0	3	1	10	40	2	0	25	5	7	0	0	0	10	5	0	10	30	5	35	0	5	4	2	10	0	0	8	0	3	0	5	2
Polygonum aviculare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum plebeium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomaderris betulina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poranthera microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Portulaca filifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca oleracea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pratia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunella vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunus persica	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteridium esculentum	0	0	0	0	0	0	0.1	0	0	0	0	2	5	0.1	0	0	0	0	6	0	0	0	0	0.2	0.3	0	0	0	0	10	0	0	0	0.1	0	0	0	0
Pterostylis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pultenaea microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pultenaea subspicata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrrosia rupestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus inundatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus lappaceus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rapistrum rugosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Romulea rosea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rorippa laciniata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa rubiginosa	0	0	0	0	0	0	0	0	0	2	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rostellularia adscendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus anglocandicans	0	0	0	0	0	0	0	0	0	0.1	7	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Rubus parvifolius	0	0	0	0	0	0	0	0	0	0	3	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0.1	0	0
Rumex acetosella	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1	0	0	0	0.1	0	2	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	10
Rumex brownii	0	0.1	0.2	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	0	0.1	0	0	0.1	0	0.1	0	0	0.1	0	0	0.1	0	0.1	0	0	0.1	0.1	0	0.1
Rumex crispus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma caespitosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma indutum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma laeve	0	0	0	0	0.1	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma pallidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma pilosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma racemosum	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.2	0	0	0	0	0.2	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma richardsonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0	0	0.3	0	0	0	0	0
Rytidosperma tenuius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0
Sanguisorba minor subsp. mu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaevola hookeri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Schoenoplectus validus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenus apogon	0	2	0	2	1	1	0	0.2	1	0.1	0	0	0	2	0.2	0	0	2	10	0	2	6	0	0	0	0	0	3	5	20	0	0	0	0.1	0	0	0	0.5
Scleranthus biflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scleranthus sp. Fitzs Hill	0	0	0	0	0	0	0	0.2	0	0.1	0	0	0	5	0.1	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Scleranthus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scutellaria humilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Secale cereale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio bipinnatisectus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio diaschides	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lautus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH040	JH033	JH034	JH060	JH039	JH036	JH084	JH037	JH041	WT149	JH094	WWF10	WWF10	JH018	JH08	WWF13	WWF07	JH117	JH069	WWF13	JH076	JH118	WWF02	WWF10	JH016	WWF05	WWF12	JH055	JH075	JH111	WWF06	WWF06	JH104	WWF08	WWF08	WWF07	WWF04	JH022
Senecio madagascariensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio minimus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio prenanthoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio quadridentatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria pumila	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigesbeckia orientalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silene spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Silybum marianum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium rosulatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium sp. A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smilax australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum amblymerum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum americanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Solanum brownii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum neoanglicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum nigrum	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	2	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0
Solanum opacum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum prinophyllum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	1	0.1	0.1	0
Solanum pungetium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum semiarmatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum vicinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
Solenogyne bellioides	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Solenogyne gunnii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soliva sessilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Sonchus oleraceus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Sorghum leiocladum	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0
Sporobolus creber	0	50	2	50	20	50	0	10	1	0	0	0	1	5	4	0	0	7	0	15	35	10	0	0	0	0	0	0.1	40	40	25	15	3	0	0	1	0	0
Stachys arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stackhousia viminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Stellaria angustifolia	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria media	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Stellaria pungens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Stellaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stylidium graminifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona galegifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tagetes minuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0.1
Themeda triandra	20	0	0	0	30	0	0	5	0	35	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Thysanotus tuberosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tragopogon porrifolius subsp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribulus micrococcus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium dubium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium repens	1	1	3	0	0	20	15	0.1	0.1	0	0	0	0	0.1	0.1	0	0	0	0	0.1	0	0	1	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0
Trifolium spp.	0	0	0	0	0	0	0	0	0	0	0	0.5	0.6	0	0	0	0	0.1	0	0	8	0	0	1	0	0	0	4	0	0	0	7	0.3	0	0	15.1	7	0	0
Tripogon loliiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urtica incisa	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0.1	0	0	0	0	0	1	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	1	0	2
Urtica urens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbascum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Verbascum thapsus	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0.1	0	0	0	5	0
Verbascum virgatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena bonariensis	0	0	1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica calycina	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Veronica derwentiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica plebeia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum tinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia sativa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia villosa	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola betonicifolia	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola hederacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia cuneata	0	0	0	0	0.1	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Vittadinia muelleri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Vittadinia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia sulcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vulpia myuros	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	10	0
Vulpia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Wahlenbergia communis	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.2	0.1	0	0	0
Wahlenbergia gracilenta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia luteola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia multicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Wahlenbergia planiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0.1	0	0	0
Wahlenbergia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia stricta	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wurmbea dioica subsp. dioica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthium occidentale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthorrhoea johnsonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthosia pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xerochrysum bracteatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH031	WWF05	JH021	JH025	JH024	WWF05	JH067	WWF05	JH030	JH032	WWF04	JH010	JH09	JH012	WT152	WT151	WWF12	WWF05	JH113	JH112	WWF03	JH098	BP22	WWF04	WWF04	WT147	WWF00	BP21	WWF04	JH065	MA01	JH119	WT138	JH122	WWF02	WWF00	WWF00	BP27
Abildgaardia ovata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia dealbata	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia deanei	0	0	0	0	0	0	0	0	0	0	0	0	30	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0
Acacia falcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia falciformis	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia filicifolia	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	15	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia implexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia leiocalyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia melanoxylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0
Acacia rubida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia ulicifolia	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia venulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena agnipila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena novae-zelandiae	0.1	0.1	0.1	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0.1	0	0	0.1	0.1	0	0	0.1	2	0	0.1	0.1	8	0	0	0	0	0	2	0	0	0.1	0
Acaena ovina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetosella vulgaris	0	0	0	0	0	0	0	0.1	0	0	2	0	0	0	0	0	0	0.1	0	0	0	5	0	5	1	0	0	5	2	0	0	0	0	0	0	0.1	0	0.1	2
Adiantum aethiopicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Aira spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ajuga australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0.1	0
Allocasuarina littoralis	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Alternanthera denticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus powellii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.2	0.1
Ammi majus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammobium alatum	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Amyema miquelii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema pendula	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0.1
Amyema spp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anagallis arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Andropogon virginicus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Angophora floribunda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthosachne scabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthoxanthum odoratum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	5	0	0
Aristida jerichoensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida personata	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Aristida ramosa	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida vagans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
Arthropodium milleflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asperula conferta	0.1	0.1	0	0	0	0	0.1	0	0	0.2	0	0	3	0	0.5	2	0.4	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asperula gunnii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asplenium flabellifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa bigeniculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa densiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa nodosa	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa puberula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa pubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa ramosissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa rudis	0	0	0	0	15	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Austrostipa scabra	8	0	0	15	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	10	0	0	0	0	0
Austrostipa verticillata	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Avena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Axonopus fissifolius	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baloskion stenocoleum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Billardiera scandens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Blechnum cartilagineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Bothriochloa decipiens	0	0	0	10	0	0	10	0	2	10	0	0	3	0	0.5	10	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.1	0	1	0	0	0	0	0
Bothriochloa macra	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0.1	0	0	0	0	0	0	0	0
Brachyloma daphnoides	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome diversifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome graminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome multifida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Brachyscome scapigera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spathulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0	0
Brachyscome spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica rapa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Briza minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus brevis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus catharticus	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0
Bromus diandrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus spp.	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	15	0	0	0	11	0	0	0	0	10	2	1	5
Bulbine bulbosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bursaria longisepala	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0
Bursaria spinosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1
Caesia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caladenia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis cuneata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis cuneifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis lappulacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capillipedium parviflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursapastoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursa-pastoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0

species	JH031	WWF05	JH021	JH025	JH024	WWF05	JH067	WWF05	JH030	JH032	WWF04	JH010	JH09	JH012	WT152	WT151	WWF12	WWF05	JH113	JH112	WWF03	JH098	BP22	WWF04	WWF04	WT147	WWF00	BP21	WWF04	JH065	MA01	JH119	WT138	JH122	WWF02	WWF00	WWF00	BP27
Cardamine hirsuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardamine lilacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carduus nutans	0.1	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Carex appressa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex breviculmis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex echinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Carex gaudichaudiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex inversa	1	0	0	0	1	0	0	0	0	0	0	0	0.2	0	0	0	0	0.2	0.2	0	0	1	1	0	0	30	0	0	0	0.3	0	1	0	0	0	0	0	0
Carex spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Cassinia leptocephala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia quinquefaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0.1	0	0	0	0	0
Cenchrus ciliaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus purpurascens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	10	0	2	0	0	0	0	0	0	0	0	0	0
Centaurea spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centaurium erythraea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0
Centaurium spicatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centella asiatica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Centipeda cunninghamii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium balearicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium glomeratum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilanthes sieberi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0.1	0	0	0	0	0
Chenopodium album	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium carinatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Chloris truncata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choretrum pauciflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysocephalum apiculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Chrysocephalum semipapposu	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cichorium intybus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium vulgare	2	0	1	0	0	0	3	0.1	2	0.1	0	0.1	0	0.1	0.5	0.2	0	0	0.1	0.1	10	0.1	20	0	15	0	0	0.1	1	0.2	0.2	0.5	0	0.1	1	0	0.5	0.1
Clematis aristata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clematis microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
Conium maculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulus erubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conyza bonariensis	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0.1	0.2	0.1	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0
Conyza parva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conyza spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.5	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1
Cotula australis	2	0	0.1	0	0.2	0	0.1	0	15	1	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Craspedia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Craspedia variabilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1	0	0
Crassula sieberiana	0	0.1	0	0	0	1	0	0	0	0	0	0	0	0	0.1	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1
Crataegus monogyna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptandra amara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclospermum leptophyllum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbonotus lawsonianus	2	0	0	0.1	0	0	0.1	0	2	0.2	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0
Cymbopogon refractus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynara cardunculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynodon dactylon	20	0	0	0	5	0	0	0	15	0	0	0	0	0	0	0	0	0.5	0	0	0	0	1	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Cynoglossum australe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.2	0	0	0	0
Cynosurus echinatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cyperus eragrostis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus exaltatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus sphaeroideus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus vaginatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dactylis glomerata	0	0	0	10	5	0	0.1	0	0	0	0	5	7	40	10	0.2	0	3	3	0	5	40	0	0	5	20	0	0	0	0.1	0	0.1	0	10	5	0	0	15
Datura stramonium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus carota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus glochidiatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daviesia genistifolia	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daviesia latifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Dianella caerulea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Dianella revoluta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Dianella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianthus armeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichanthium sericeum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichanthium setosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Dichelachne crinita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelachne micrantha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Dichondra repens	3	0	1	0	0	0	0	0.1	2	5	0	0.1	0.1	0.2	0	0.1	0	0	1	1	2	0	0	0	0	0	0	0.1	0	0	0.1	0.1	0	1	0.1	0.2	0.5	0
Dichopogon fimbriatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichopogon strictus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera peltata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera spatulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania carinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania pumilio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinopogon caespitosus	0	0	0.1	5	1	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	0.1	0	0	0	0	0
Echinopogon ovatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echium plantagineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia hastata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0.3	0	0	0.1	0	0	0	0	0.1
Einadia nutans	0	0	0	0	0.2	0	0	0	0	0	0	0.1	0	0.2	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0

species	JH031	WWF05	JH021	JH025	JH024	WWF05	JH067	WWF05	JH030	JH032	WWF04	JH010	JH09	JH012	WT152	WT151	WWF12	WWF05	JH113	JH112	WWF03	JH098	BP22	WWF04	WWF04	WT147	WWF00	BP21	WWF04	JH065	MA01	JH119	WT138	JH122	WWF02	WWF00	WWF00	BP27
Einadia polygonoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia trigonos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis acuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis atricha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleusine spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleusine tristachya	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus scaber	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
Epilobium billardierianum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Eragrostis brownii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis curvula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis lacunaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptostachya	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	10	0	5	0	0	0	5	0	0	0	0	0	0	0	0
Eragrostis pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis trachycarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium cicutarium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium moschatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium spp.	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus acaciiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0
Eucalyptus andrewsii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus blakelyi	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus bridgesiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus calidissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus caliginosa	10	40	40	30	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.1	0	0	0	0
Eucalyptus campanulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus conica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0
Eucalyptus dalrympleana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0
Eucalyptus fastigata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus laevopinea	0	0	0	0	0	0	0	0	0	0	0	15	3	5	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus malacoxylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	15	0	0	0	0	0	0
Eucalyptus melliodora	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	5	0	0	0	0	0	0	0
Eucalyptus michaeliana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nicholii	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nobilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Eucalyptus nova-anglica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus obliqua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	10	0
Eucalyptus pauciflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0
Eucalyptus radiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	30	0	0	5	0	0	0	0	0	0	0	0	0	0	40	25	20	15
Eucalyptus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus stellulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus viminalis	0	0	0	0	0	0	0	0	0	0	0	0	5	0	3	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Eucalyptus williamsiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus youmanii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton involucratus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton sphaericus	1	0	0	0	0	0	3	0	1	0	0	0.1	0.1	0.1	0.1	0	0	0	0.2	0.2	0	0	0	0	0	1	0	2	0	0.1	0	0	0	0	0.1	0	0	0.1
Euphorbia prostrata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exocarpos cupressiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0
Festuca arundinacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	60	0	0	0	0	0	0	0	0	0	0	0	55	0	0	0	0
Festuca nigrescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fimbristylis dichotoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gahnia sieberiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Galium binifolium	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium gaudichaudii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leiocarpum	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leptogonium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Galium murale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium propinquum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gamochaeta coarctata	0.5	0	0	0	0	0	0.1	0	0	3	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Gamochaeta spp.	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Geranium molle subsp. molle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geranium solanderi	0.2	0	0.2	0	0.1	1	2	1	1	0	5	0.1	0.1	0	0	0	0.5	0.1	0.2	0.2	5	0	1	0	5	0.2	2	2	1	0.1	0.2	0.2	0	0	0	0	2	0.1
Glycine clandestina	0	0.1	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine tabacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Gomphrena celosioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0.1	0
Gonocarpus elatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus tetragynus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus teucrioides	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Goodenia bellidifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia hederacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Goodenia heteromera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia rotundifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grona varians	0	0.2	0.1	0	0	0	0	0.1	0	0.1	1	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0.3	0.1	0.1	0.1	0.1	0
Hainardia cylindrica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis aspera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis heterophylla	0.1	0	0	0	0	0	0	1	0	1	0	0	2	0	0	0	0	0	0.1	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardenbergia violacea	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	1	0.5	0
Heliotropium amplexicaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemarthria uncinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibbertia obtusifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Hibbertia riparia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH031	WWF05	JH021	JH025	JH024	WWF05	JH067	WWF05	JH030	JH032	WWF04	JH010	JH09	JH012	WT152	WT151	WWF12	WWF05	JH113	JH112	WWF03	JH098	BP22	WWF04	WWF04	WT147	WWF00	BP21	WWF04	JH065	MA01	JH119	WT138	JH122	WWF02	WWF00	WWF00	BP27
Holcus lanatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	20	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Hordeum leporinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hordeum vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybanthus monopetalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle laxiflora	0	0	0.1	0	0	0	0.3	0.4	0.1	0	0	0.2	0.2	0.2	2	1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.2	0.1	0	1	0	0	0	0
Hydrocotyle pedicellosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle sibthorpioides	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum gramineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.1	0	0	0	0	0
Hypericum japonicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum perforatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris glabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Hypochaeris radicata	0	0.5	1	2	1	0	2	0.1	0.2	0.2	0.1	0	0.5	0.2	0.1	0	0.1	0.2	0.3	0.2	0.1	1	0.1	0.2	0.1	3	0	5	0	1	0	0	0	0	1	0.5	0.5	1
Hypoxis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypoxis hygrometrica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indigofera australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isolepis hookeriana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus alexandri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus australis	2	0	0	0.2	0.1	0	1	0	0	25	0	0	0.1	0.1	0	0	0	0	0.5	0.1	0	2	0	0	0	0	0	0.1	0	0.1	0.1	0.1	0	0	0	0	0	0
Juncus brevibracteus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus cognatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus filicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus fockei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus holoschoenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus pauciflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus remotiflorus	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	0	0.1	0	0	0	0	0	0	0.1	0	0
Juncus subsecundus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus usitatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Lachnagrostis aemula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lachnagrostis filiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lactuca serriola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagenophora stipitata	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamium amplexicaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lemna spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leonotis leonurus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon saxatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon taraxacoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium bonariense	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Lepidium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Lepidosperma laterale	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptorhynchos squamatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Leptospermum gregarium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leptospermum polygalifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lespedeza juncea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leucopogon lanceolatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ligustrum lucidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lissanthe strigosa	0	5	0.1	8	0	0	0	0.2	0	0	1	0.1	0.1	0.2	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Lolium perenne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lolium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Lomandra briggsiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra filiformis	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0
Lomandra longifolia	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0.5	0	0	0	0	0	0	0	0	2	1	0
Lomandra multiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	7	0	0.5	0	0
Lomandra spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomatia fraseri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula flaccida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lysimachia arvensis	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lythrum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva neglecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marrubium vulgare	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0
Medicago minima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago polymorpha	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melichrus procumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melichrus urceolatus	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha diemenica	0.1	0	0.1	0	0	0	0.1	0	0.1	0.1	0	0.1	0.2	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha satureioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrantheum ericoides	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microlaena stipoides	0	0	25	60	65	70	30	5	30	15	70	70	60	30	10	25	0	0	70	70	70	0	80	15	0	40	60	10	10	40	85	20	5	50	40	30	30	1
Microseris lanceolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola caroliniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Moenchia erecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myoporum montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myosotis discolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassella trichotoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia alpicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia argophylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia erubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia oppositifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0
Olearia viscidula	0	0	8	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	2	0.4	0	0	0	0
Onopordum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opercularia diphylla	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Opercularia hispida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH031	WWF05	JH021	JH025	JH024	WWF05	JH067	WWF05	JH030	JH032	WWF04	JH010	JH09	JH012	WT152	WT151	WWF12	WWF05	JH113	JH112	WWF03	JH098	BP22	WWF04	WWF04	WT147	WWF00	BP21	WWF04	JH065	MA01	JH119	WT138	JH122	WWF02	WWF00	WWF00	BP27
Opercularia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreomyrrhis eriopoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis perennans	0	0.1	0	0	0	0	0.1	0.1	0.1	0	0	0.1	0	0	0	0.1	0.1	0	0.5	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0.1
Oxalis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum decompositum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum effusum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum simile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0.1	0	0	0	0	0	0	0	0
Panicum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paronychia brasiliana	1	0	0.2	0	0	0	0	0.1	0.2	0.2	0	0.1	0	0.5	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Paspalidium distans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paspalum dilatatum	0	0	0.2	0	0	0	0	0	0	0	0	0	0.1	0	2	0	0	0.2	0.2	0	0	1	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0
Paspalum distichum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea calidirupium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea falcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pennisetum clandestinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0
Persicaria hydropiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria prostrata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petrorhagia nanteuilii	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Phalaris aquatica	0	0	4	0	0	0	0	0	0	0	0	0	0	0	60	0	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllanthus virgatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phytolacca octandra	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	0	0	3	0	0	0	0.5
Pimelea curviflora	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea linifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea simplex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea strigosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus radiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago debilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0.1	0	0	0.5	0	0	0
Plantago gaudichaudii	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago lanceolata	0	0	1	1	1	5	0	0	0	0	0	0	0.2	0.1	1	10	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0	0	1
Plantago varia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plectranthus graveolens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Poa annua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	10	0	0	0	0	0.2	0	0	0	0	5	0
Poa labillardierei var. labillard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa sieberiana	0	30	10	1	1	0	55	15	0	2	5	0	2	1	20	60	20	0.1	15	0	0	0.1	0	20	10	6	10	1	0	0.1	0.2	0	2	0	25	30	10	2
Polygonum aviculare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum plebeium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomaderris betulina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Poranthera microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.2	0
Portulaca filifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca oleracea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pratia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunella vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Prunus persica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteridium esculentum	0	1	0	0	0	2	0	0.4	0	0	10	3	5	0	0	0	0	0	0.5	1	0.2	0	0	25	0.5	4	0	20	20	0	0	0	0	3	5	0.5	2	1
Pterostylis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Pultenaea microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pultenaea subspicata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrrosia rupestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus inundatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus lappaceus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0
Rapistrum rugosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romulea rosea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rorippa laciniata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa rubiginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rostellularia adscendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus anglocandicans	0	0	0	0	0	0.1	0	0	0	0	0	5	20	0	20	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0.1
Rubus parvifolius	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	1	0.1	0	0	0	0	0	0	8	0	0	0	0	0	0	2	0.1	0	0.5	0
Rumex acetosella	0	0	4	0	0	0	0.1	0	0	0	0	0.2	0.1	2	1	0.1	0	0	0.2	0.3	0	1	0	0	0	0.3	0	0	0	0.1	0	0	0	0	0	0	0	0
Rumex brownii	0.1	0	0.1	0	0.1	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0.2	0.3	0	0	0	0	0	0
Rumex crispus	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma caespitosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma indutum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma laeve	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma pallidum	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma pilosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma racemosum	0	0	0.2	0	0	0	0.1	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma richardsonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma spp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Rytidosperma tenuius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanguisorba minor subsp. mu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaevola hookeri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus validus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenus apogon	0	0	0	0	1	0	15	0	0	1	0	0.1	0	0.3	0	0	0	0.1	0	0	0	2	0	0	0	0	0	0	0	0.2	0	2	0	0	0	0	0	0
Scleranthus biflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scleranthus sp. Fitzs Hill	0	0	3	0	0	0	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Scleranthus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0
Scutellaria humilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Secale cereale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Senecio bipinnatisectus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio diaschides	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Senecio lautus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	JH031	WWF05	JH021	JH025	JH024	WWF05	JH067	WWF05	JH030	JH032	WWF04	JH010	JH09	JH012	WT152	WT151	WWF12	WWF05	JH113	JH112	WWF03	JH098	BP22	WWF04	WWF04	WT147	WWF00	BP21	WWF04	JH065	MA01	JH119	WT138	JH122	WWF02	WWF00	WWF00	BP27
Senecio madagascariensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Senecio minimus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Senecio prenanthoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0
Senecio quadridentatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria pumila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sigesbeckia orientalis	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Silene spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silybum marianum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium rosulatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium sp. A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smilax australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0.5	0	0
Solanum amblymerum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum americanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Solanum brownii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum neoanglicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Solanum nigrum	0	0	0	0	0.1	0.1	0	0	0	0	0.1	0.1	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.2	0.1	0	2	0	0	0.1
Solanum opacum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum prinophyllum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum pungetium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum semiarmatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum vicinum	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0.2	0	1	0	0	0
Solenogyne bellioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solenogyne gunnii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soliva sessilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Sonchus asper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus oleraceus	0.1	0	0.1	0	0	1	0	0	0.1	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0
Sorghum leiocladum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Sporobolus creber	2	0	0	0	0	0	0	0	2	25	10	10	0.1	0	2	5	25	0	5	1	0	0.2	0	0	0	20	0	0	0	30	0	1	1	0	0	0	0
Stachys arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stackhousia viminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria angustifolia	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria media	0	0	4	0	1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	1	0	0	0	0	0	0	0.1	30	0	0	0.2	0	0.1	0
Stellaria pungens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stylidium graminifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona galegifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tagetes minuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0.1	0	0	0.1	0.1	0	0.1	0	0.1	0	0	0.1	0	0.1	0	0	0	0	0.1	0	0	0	2	0	0	0	0.2	2	0	0.1	0	0	0	0.1	0.1	0	0.1
Themeda triandra	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Thysanotus tuberosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tragopogon porrifolius subsp.	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribulus micrococcus	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium dubium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium repens	0.1	0	0.2	0	0	0	0.2	0	1	2	0	1	1	1	0	0.1	0	0	1	1	0	3	0	0	0	2	0	0	0	0	1	2	0	0	0	0	0
Trifolium spp.	0	0	0	0	0	0.1	0	3	0	0	1.1	0	0	0	0	0	8	0.6	0	0	1	0	0.1	2	0.1	0	5	3	0	0	0	0	0	5	0.2	0	0.1
Tripogon loliiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urtica incisa	0	0	2	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Urtica urens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0
Verbascum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbascum thapsus	0	0	0.1	0	0	0	0	0	0	0	1	0	0	0.1	0	0.1	0	0	0.1	0	0.5	0	0	0	0.1	0	0.5	0	0.1	0.1	0	0	0	0.1	0	0	0
Verbascum virgatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena bonariensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica calycina	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Veronica derwentiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica plebeia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum tinus	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia sativa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia villosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola betonicifolia	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.5	0
Viola hederacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia cuneata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Vittadinia muelleri	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Vittadinia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia sulcata	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vulpia myuros	0	0	0	0	0	20	0	30	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	5	50	0	0	0	50	0	0	0	0	0	0	0	0	0
Vulpia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia communis	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Wahlenbergia gracilenta	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia gracilis	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Wahlenbergia luteola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia multicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia planiflora	0	0	0	0	0	0.1	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wurmbea dioica subsp. dioica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthium occidentale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthorrhoea johnsonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthosia pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Xerochrysum bracteatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	WWF04	WWF02	WWF00	WWF03	WWF03	BP24	JH114	WWF02	JH124	JH095	MA09	WT139	BAMPlo	WWF08	WWF08	WWF01	WT144	JH120	WT145	WWF05	JH079	WT140	JH092	WT146	WWF08	WWF06	BAMPlo	BAMPlo	JH070	JH116	JH073	WWF095
Abildgaardia ovata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia dealbata	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia deanei	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Acacia falcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia falciformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia filicifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia implexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia leiocalyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia melanoxylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia rubida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia ulicifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Acacia venulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena agnipila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acaena novae-zelandiae	0.5	0.1	0	1	0	0.1	0.1	0.1	0	0	0	0	0.1	0.1	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0	0.1	0
Acaena ovina	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0.1	0	0	0	0	0
Acaena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetosella vulgaris	0.5	0.1	0.5	0	0.1	0	0	0.2	0	0	0	0	0	0.1	2	0.1	0	0	0	0.1	0	0	0	0	0.2	5	0	0	0	0	0	5
Adiantum aethiopicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aira spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ajuga australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Allocasuarina littoralis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternanthera denticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus powellii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus spp.	0	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Ammi majus	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammobium alatum	0	0	0	0	0	0	0	0	1	0	0	0.1	0.5	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Amyema miquelii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema pendula	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amyema spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anagallis arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Andropogon virginicus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Angophora floribunda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthosachne scabra	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthoxanthum odoratum	0	0	1	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida jerichoensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Aristida personata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida ramosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida vagans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0
Arthropodium milleflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asperula conferta	0	0	0	0	0	0	0	0	0	0.2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	3	0	0.1
Asperula gunnii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asplenium flabellifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa bigeniculata	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	5	0	0	0	0	0.5	0	0	0	0	0.1	0.2	0	0	0	0	0	0.5
Austrostipa densiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Austrostipa nodosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa puberula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa pubescens	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa ramosissima	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austrostipa rudis	0	0	0	0	0	0	0	0	25	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	1	5	0	30	0
Austrostipa scabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0.1	0	0	0	0	0	0	0	0.2
Austrostipa verticillata	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Axonopus fissifolius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baloskion stenocoleum	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens pilosa	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Billardiera scandens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blechnum cartilagineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bothriochloa decipiens	0	0	0	0	0	0	0	0	0	0	0	50	25	0	0	0	15	0	0	0	0	0.2	10	5	0	0	0	0	0	0	0	0	0
Bothriochloa macra	0	0	0	0	0.1	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Brachyloma daphnoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome diversifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome graminea	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome multifida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome scapigera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spathulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brachyscome spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica rapa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Briza minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus brevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus catharticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus diandrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Bromus spp.	0	10.5	30	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Bulbine bulbosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bursaria longisepala	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bursaria spinosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caesia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caladenia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis cuneata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Calotis cuneifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotis lappulacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capillipedium parviflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursapastoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsella bursa-pastoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	WWF04	WWF02	WWF00	WWF03	WWF03	BP24	JH114	WWF02	JH124	JH095	MA09	WT139	BAMPlo	WWF08	WWF08	WWF01	WT144	JH120	WT145	WWF05	JH079	WT140	JH092	WT146	WWF08	WWF06	BAMPlo	BAMPlo	JH070	JH116	JH073	WWF095
Cardamine hirsuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardamine lilacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carduus nutans	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex appressa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex breviculmis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex echinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex gaudichaudiana	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex inversa	0	0	0	0	0	0	0	0	0	0.3	0.5	0	0	0	0	0	0	0	0	0	0	1	1	0	5	0	0	0.1	0	0	1	0.5
Carex spp.	0	0	1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia leptocephala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cassinia quinquefaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus ciliaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus purpurascens	0	0	0	0	0	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Centaurea spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centaurium erythraea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Centaurium spicatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centella asiatica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Centipeda cunninghamii	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium balearicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Cerastium glomeratum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium vulgare	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilanthes sieberi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0
Chenopodium album	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium carinatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloris truncata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choretrum pauciflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysocephalum apiculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysocephalum semipapposı	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cichorium intybus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0
Cirsium vulgare	0.1	1	5	0	0.1	1	0.1	0.2	0	0.1	0.2	0.2	0.1	10	0.1	2	0	0.1	0.1	0	0	0.2	0	0	0	0	0.1	0.1	0	0.1	0.2	0.1	0.1
Clematis aristata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clematis microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conium maculatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulus erubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conyza bonariensis	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.5	0	10	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0
Conyza parva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conyza spp.	1	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Cotula australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Craspedia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Craspedia variabilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassula sieberiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	
Crataegus monogyna	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptandra amara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclospermum leptophyllum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymbonotus lawsonianus	0	0	0	0	0	0	0.1	0.1	0	0	0.5	0	0	0.1	0	0	0	0.1	0	0.1	0	0.1	0.1	0	0	0	0	0	0.1	0.1	0.1	0.2
Cymbopogon refractus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynara cardunculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynodon dactylon	0	0	0	0	0	0	0	0	0	0	0	0	40	0	25	0	0	0	10	0.1	0	35	0	0	50	0	20	0	0	0	0	10	
Cynoglossum australe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Cynosurus echinatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus eragrostis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Cyperus exaltatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus gracilis	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus sphaeroideus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	10	0	0	0	0	0	0	0	0	0
Cyperus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperus vaginatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dactylis glomerata	0.1	1	0	0	0.5	0	5	0.1	40	0	0	0	0	0	0	1	0	5	0	0	50	0	0.1	60	0	0	25	2	15	3	2	0
Datura stramonium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus carota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daucus glochidiatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daviesia genistifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daviesia latifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella caerulea	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella revoluta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianella spp.	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dianthus armeria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichanthium sericeum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichanthium setosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelachne crinita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelachne micrantha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Dichondra repens	0	0.1	0	0.1	0.1	0	1	0.2	0	0.1	0.5	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0
Dichopogon fimbriatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichopogon strictus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera peltata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drosera spatulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania carinata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dysphania pumilio	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0.1	0	0	0	0	0
Dysphania spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinopogon caespitosus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinopogon ovatus	0	0	0	0	0	0	0	0	0	0	0	0	0.1	3	0.1	0	0	0	0	0.1	0	0	0	0	0	1	0	0	0	0	0	0	0
Echium plantagineum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia hastata	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia nutans	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0

species	WWF04	WWF02	WWF00	WWF03	WWF03	BP24	JH114	WWF02	JH124	JH095	MA09	WT139	BAMPlo	WWF08	WWF08	WWF01	WT144	JH120	WT145	WWF05	JH079	WT140	JH092	WT146	WWF08	WWF06	BAMPlo	BAMPlo	JH070	JH116	JH073	WWF095
Einadia polygonoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Einadia trigonos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis acuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleocharis atricha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleusine spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Eleusine tristachya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	3	0	0	0	0	0	0	0	0
Elymus scaber	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilobium billardierianum	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis brownii	0	0	0	0	0.5	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis curvula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis lacunaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptocarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis leptostachya	0	0	0	0.1	0	10	0	0	0	0	0	20	0	0	0	0	15	0	5	0	0	0	10	5	10	0	0.1	0	0	0	0	1
Eragrostis pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eragrostis trachycarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium cicutarium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Erodium moschatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erodium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0.1
Eucalyptus acaciiformis	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus andrewsii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus blakelyi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus bridgesiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus calidissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus caliginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus campanulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus conica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus dalrympleana	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus fastigata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus laevopinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus malacoxylon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus melliodora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus michaeliana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nicholii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nobilis	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus nova-anglica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus obliqua	5	0	0	60	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus pauciflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus radiata	20	50	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus stellulata	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus viminalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus williamsiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucalyptus youmanii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton involucratus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchiton sphaericus	0	0.1	0	0	0	0	0	0.1	0	0	0	1	0	0	0	0	0.1	1	1	0.1	1	0	0	5	0	0	0.1	0.1	0	0.1	0	0
Euphorbia prostrata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exocarpos cupressiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca arundinacea	0	0	0	0	0	0	0	0	5	0	0	1	0	0	0	0	0	0	1	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Festuca nigrescens	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Fimbristylis dichotoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	10	0	0	0.2	0	0	0	0	0.1	0	0	0	0	0
Gahnia sieberiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium binifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium gaudichaudii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leiocarpum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium leptogonium	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium murale	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium propinquum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gamochaeta coarctata	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	3	0	3	0	1	0	0	0	0	0	0.1	0	2	0
Gamochaeta spp.	0	0	0	0	0.1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Geranium molle subsp. molle	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Geranium solanderi	5	1	1	1	0.1	0	0	0.1	0	0.1	0	0	0	0.1	0.1	1	0	0	0	0.1	0	0	0	0	0	0.3	0.1	0.1	0.2	0	1	0
Glycine clandestina	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycine tabacina	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Gomphrena celosioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus elatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus tetragynus	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gonocarpus teucrioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia bellidifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia hederacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia heteromera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia rotundifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grona varians	0	0	0	0.1	0.2	0	0	0.1	0	0	0	1	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0.1	0	0.1	0.1	0	0	0	0
Hainardia cylindrica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis aspera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haloragis heterophylla	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	8	0	2	0.3	0.1	1	0.1	0	0	0	0.5	1	5	0	0
Haloragis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardenbergia violacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Heliotropium amplexicaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemarthria uncinata	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibbertia obtusifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Hibbertia riparia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	WWF04	WWF02	WWF00	WWF03	WWF03	BP24	JH114	WWF02	JH124	JH095	MA09	WT139	BAMPlo	WWF08	WWF08	WWF01	WT144	JH120	WT145	WWF05	JH079	WT140	JH092	WT146	WWF08	WWF06	BAMPlo	BAMPlo	JH070	JH116	JH073	WWF095
Holcus lanatus	0	0	0	0	0.2	20	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0
Hordeum leporinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hordeum vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybanthus monopetalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle laxiflora	0	0.1	0	0	0.1	0.1	0.2	0.2	0	0	0	0	0.1	0.1	0	0.5	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0.2	0	0
Hydrocotyle pedicellosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocotyle sibthorpioides	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum gramineum	0	0	0	0	0	2	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0
Hypericum japonicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypericum perforatum	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris glabra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypochaeris radicata	0.1	0.5	0.1	0.1	0.2	0.1	1	0.2	5	0.2	1	0	0.1	0.5	5	0.1	0.2	2	1	0.1	4	0	1	3	0.4	0	0.1	0.1	0.5	0.1	0.2	0.5
Hypoxis exilis	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hypoxis hygrometrica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indigofera australis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Isolepis hookeriana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0
Juncus alexandri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0
Juncus australis	0	0	0	0	0	10	0	0	0	0	0.3	0	0	0	0	0	0	70	0	0	4	0	2	0	0	0	0.1	0	1	10	0	0
Juncus brevibracteus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus cognatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus filicaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0
Juncus fockei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus holoschoenus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus pauciflorus	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus remotiflorus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0.1	0	0.1	0	0	0	0	0.1	0	0	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Juncus subsecundus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Juncus usitatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Lachnagrostis aemula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lachnagrostis filiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lactuca serriola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagenophora stipitata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamium amplexicaule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lemna spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leonotis leonurus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon saxatilis	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon taraxacoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium bonariense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidosperma laterale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptorhynchos squamatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptospermum gregarium	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leptospermum polygalifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lespedeza juncea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leucopogon lanceolatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ligustrum lucidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lissanthe strigosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1	0	0	0	0.1	0	0	2	0	0	0.5	0	0	0.1	0	0	0.5
Lolium perenne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lolium spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra briggsiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra filiformis	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1
Lomandra longifolia	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra multiflora	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Lomandra spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomatia fraseri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula flaccida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lysimachia arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Lythrum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva neglecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malva parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Marrubium vulgare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago minima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago polymorpha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicago spp.	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melichrus procumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melichrus urceolatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha diemenica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
Mentha satureioides	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Micrantheum ericoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microlaena stipoides	80	40	30	20	65	0	70	10	20	0	0	10	20	5	25	60	30	10	10	70	0	40	40	0	0	0	1	30	70	25	70	10
Microseris lanceolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microtis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola caroliniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiola spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Moenchia erecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myoporum montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myosotis discolor	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassella trichotoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia alpicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia argophylla	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia erubescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia oppositifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia spp.	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olearia viscidula	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onopordum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Opercularia diphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opercularia hispida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	WWF04	WWF02	WWF00	WWF03	WWF03	BP24	JH114	WWF02	JH124	JH095	MA09	WT139	BAMPlo	WWF08	WWF08	WWF01	WT144	JH120	WT145	WWF05	JH079	WT140	JH092	WT146	WWF08	WWF06	BAMPlo	BAMPlo	JH070	JH116	JH073	WWF095
Opercularia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oreomyrrhis eriopoda	0	0	0	0.1	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0
Oxalis perennans	0.1	0.1	0.1	0	0.1	0	0.5	0.1	0	0.1	1	0	0	0.1	0.1	0	0	0.1	0	0.1	0	0	0	0	0.1	0.1	0	0	0.1	0	0.1	0.1
Oxalis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum decompositum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum effusum	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.5	0	0	0	0	0.1	0	0.1	0	0	0	0	0
Panicum simile	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Panicum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paronychia brasiliana	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0.4	0	0	0	0.1	0	0.1	0	0	0.1	0	0.1	0	0	0	0	0
Paspalidium distans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paspalum dilatatum	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	10	0	10	0.1	0	0	0	5	0	0	0.1	0	0	0	0	0
Paspalum distichum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea calidirupium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellaea falcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pennisetum clandestinum	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria hydropiper	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria prostrata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petrorhagia nanteuilii	0.1	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Phalaris aquatica	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllanthus virgatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phytolacca octandra	1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea curviflora	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0
Pimelea linifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea simplex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pimelea strigosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinus radiata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago debilis	0	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago gaudichaudii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago lanceolata	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0.1	0.1	0	0.1	0	0	0	0.1	0	0	1	0	0	0.2	0.1	0.1	1	1	0.1	0.1
Plantago varia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Plectranthus graveolens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa annua	0	0	5	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa labillardierei var. labillard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa sieberiana	0	15	20	50	1	5	20	52	5	25	5	5	0	0	10	2	0	0	0	0.1	0.1	0.2	1	0	0	0	0	3	0	10	0	20
Polygonum aviculare	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum plebeium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomaderris betulina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poranthera microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca filifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulaca oleracea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Pratia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunella vulgaris	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunus persica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pteridium esculentum	0	0.5	0.1	5	0.5	0	0.5	10	5	0	0	0	0.1	0	5	0	0	0	0	0.2	0	0	0	0	0	0	0.1	0	6	0	1	0
Pterostylis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pultenaea microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pultenaea subspicata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrrosia rupestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus inundatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus lappaceus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rapistrum rugosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romulea rosea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rorippa laciniata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Rosa rubiginosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Rostellularia adscendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus anglocandicans	0	1	0.5	0	0.2	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0	0
Rubus parvifolius	0	0	0	2	0	0	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rumex acetosella	0	0	0	0	0	0	0.3	0	0	0	0	0	0.2	0	0	0	1	0	0	0	0	0.1	0.1	0	0	0	0.1	0.1	0.1	0	0.1	0
Rumex brownii	0	0	0	0	0.1	0	0	0	0	0	0.1	0.1	0.1	0.3	0	0	0	0	0	0.1	0	0.1	0	0	0	0.1	0	0.1	0.1	0	0.1	0
Rumex crispus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma caespitosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Rytidosperma indutum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma laeve	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0
Rytidosperma pallidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma pilosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma racemosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	2	0	0	0	0
Rytidosperma richardsonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma spp.	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rytidosperma tenuius	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanguisorba minor subsp. mu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaevola hookeri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenoplectus validus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenus apogon	0	0	0	0	0	15	0	0	0.2	0.1	0	0	0	0	0	0	0	12	0	0	6	0	1	0	0	0	0	0	1	40	2	0
Scleranthus biflorus	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scleranthus sp. Fitzs Hill	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scleranthus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scutellaria humilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Secale cereale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio bipinnatisectus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio diaschides	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lautus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

species	WWF04	WWF02	WWF00	WWF03	WWF03	BP24	JH114	WWF02	JH124	JH095	MA09	WT139	BAMPlo	WWF08	WWF08	WWF01	WT144	JH120	WT145	WWF05	JH079	WT140	JH092	WT146	WWF08	WWF06	BAMPlo	BAMPlo	JH070	JH116	JH073	WWF095
Senecio madagascariensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio minimus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio prenanthoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio quadridentatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria parviflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria pumila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Sigesbeckia orientalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silene spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silybum marianum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium rosulatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium sp. A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smilax australis	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum amblymerum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum americanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum brownii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum neoanglicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum nigrum	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0.1	0	0	0.1	0	0.1	0	0	0	0
Solanum opacum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum prinophyllum	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum pungetium	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum semiarmatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanum vicinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solenogyne bellioides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solenogyne gunnii	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soliva sessilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus oleraceus	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.2	0
Sorghum leiocladum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sporobolus creber	0	0	0	0	0.1	0	0	0	0	0.2	5	30	0.1	0	0	0	40	1	30	0.1	35	0	30	15	0	0	0.2	0	0	0	5	20
Stachys arvensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stackhousia viminea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria angustifolia	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Stellaria media	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0.3	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria pungens	0	5	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stylidium graminifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona galegifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swainsona spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tagetes minuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0.1	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0
Themeda triandra	0	0	0	0	0.1	0	0	0.1	0.1	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thysanotus tuberosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tragopogon porrifolius subsp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tribulus micrococcus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium dubium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium repens	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	0	7	0.1	0	0	0	0	0	0.1	0	0	0	0	2	1	1	0
Trifolium spp.	0	1	3	0	1	2	0	0.2	0	0	0	0	0	0.3	23.1	0.7	0	0	0	0.1	0	0	0	0	0	0	56	0.2	0.1	0	0	20
Tripogon loliiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urtica incisa	5	0	1	0	0	0	0	0	0	0	0	0	0.1	10	0	2	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Urtica urens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbascum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0	0
Verbascum thapsus	0	0	0.2	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.1	0	0.1	0	0	0
Verbascum virgatum	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena bonariensis	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Veronica calycina	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Veronica derwentiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica gracilis	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica plebeia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum tinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia sativa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia villosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola betonicifolia	0	0.1	0.1	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola hederacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia cuneata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia muelleri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vittadinia sulcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vulpia myuros	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vulpia spp.	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia communis	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0.6	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Wahlenbergia gracilenta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia gracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Wahlenbergia luteola	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia multicaulis	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia planiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Wahlenbergia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Wahlenbergia stricta	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wurmbea dioica subsp. dioica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthium occidentale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthorrhoea johnsonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xanthosia pilosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xerochrysum bracteatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX D BAM PLOT DATA

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
JH029	510	2.55	101	VZ1_DC_woodland	56	380222	6585723	193	3	0	6	13	0	1	23	0	69.2	22.3	0	5	3	0	3	43	0	0	0	1	0	0	0
BAMPlot1	510	2.55	101	VZ1_DC_woodland	56	381377	6579538	330	1	1	7	10	0	0	20	0.1	66.7	1	0	0	1	0	10	3	0	0	0	1	0	0	0.1
WWF136	510	0.38	101	VZ2_DC_openwoodland	56	355729	6599109	0	1	0	4	5	0	0	13	0	46.1	1.8	0	0	1	0	44	0	1	0	0	0	1	0	2
WWF139	510	8.72	101	VZ3_DC_grassland	56	356040	6599837	0	0	0	5	12	0	1	0	0	39.8	4.3	0	0.1	0	0	44	15	0	0	0	0	0	0	11.1
WWF134	510	8.72	101	VZ3_DC_grassland	56	355734	6598740	0	0	0	6	1	0	0	0	0	42.1	0.1	0	0	0	3	57	29	0	0	0	0	0	0	0.2
WWF133	510	8.72	101	VZ3_DC_grassland	56	355742	6598498	0	0	0	8	6	0	0	0	0	88	0.9	0	0	0	0	48	0	0	0	0	0	0	0	0.5
WWF135	510	8.72	101	VZ3_DC_grassland	56	355732	6599033	180	0	0	7	1	0	0	0	0	41.5	0.1	0	0	0	0	50.2	0	0	0	0	0	0	0	1
JH050	510	2.4	101	VZ4_RC_grassland	56	382032	6579296	156	0	1	2	4	0	0	0	1	1.1	3.2	0	0	0	0	34	0	0	0	0	0	0	0	10.1
WT153	510	2.4	101	VZ4_RC_grassland	56	374735	6574925	6	0	2	6	12	0	0	0	10.1	86.1	11.3	0	0	0	0	1.4	0	0	0	0	0	0	0	0
JH121	510	2.4	101	VZ4_RC_grassland	56	375216	6576728	44	0	1	5	8	1	0	0	0.1	79.1	16	0.1	0	0	0	14	0	0	0	0	0	0	0	0.1
JH077	510	14.23	101	VZ5_low_grassland	56	384351	6579070	190	0	0	9	2	0	0	0	0	112.7	1.1	0	0	0	0	2	0	0	0	0	0	0	0	0.1
JH026	510	14.23	101	VZ5_low_grassland	56	380811	6587385	154	0	2	7	5	0	0	0	5.1	68	15.8	0	0	0	0	1	0	0	0	0	0	0	0	0
JH027	510	14.23	101	VZ5_low_grassland	56	380628	6587423	178	0	3	6	7	0	0	0	9.1	49.2	21.5	0	0	0	0	3	0	0	0	0	0	0	0	0
WWF074	510	14.23	101	VZ5_low_grassland	56	379430	6582422	89	0	0	3	2	0	0	0	0	5.2	0.6	0	0	0	0	4	0	0	0	0	0	0	0	2
JH042	510	0.96	101	VZ6_RC_woodland	56	374875	6585092	63	2	0	12	10	0	0	15.1	0	72.5	21.9	0	0	0	0	11.6	0	1	0	0	0	0	0	2
JH102	510	0.96	101	VZ6_RC_woodland	56	377739	6579995	348	3	3	10	18	1	0	35	3.2	44.6	54.6	0.1	0	3	12	39	12	1	1	1	1	0	1	0.2
WWF110	510	0.96	101	VZ6_RC_woodland	56	370150	6584877	0	4	1	8	11	0	0	47	0.4	87.2	1.6	0	0	3	2	32	40	1	1	0	0	1	1	0.1
JH063	510	1.39	101	VZ7_TL_canopy	56	379638	6582376	9	2	0	8	4	0	1	15	0	25.5	1.4	0	0.1	1	0	17	14.5	0	0	0	0	1	0	0.1
WWF129	510	1.39	101	VZ7_TL_canopy	56	361433	6593991	0	1	0	9	10	0	0	15	0	62.5	4.2	0	0	1	1	27	25	0	0	0	0	0	0	0.1
WWF128	510	1.39	101	VZ7_TL_canopy	56	361791	6593972	325	2	0	4	4	0	0	15	0	40	6.2	0	0	2	2	29	10	0	0	0	1	0	0	5.1
JH108	533	0.06	101	VZ8_DC_openwoodland	56	370292	6585934	0	1	0	8	8	1	1	15	0	66.3	9.4	0.1	0.1	2	0	3	0	0	0	0	0	0	0	0
WWF111	533	0.52	101	VZ9_DC_grassland	56	370245	6585696	342	0	0	7	4	0	0	0	0	55.5	0.6	0	0	0	0	11	0	0	0	0	0	0	0	0.2
WWF112	533	0.52	101	VZ9_DC_grassland	56	370302	6585984	315	0	0	11	5	0	2	0	0	76	1.4	0	0.2	0	0	14	0	0	0	0	0	0	0	0.2
JH107	533	0.08	101	VZ10_TL_canopy	56	370248	6585899	0	1	0	5	10	0	0	10	0	52.1	12.6	0	0	2	1	3.2	15	0	0	0	1	0	0	5
JH061	534	1.4	101	VZ11_DC_woodland	56	377287	6583195	10	1	5	13	15	1	0	15	9.3	36.3	41	0.1	0	1	1	27	5.5	1	1	1	1	0	0	0
JH059	534	1.4	101	VZ11_DC_woodland	56	377165	6583307	349	1	1	8	5	0	0	25	0.1	16.1	10.2	0	0	3	2	21.4	43	1	0	0	1	0	0	0.1
JH013	534	1.4	101	VZ11_DC_woodland	56	373305	6583521	193	1	2	6	13	0	0	10	0.2	16.4	61.6	0	0	1	9	14	1	0	0	1	0	0	0	0
WWF090	534	0.58	101	VZ12_DC_openwoodlanc	56	373231	6583396	160	1	0	7	6	0	1	7	0	47.1	5.5	0	0.1	2	0	5.6	1	0	0	0	0	0	1	0
WWF115	534	12.88	101	VZ13_mod_grassland	56	370362	6586421	0	0	0	7	5	0	0	0	0	61.3	0.9	0	0	0	0	23	0	0	0	0	0	0	0	0.1
WWF123	534	12.88	101	VZ13_mod_grassland	56	366844	6592202	0	0	0	4	6	0	0	0	0	75.1	6	0	0	0	0	30	0	0	0	0	0	0	0	0.1
WT143	534	12.88	101	VZ13_mod_grassland	56	380595	6586784	0	0	1	9	9	0	0	0	0.1	91.6	11.2	0	0	0	0	2.6	0	0	0	0	0	0	0	25.1
JH101	534	31.88	101	VZ14_low_grassland	56	375991	6579556	67	0	0	7	5	0	0	0	0	28.5	75.2	0	0	0	0	15	0	0	0	0	0	0	0	10
MA07	534	31.88	101	VZ14_low_grassland	56	356433	6606647	37	0	0	2	2	0	0	0	0	0.4	0.3	0	0	0	0	18	0	0	0	0	0	0	0	81.5
MA08	534	31.88	101	VZ14_low_grassland	56	356125	6606415	49	0	1	5	1	0	0	0	0.1	20.4	0.1	0	0	0	0	2.4	8	0	0	0	0	0	0	30.6
JH040	534	31.88	101	VZ14_low_grassland	56	374673	6581159	113	0	0	2	6	0	0	0	0	25	12.4	0	0	0	0	19	0	0	0	0	0	0	0	15
JH033	534	31.88	101	VZ14_low_grassland	56	380599	6586372	78	0	2	6	9	0	0	0	3.1	65	25.2	0	0	0	0	2	0	0	0	0	0	0	0	0
JH034	534	31.88	101	VZ14_low_grassland	56	380571	6586637	89	0	0	5	8	0	0	0	0	19.1	36.4	0	0	0	0	2	0	0	0	0	0	0	0	24
JH060	534	31.88	101	VZ14_low_grassland	56	377365	6583228	66	0	0	5	11	0	0	0	0	67.1	34.7	0	0	0	0	3.2	0	0	0	0	0	0	0	0.2
JH039	534	31.88	101	VZ14_low_grassland	56	376706	6580277	228	0	1	8	8	0	0	0	1	52.4	26.8	0	0	0	0	9.4	0	0	0	0	0	0	0	15
JH036	534	31.88	101	VZ14_low_grassland	56	374775	6585228	75	0	0	6	2	0	0	0	0	98.1	4	0	0	0	1	0	0	0	0	0	0	0	0	2
JH084	534	31.88	101	VZ14_low_grassland	56	385739	6584118	0	0	0	2	1	1	0	0	0	6	3	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
JH037	534	3.26	101	VZ15_RC_woodland	56	381718	6583497	31	2	4	12	9	0	0	30.1	0.4	63.7	11.7	0	0	0	0	8.8	11.5	1	0	0	1	0	0	0.2
JH041	534	3.26	101	VZ15_RC_woodland	56	374149	6582708	99	2	2	11	13	0	0	35	0.3	59	31.1	0	0	0	3	27	85	1	1	1	1	0	0	2
WT149	534	3.26	101	VZ15_RC_woodland	56	370265	6572237	57	2	1	4	13	0	1	25	0.1	90.1	6.5	0	0.1	6	0	31	0	1	1	0	1	0	1	2.2
JH094	534	3.26	101	VZ15_RC_woodland	56	367533	6572226	167	3	1	3	2	0	0	25.1	3	0.3	2.1	0	0	1	0	40	0	0	1	0	1	0	1	4
WWF118	534	1.09	101	VZ16_TL_canopy	56	370490	6587436	0	3	3	7	11	0	0	15.2	0.5	62.4	2	0	0	0	2	21	2	0	0	0	1	0	1	0.6
WWF117	534	1.09	101	VZ16_TL_canopy	56	370434	6587158	0	1	0	6	6	0	0	10	0	68.1	0.8	0	0	1	1	24	4	0	0	0	0	0	1	0.2
WWF081	534	1.09	101	VZ16_TL_canopy	56	377099	6583189	321	1	2	7	13	0	2	20	2.1	47.4	3.3	0	0.2	2	2	54	0	1	1	1	1	1	1	0
WWF103	565	4.96	101	VZ17_DC_woodland	56	367168	6579686	0	2	1	2	9	1	0	39	0.1	65	2.9	2	0	1	1	26	3	0	1	0	0	0	1	1.2
WWF104	565	4.96	101	VZ17_DC_woodland	56	367110	6580549	0	3	3	5	11	1	1	24.5	0.3	87.2	6.2	5	0.4	1	2	30	5	0	0	0	1	1	1	0
JH018	565	4.96	101	VZ17_DC_woodland	56	370181	6583268	159	2	2	11	12	2	0	7	1.2	88.7	12.1	0.2	0	1	0	2.8	76	0	0	0	0	0	0	0
JH08	565	4.96	101	VZ17_DC_woodland	56	367499	6580398	13	1	5	9	24	1	1	40	0.7	60.7	9.9	0.1	0.1	4	0	38	24.4	1	1	1	0	0	0	0.1
WWF076	565	0.17	101	VZ18_DC_openwoodlanc	56	378931	6583753	0	1	0	2	1	0	0	5	0	80	0.1	0	0	1	2	1.2	37	0	0	0	0	0	1	0	5
JH117	565	11.94	101	VZ19_DC_grassland	56	367086	6580526	358	0	1	5	7	1	0	0	0.1	89.2	3.1	6	0	0	0	6.2	0	0	0	0	0	0	0	0
JH069	565	11.94	101	VZ19_DC_grassland	56	367299	6579685	75	0	1	6	9	0	0	0	1	112	16.7	0	0	0	0	6.4	0	0	0	0	0	0	0	0
WWF131	565	11.94	101	VZ19_DC_grassland	56	355761	6598091	0	0	0	9	3	0	0	0	0	89.9	2.7	0	0	0	0	55	0	0	0	0	0	0	0	0.2
JH076	565	11.94	101	VZ19_DC_grassland	56	369982	6583304	86	0	0	5	5	0	0	0	0	82	9.1	0	0	0	1	2.2	70	0	0	0	0	0	0	0
JH118	565	11.94	101	VZ19_DC_grassland	56	367570	6580300	8	0	0	5	8	0	0	0	0	86.1	13.5	0	0	0	0	2.4	0	0	0	0	0	0	0	0
WWF130	565	0.17	101	VZ20_TL_canopy	56	355926	6597869	38	1	0	4	6	0	0	30	0	80	1	0	0	0	4	3	73	0	0	1	1	1	0	5
WWF020	567	15.51	101	VZ21_DC_woodland	56	386576	6567821	203	3	0	2	7	1	1	26	0	50	10.7	0.2	1	3	1	20	44	1	1	1	1	1	1	2
WWF109	567	15.51	101	VZ21_DC_woodland	56	369498	6584094	0	2	1	4	15	1	1	52	1	65.8	3.8	0.3	0.1	1	2	31	47	1	1	1	1	1	1	0
JH016	567	15.51	101	VZ21_DC_woodland	56	371523	6583091	168	2	6	7	10	0	0	9	4.4	12.8	40.8	0	0	2	7	56	31.7	0	0	1	1	0	0	0
WWF055	567	15.51	101	VZ21_DC_woodland	56	381637	6579426	89	1	0	2	2	0	0	30	0	30	0.6	0	0	3	0	38	7	0	0	0	1	1	0	0
JH055	567	29.63	101	VZ22_mod_grassland	56	371822	6582845	201	0	0	6	5	0	0	0	0	78.4	7.3	0	0	0	0	10.6	0	0	0	0	0	0	0	0
JH075	567	29.63	101	VZ22_mod_grassland	56	371201	6583059	326	0	2	7	6	1	0	0	5.1	63.1	6.2	10	0	0	0	2.4	0	0	0	0	0	0	1	0
JH111	567	29.63	101	VZ22_mod_grassland	56	380746	6587066	0	0	0	2	6	9	0	0	0	0.2	75.3	16.6	0	0	0	0	9.6	2	0	0	0	0	0	0	5
WWF062	567	29.63	101	VZ22_mod_grassland	56	380504	6582085	56	0	2	7	7	0	1	0	2	97.1	5.6	0	0.1	0	0	1	36	0	0	0	0	0	0	0
WWF068	567	29.63	101	VZ22_mod_grassland	56	381978	6581871	2	0	0	10	8	0	2	0	0	63	13.6	0	0.2	0	0	5.4	0	0	0	0	0	0	0	5.1
JH104	567	0.34	101	VZ23_RC_woodland	56	379469	6579647	151	2	4	5	14	1	1	20	3.2	63.6	11.5	0.1	0.1	2	0	10.6	3	0	1	1	0	0	0	0
WWF122	567	1.08	101	VZ24_TL_canopy	56	366984	6592117	0	2	3	11	10	1	1	1	1	45.1	3	0.5	0.1	0	3	32	0	0	1	1	0	0	0	0.3
WWF087	568	4.48	101	VZ25_DC_openforest	56	374951	6589052	0	1	4	14	15	1	4	30	3.6	54.6	5.4	0.7	2.5	0	0	41	256	1	1	1	1	0	1	0
WWF088	568	4.48	101	VZ25_DC_openforest	56	375420	6589368	0	4	3	5	16	0	0	30.1	6.5	35.1	6.5	0	0	0	0	17	100	1	1	1	1	1	1	0
WWF073	568	25.72	101	VZ26_DC_woodland	56	380881	6580696	0	1	3	3	10	0	0	7	5.2	46	3	0	0	1	0	9.4	107	0	0	0	0	0	0	0
WWF045	568	25.72	101	VZ26_DC_woodland	56	387920	6582495	152	2	0	3	3	0	0	35	0	55	6.1	0	0	8	7	36	0	0	0	1	1	1	0	0
JH022	568	25.72	101	VZ26_DC_woodland	56	374675	6586645	308	2	3	10	9	0	0	35	15.3	24	5.2	0	0	3	9	10	120	1	1	1	1	0	1	0.1
JH031	568	25.72	101	VZ26_DC_woodland	56	380422	6585788	54	1	0	6	10	0	0	10	0	33.1	8.7	0	0	0	1	1	33	0	0	0	1	0	0	0
WWF052	568	25.72	101	VZ26_DC_woodland	56	383590	6577150	220	3	7	5	8	1	4	45.1	8.8	40.6	0.8	1	2.3	5	0	71	60	1	1	1	1	1	1	0
JH021	568	25.72	101	VZ26_DC_woodland	56	374444	6587166	98	1	4	3	12	0	1	40	8.3	25.3	14	0	0.1	1	8	29	73	1	1	1	1	0	0	0.2
WWF051	568	1.3	101	VZ27_DC_openwoodlanc	56	386789	6586469	223	1	0	1	3	1	0	5	0	70	2.1	2	0	0	1	4	12	0	0	0	1	1	0	0
JH067	568	50.29	101	VZ28_DC_grassland	56	368957	6578098	162	0	0	6	11	0	0	0	0	56.2	61	0	0	0	0	6.6	12	0	0	0	0	0	0	0
WWF059	568	50.29	101	VZ28_DC_grassland	56	381319	6581010	0	0	0	1	4	10	1	2	0	0.2	25	3.5	0.4	0.2	1	0	22	1	0	0	0	0	1	1	0.1
JH030	568	50.29	101	VZ28_DC_grassland	56	380292	6585728	18	0	0	4	11	0	0	0	0	49	21.6	0	0	0	0	5	24	0	0	0	0	0	0	0
JH032	568	50.29	101	VZ28_DC_grassland	56	380479	6585874	58	0	0	7	11	0	0	0	0	83	9.9	0	0	0	0	5	8	0	0	0	0	0	0	0
WWF049	568	50.29	101	VZ28_DC_grassland	56	384526	6582171	148	1	2	7	3	1	1	1	0	111	5.6	10	0	1	0	5	16	0	0	0	0	0	0	2
JH025	568	2.75	101	VZ29_TL_canopy	56	374664	6583702	239	2	3	5	2	0	0	40	8.2	90.2	1.1	0	0	3	1.1	2	4	42	0	1	1	1	0	0	0
JH024	568	2.75	101	VZ29_TL_canopy	56	375428	6583576	353	1	1	9	6	0	0	20	0.1	93.2	1.7	0	0	3	4	23.4	114	0	0	0	1	0	0	0
JH010	571	14.12	101	VZ30_DC_openforest	56	368305	6579942	258	1	2	7	9	1	1	15	0.2	82.4	1	3	0.1	1	0	12	1.3	0	0	1	0	0	1	0
JH09	571	14.12	101	VZ30_DC_openforest	56	368311	6579635	48	2	2	7	12	1	0	8	30.1	64.5	8.2	5	0	0	0	49.4	7.7	0	0	0	1	1	0	3.1
JH012	571	14.12	101	VZ30_DC_openforest	56	369700	6579469	35	2	3	4	9	0	0	20	0.4	33.4	2.1	0	0	4	0	27	13	0	0	1	1	0	0	0
WT152	571	1.36	101	VZ31_RC_woodland	56	374446	6574293	54	1	2	5	11	0	0	3	20	32.6	13.4	0	0	2	0	11.4	25	1	1	1	1	0	1	8
WT151	571	1.36	101	VZ31_RC_woodland	56	374038	6574066	56	1	4	6	12	0	0	8	11.4	100.3	4.2	0	0	5	0	23	21	1	1	1	1	1	1	0.1
WWF120	766	1.18	101	VZ32_DC_sedgeland	56	369988	6591121	0	0	0	6	8	0	0	0	0	57	2	0	0	0	0	31	0	0	0	0	0	0	0	0
WWF056	766	0.4	101	VZ33_RC_sedgeland	56	382391	6579128	0	0	0	8	4	0	0	0	0	3.1	0.5	0	0	0	0	7.6	0	0	0	0	0	0	0	0.3
JH113	965	1.98	101	VZ34_openforest	56	385788	6576129	0	2	1	4	7	1	0	17	1	75.7	17.1	0.5	0	1	0	16.6	61	0	0	0	1	0	0	0.2
WWF032	965	12.21	101	VZ35_woodland	56	388649	6572092	233	1	1	2	2	1	0	30	0.1	71	7	0.2	0	3	1	11.8	30	0	0	0	1	0	0	5
WWF001	965	12.21	101	VZ35_woodland	56	394220	6565000	3	1	2	4	5	1	0	5	1.1	91	1.4	3	0	0	0	3	2.5	0	0	0	0	0	0	3
BP22	965	12.21	101	VZ35_woodland	56	388226	6581676	230	1	0	6	9	0	0	1	0	84.2	8.6	0	0	0	2	13.4	45	0	0	0	0	1	0	5
WWF041	965	12.21	101	VZ35_woodland	56	387332	6578044	173	1	0	5	3	1	1	5	0	51	2.6	25	0.1	0	0	14.6	0	0	0	0	0	0	0	1
WWF043	965	0.95	101	VZ36_DC_shrubland	56	389170	6580558	158	0	1	3	4	1	1	0	5	32	5.7	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0
WT147	965	26.13	101	VZ37_low_grassland	56	385634	6576165	192	0	2	8	5	1	0	0	1.1	101.6	6.8	4	0	0	0	7	0	0	0	0	0	0	0	15.3
WWF002	965	26.13	101	VZ37_low_grassland	56	393966	6565419	248	0	0	5	5	0	1	0	0	72.6	3.7	0	5	0	0	1.4	0	0	0	0	0	0	0	5
BP21	965	26.13	101	VZ37_low_grassland	56	388878	6581352	230	0	1	6	10	3	0	0	8	33.2	15.6	24.1	0	0	0	4.4	0	0	0	0	0	0	0	2
WWF044	965	26.13	101	VZ37_low_grassland	56	388473	6581606	300	0	0	5	1	1	0	0	0	11.3	1	20	0	0	0	0	0	0	0	0	0	0	0	0	10
JH112	965	1.1	101	VZ38_TL_canopy	56	385788	6576087	0	3	3	3	7	1	0	37	1.2	71.1	1.8	1	0	6	2	17	58	0	0	1	1	1	0	0
JH065	501	2.65	101	VZ39_DC_

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
JH095	1192	1.22	101	VZ46_RC_grassland	56	370899	6572823	69	0	0	6	7	0	0	0	0	95.7	5.7	0	0	0	0	23	0	0	0	0	0	0	0	10.1
MA09	1192	18.02	101	VZ47_DC_grassland	56	356254	6601581	266	0	0	5	5	0	0	0	0	40.8	2.6	0	0	0	0	3	0	0	0	0	0	0	0	0
WT139	1192	18.02	101	VZ47_DC_grassland	56	356113	6601395	332	0	1	7	4	0	1	0	0.1	116.1	1.4	0	1	0	0	8	0	0	0	0	0	0	0	0
BAMPlot25	1192	18.02	101	VZ47_DC_grassland	56	374170	6588223	68	0	0	7	12	1	0	0	0	85.4	1.7	0.1	0	0	0	7	12	0	0	0	0	0	0	0.2
WWF084	1192	2.82	101	VZ48_DC_woodland	56	374123	6588062	0	3	1	3	8	0	1	23	0.5	23	10.9	0	0.1	0	1	19	11	0	1	1	1	1	0	0.6
WWF085	1192	2.82	101	VZ48_DC_woodland	56	374390	6588420	0	1	1	8	5	1	0	5	2	70.2	0.5	5	0	0	0	8.4	0	0	0	1	0	0	0	2
WWF017	1194	0.93	101	VZ49_DC_woodland	56	386442	6566304	0	1	3	3	10	1	3	25	0.4	63	7.7	0.1	1.1	5	5	23	58	0	1	1	1	1	1	0.1
WT144	501	6.35	101	VZ50_low_grassland	56	384500	6582914	86	0	0	8	1	0	0	0	0	113	0.1	0	0	0	0	7	0	0	0	0	0	0	0	11
JH120	501	6.35	101	VZ50_low_grassland	56	380156	6580557	135	0	0	4	6	0	0	0	0	93	44.4	0	0	0	0	13	0	0	0	0	0	0	0	0
WT145	501	6.35	101	VZ50_low_grassland	56	381977	6582971	87	0	0	8	1	0	0	0	0	68	1	0	0	0	0	3.8	0	0	0	0	0	0	0	10
WWF058	568	58.68	101	VZ51_low_grassland	56	383338	6580560	264	0	1	13	11	1	1	0	0.1	75.9	3	0.2	0.1	0	0	4.6	0	0	0	0	0	0	0	0.2
JH079	568	58.68	101	VZ51_low_grassland	56	383203	6579452	110	0	0	6	2	0	0	0	0	46.2	1.3	0	0	0	0	5	0	0	0	0	0	0	0	0
WT140	568	58.68	101	VZ51_low_grassland	56	379399	6587682	271	0	1	10	8	1	1	0	0.2	77.4	0.8	0.1	0.1	0	0	2.4	0	0	0	0	0	0	0	0.1
JH092	568	58.68	101	VZ51_low_grassland	56	374568	6586872	92	0	1	7	3	0	0	0	2	94	1.2	0	0	0	0	3.2	0	0	0	0	0	0	0	0
WT146	568	58.68	101	VZ51_low_grassland	56	383211	6579790	133	0	0	10	3	0	0	0	0	61.3	5.2	0	0	0	0	5.5	0	0	0	0	0	0	0	5
WWF086	568	58.68	101	VZ51_low_grassland	56	374791	6589215	0	0	0	4	9	0	1	0	0	60.2	21.2	0	0.1	0	0	5.4	0	0	0	0	0	0	0	0.2
WWF065	568	58.68	101	VZ51_low_grassland	56	381500	6581811	230	0	3	6	5	0	1	0	3.5	11.5	0.7	0	0.1	0	0	1.2	2	0	0	0	0	0	0	5
BAMPlot19	568	58.68	101	VZ51_low_grassland	56	387162	6586830	17	0	0	11	9	2	2	0	0	22	1.1	0.2	0.2	0	0	11	0	0	0	0	0	0	0	0.3
BAMPlot5	571	26.71	101	VZ52_low_grassland	56	367561	6579749	50	0	0	8	7	0	1	0	0	36.5	1.2	0	0.1	0	0	13	0	0	0	0	0	0	0	0.6
JH070	571	26.71	101	VZ52_low_grassland	56	367534	6580001	90	0	2	6	6	1	0	0	0.2	78.1	1.6	6	0	0	0	2.8	0	0	0	0	0	0	0	0
JH116	571	26.71	101	VZ52_low_grassland	56	367564	6579573	290	0	0	5	9	0	0	0	0	86	12.7	0	0	0	0	5	0	0	0	0	0	0	0	0.1
JH073	571	26.71	101	VZ52_low_grassland	56	368367	6580061	252	0	0	5	6	1	0	0	0	108	1.6	1	0	0	0	3.2	0	0	0	0	0	0	0	0
WWF095	571	26.71	101	VZ52_low_grassland	56	370073	6582037	0	0	0	2	10	5	0	0	0	0.7	62.6	0.6	0	0	0	8	0	0	0	0	0	0	0	5

APPENDIX E ASSESSMENT OF MNES

In accordance with *Guidance for Accredited Assessors on the assessment of MNES*, published by DPHI in 2024 (either just prior to or immediately after the publishing of the Amended BDAR (ERM 2024)), Appendix E has been prepared to summarise the assessment of predicted impacts on EBPC Act-listed Threatened Species and Communities and World Heritage properties and provide a completion checklist relating to the assessments.

The Summary Table (Attachment 1) and Completion Checklist (Attachment 2) are provided below. Resources used for the completion of Appendix E and the assessment of impacts to MNES throughout this BDAR include:

- EPBC Act Referral Decision (2020/8734) provided by the Australian Government's Department of Agriculture, Water and the Environment on the 31st August 2020:
    - The decision brief advised that the proposed action is a controlled action and that the project will require assessment under the assessment bilateral agreement with New South Wales. The relevant controlling provisions included World Heritage properties, National Heritage placed, listed threatened species and communities and listed migratory species.
- The Secretary's Environmental Assessment Requirements (SSD-10471) dated 17th September 2020 and supplementary SEARs relating to Commonwealth matters;
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Protected Matters Search Tool (PMST) (http://www.environment.gov.au/epbc/protectedmatters- search-tool);
- DCCEEW Species Profiles and Threats (SPRAT) database (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl);
- DCCEEW Directory of Important Wetlands in Australia (https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands);
- Interim Biogeographical Regionalisation for Australia (IBRA) and IBRA sub-regions v7 (http://www.environment.gov.au/land/nrs/science/ibra);
- NSW Department of Planning, Industry and Environment (DPIE) Threatened Species Database Collection (http://www.environment.nsw.gov.au/threatenedspeciesapp/);
- DPIE Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE, 2019);
- NSW Biodiversity Values Map (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap);
- NSW Department of Primary Industries (DPI) Key Fish Habitat mapping;
- DPE State Vegetation Type Mapping Version C2.0M2.0 (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map);
- DPE BioNet Atlas of NSW database;
- DPE Threatened Biodiversity Data Collection (TBDC) database;
- DPE BioNet Vegetation Classification database;
- NSW Mitchell Landscapes map and descriptions (NPWS, 2003);
- Groundwater Dependent Ecosystem Atlas (BoM, 2023);
- Matters of National Environmental Significance Significant Impact Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999* (Australian Government Department of the Environment (2013);

- Draft Wind Farms – turbine strike assessment & adaptive impact management – Biodiversity Assessment Method Guide – February 2024 (DCCEEW, 2024);
- Commonwealth Listing Advice on New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands. (TSSC, 2011);
- Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC, 2006);
- Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE, 2022);
- Conservation Advice for *Petauroides volans* (greater glider (southern and central) (DCCEEW, 2022); and
- Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tail Quoll, south eastern mainland. (TSSC, 2020).

ATTACHMENT 1 SUMMARY TABLE FOR ASSESSMENT OF PREDICTED IMPACTS ON EPBC ACT-LISTED THREATENED SPECIES AND COMMUNITIES

Description of Threatened Species/Community	PCTs associated	Impact	Credits Required	Offsetting Approach	Page references
New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community	533, 534	Woodlands = 6.54 ha Grasslands = 13.40 ha	480	The Applicant is developing a biodiversity offset strategy in parallel with the Biodiversity Assessment Report. This strategy will detail the offset approach to be undertaken to retire credit obligations.	Section 8.7.1
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community	510	Woodlands = 5.28 ha Grasslands = 11.12 ha	398		Section 8.7.1
Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*)	510, 533, 534, 565, 567, 568, 965, 970, 1194	120.37 ha	N/A	Offset to be delivered through retiring ecosystem credits.	Section 8.7.1
Bluegrass (*Dichanthium setosum*)		4.22 ha	33	Purchase and retire 'like for like' credits in accordance with the BOS	Section 8.7.1
Koala (combined populations of QLD, NSW and ACT) (*Phascolarctos cinerus*)	501, 510, 533, 534, 565, 567, 568, 571, 965, 970, 1192, 1194	104.81 ha	3,358	Purchase and retire 'like for like' credits in accordance with the BOS	Section 8.7.1
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	510, 533, 534, 565, 567, 568, 965, 970	136 individuals	272	Purchase and retire 'like for like' credits in accordance with the BOS	Section 8.7.1
Greater Glider (*Petauroides volans*)	510, 567, 568, 965, 970, 1192, 1194	91.00 ha	2,481	Purchase and retire 'like for like' credits in accordance with the BOS	Section 8.7.1
Beadle's Grevillea (*Grevillea beadleana*)	567	0.00 ha	0	No offset required as species not adversely impacted	Section 8.7.1
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	510, 567, 568, 965, 970, 1194	0.00 ha	0	No offset required as species not adversely impacted	Section 8.7.1

Description of Threatened Species/Community	PCTs associated	Impact	Credits Required	Offsetting Approach	Page references
White-throated Needletail (*Hirundapus caudacutus*)	510, 533, 534, 565, 567, 568, 571, 766, 965, 970, 1194	120.37 ha	N/A	Offset to be delivered through retiring ecosystem credits.	Section 8.7.1
Narrow-leaved Bertya (*Bertya ingramii*)	567	0.00 ha	0	No offset required as species not adversely impacted	Section 8.7.1
Austral Toadflax (*Thesium australe*)	510, 533, 534, 565, 567, 568, 965, 970, 1194	0.06 ha	1	Purchase and retire 'like for like' credits in accordance with the BOS	Section 8.7.1
Long-nosed Potoroo (northern) (*Potorous tridactylus tridactylus*)	965	0.00 ha	0	No offset required as species not adversely impacted	Section 8.7.1
Fork-tailed Swift (*Apus pacificus*)	-	120.37 ha	N/A	Offset to be delivered through retiring ecosystem credits.	Section 8.7.1

ATTACHMENT 2 COMPLETION CHECKLIST FOR BDAR APPENDIX E, RELATING TO ASSESSMENT OF PREDICTED IMPACTS ON EPBC ACT-LISTED THREATENED SPECIES AND COMMUNITIES

Information Required to be Included	Comments	Complete?
Part A		
Appendix E clearly shows how operational and construction footprints, including clearing boundaries, structures to be built and elements of the action, are situated with regard to MNES (and/or references to where this detail is provided within the body of the BDAR)	Table 5-8 summarises the MNES that are present within the development footprint.	Y
Appendix E includes a map(s) of the subject land boundary showing the proposal/disturbance footprint with respect to location of MNES, including links to or directory locations of GIS shape files (and/or references to where this detail is provided within the body of the BDAR).	Figure * shows the disturbance footprint with respect to location of MNES.	N

Information Required to be Included	Comments	Complete?
Appendix E identifies any other site constraints in selecting the location and design of the proposed development (such as bushfire protection requirements, flood planning levels, servicing constraints) (and/or references to where this detail is provided within the body of the EIS or BDAR)	The Applicant has completed an environmental assessment of the Project Area in accordance with the SEARs and has modified the project layout based on the outcomes of these assessments, consideration of technical, environmental, and constructability issues, and community feedback. Section describes Project alternatives that were considered, and modifications made to previous designs.	Y
Appendix E clearly depicts stages and timing of the action that may impact on MNES (and/or references to where this detail is provided within the body of the BDAR)	Table 8-4 clearly depicts stages and timing of the action that may impact on MNES.	Y
The BDAR Declarations (Section i) include an explicit statement that all EPBC Act listed threatened species and communities that occur on the subject land, or in the vicinity, have been identified in the BDAR/EIS including those that are ecosystem credit species	I, Mark Aitkens, declare that all EPBC Act listed threatened species and communities that occur on the subject land, or in the vicinity, have been identified in the BDAR/EIS including those that are ecosystem credit species. *signature*	Y
Appendix E contains a completed Summary Table	See Attachment 1.	Y
Appendix E contains sufficient general information regarding the project's predicted impact on MNES	The evaluation of direct, indirect and prescribed impacts on biodiversity values is provided in **Sections 7** to . The significance assessment for each MNES, includes general information regarding the projects predicted impacts on MNES, see **Section 8.7.1** for more detail.	Y
Appendix E contains (or references) a separate assessment for each threatened species and community that occurs on or near the site (containing minimum information requirements)	The significance assessment for each MNES, includes general information regarding the projects predicted impacts on MNES is provided in Section 8.7.1. Minimum information requires are provided in Section .	Y
Appendix E contains appropriate analysis and justification for any species and communities identified in the referral documentation (provided by the Australian Government) that have been ruled out because they don't occur on or near the site.	None of the species identified in the referral documentation have been ruled out (i.e., survey has been performed for all species). Some species have not attracted an offset liability as they were found to not occur within the impact area. See **Section 8.7.1** for more detail.	Y
Appendix E identifies any relevant Commonwealth guidelines and policy statements applicable to the proposed development, including but not limited to: ▪ International environmental obligations;	Relevant Commonwealth guidelines that have been considered include: Commonwealth Listing Advice on New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands. (TSSC, 2011);	Y

Information Required to be Included	Comments	Complete?
▪ Recovery Plans; ▪ Approved Conservation Advice, and ▪ Threat Abatement Plans	Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC, 2006); Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE, 2022); Conservation Advice for *Petauroides volans* (greater glider (southern and central) (DCCEEW, 2022); Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tail Quoll, south eastern mainland. (TSSC, 2020).	
Part B **Confirm that Appendix E (MNES) contains the following items for each EPBC Act listed threatened species and community on the site or in the vicinity**		
Appendix E includes relevant information on the identification of MNES on the site or in the vicinity via: ▪ Field based survey effort; ▪ Published peer reviewed literature; ▪ Local data, and ▪ Supporting databases (such as the NSW BioNet Vegetation Classification, NSW BioNet Threatened Biodiversity Data Collection, NSW BioNet Atlas, Commonwealth Species Profile and Threats Database search results).	Refer to Section 8.7.1 for details, which includes cross referencing to relevant parts of the BDAR (e.g., **Sections 2.2**, **4** and **5**)	Y
Appendix E includes appropriate mapping in accordance with the relevant Commonwealth Listing Advice	The mapping of MNES is provided throughout the BDAR notably: ▪ New England Peppermint Grassy Woodland CEEC in Figure 4-4; ▪ Box Gum Woodland CEEC in Figure 4-4; ▪ Bluegrass in Figure 5-3; ▪ Koala mapping in in Figure 5-4; ▪ Narrow-leaved Black Peppermint mapping in Figure 5-5; ▪ Southern Glossy-black Cockatoo mapping in Figure 5-6; ▪ Greater Glider mapping in Figure 5-7; and ▪ Austral Toadflax mapping in Figure 5-11.	Y
Appendix E includes consideration of important populations and critical habitat as defined in Approved Listing Advice, Approved Conservation Advice, Threat Abatement Plans and Recovery Action Plans.	Important populations and critical habitat as defined in Approved Listing Advice, Approved Conservation Advice, Threat Abatement Plans and Recovery Action Plans is taken into consideration in **Section 8.7.1**.	Y

Information Required to be Included	Comments	Complete?
Appendix E identifies feasible alternatives and efforts to avoid and minimise predicted impacts on MNES (including direct, indirect and prescribed impacts) including an analysis of the following alternatives: ▪ Designs and engineering solutions; ▪ Modes or technologies; ▪ Routes and locations of facilities, and ▪ Sites within the subject site.	Avoid and minimise outcomes have been achieved to reduce the impact on MNES, as discussed in Sections 7 to .	Y
Appendix E identifies feasible measures to mitigate and/or manage predicted impacts on MNES (including direct, indirect and prescribed impacts) including: ▪ Techniques, timing, frequency and responsibility; ▪ Identify measures for which there is a risk of failure; ▪ Evaluate the risk and consequence of any residual impacts, and ▪ Any adaptive management strategy proposed to monitor and respond to impacts	Feasible measures to mitigate and/or manage predicted impacts on MNES are identified through Sections 7.1.1 to 7.1.	Y
Appendix E identifies the residual adverse impacts likely to occur to MNES after the proposed avoidance and mitigation measures are taken into account, including: ▪ Nature and consequences of impacts (i.e. direct and indirect); ▪ Duration of impact (e.g. construction, operation, life of project); ▪ Quantum of impact, and ▪ Consequences of impacts on the species, the population and/or extent of the community at local, state and national scales.	Residual impacts have been determined through assessments provided in Section 8.7.1.	Y
Appendix E identifies the level of predicted residual impact and provides adequate justification and evidence for the predicted level of impact, with reference to the Commonwealth's Significant Impact Guideline. Note. This will mean that the level of predicted impact is described as either: ▪ High likelihood of significant residual impact (requiring offsets) or ▪ Low likelihood of significant residual impact (not requiring offsets).	A conclusion as to whether there is a risk of a significant residual impact is provided in Section 8.7.1. A conclusion is provided as to the likelihood for a low or high significant residual impact.	Y
Appendix E identifies plans for offsetting, including: ▪ whether the MNES has been offset using the BAM;	The offsetting strategy is detailed in Section 10. Its compatibility with MNES is discussed in Section 10.2.2.	Y

Information Required to be Included	Comments	Complete?
▪ how impacts requiring offsets correlate to MNES impacts; ▪ whether ecological rehabilitation and/or biodiversity conservation actions are proposed for offsetting; and ▪ whether any other offsetting approach is proposed, such as land-based offsets, retiring credits by payment into the Biodiversity Conservation Fund and/or through supplementary measures.		
Appendix E identifies the number and type of (species/ecosystem) credits required for predicted residual adverse impacts to MNES.	The number of credits are detailed in Section 10 and summarised in Attachment 1.	Y
Appendix E contains an explicit statement that confirms that the BAM (and BAM calculator) has been used correctly to identify the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity	See Declarations.	Y

APPENDIX F BAT CALL ANALYSIS REPORTS

Bat Call Analysis Report

Winterbourne Wind Farm

Prepared for ERM

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Document Records - Quality

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Revision	Date	Description	Prepared by	Reviewed by	Approved by
Version A	6/3/2024	Frist draft	OA	KM	ERM
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1.0 Introduction

1.1 Background

Green Tape Solutions were commissioned to undertake bat call analysis for Winterbourne Wind Farm near Walcha, NSW.

1.2 Scope of Work

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

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

2.0 Methodology

2.1 Capture Technique

Microbat calls were sampled using seven Anabat Chorus devices and four Anabat Swift devices (Titley Electronics). Passive monitoring was undertaken from 22nd May 2023 to 21st April 2024. The original call files display Australian Eastern Standard Time. The data was analysed using Anabat Insight.

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

2.2 Call Identification

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

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

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

The reliability of identification is as follows:

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

2.3 National Standard

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

3.0 Results

3.1 Total Species Recorded

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

A summary of the species identified through bat call analysis is provided in **Tables 1 and 2**. The total number of calls per detector is also given in **Tables 1 and 2**; this number is indicative of bat activity but may still include some background noise or poor quality calls that were not identifiable.

Table 1: Summary of Bat Call Analysis

Species	Biodiversity Act	EPBC Act	ANA001	AS01A	AS02A	CH3	CH9	CH13	CH16	CH17	CH18	CH22	M27
Total Calls			399	654	6,236	77	445	1,270	2,873	17	14	307	746
Austronomus australis	LC	NOC	Definite		Definite		Definite	Definite	Definite			Definite	
Chalinolobus gouldii	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Chalinolobus morio	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite		Definite	Definite	Definite
Falsistrellus tasmaniensis	V	NOC	Possible	Possible			Possible	Possible	Probable	Possible			Probable
Micronomus norfolkensis	V	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible		Possible
Miniopterus orianae oceanensis	V	NOC	Probable	Probable		Definite		Definite	Definite	Definite	Definite	Definite	Definite
Myotis macropus	V	NOC		Possible		Possible	Possible	Possible	Possible	Possible		Possible	Possible
Nyctophilus sp	V	V		Possible		Possible	Possible	Possible	Possible	Possible		Possible	Possible
Ozimops planiceps	LC	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible		Possible
Ozimops ridei	LC	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible		Possible
Rhinolophus megaphyllus	LC	NOC						Definite					
Saccolaimus flaviventris	V	NOC							Definite				
Scoteanax	V	NOC	Possible	Possible			Possible	Possible	Probable	Possible	Probable	Probable	Probable

Species	Biodiversity Act	EPBC Act	ANA001	AS01A	AS02A	CH3	CH9	CH13	CH16	CH17	CH18	CH22	M27
Total Calls			399	654	6,236	77	445	1,270	2,873	17	14	307	746
rueppellii													
Scotorepens orion	LC	NOC			Probable	Probable		Probable	Probable	Probable		Probable	Probable
Scotorepens sp.	LC	NOC	Probable	Probable	Probable	Probable				Probable		Probable	Probable
Vespadelus darlingtoni	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite		Definite	Definite
Vespadelus regulus	LC	NOC	Possible	Possible		Possible		Possible	Probable		Probable	Probable	Probable
Vespadelus troughtoni	V	NOC	Probable	Probable	Possible	Probable			Possible	Probable	Possible	Possible	Possible
Vespadelus vulturnus	LC	NOC						Possible	Possible	Possible			

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

Table 2: Summary of Bat Call Analysis on the Met Masts

Species	*Biodiversity Act*	*EPBC Act*	M1 – 2.3m	M1 - 30m	M1 - 70m	M2 – 2.3m	M2 - 30m	M2 - 70m	M3 – 2.3m	M3 - 30m
Total Calls										
Austronomus australis	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Chalinolobus gouldii	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Chalinolobus morio	LC	NOC								
Falsistrellus tasmaniensis	V	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible
Micronomus norfolkensis	V	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible
Miniopterus australis	V	NOC	Definite			Definite			Definite	
Miniopterus orianae oceanensis	V	NOC	Probable		Probable	Probable	Probable	Probable	Definite	Probable
Myotis macropus	V	NOC	Possible			Possible			Possible	
Nyctophilus sp	V	V	Possible		Possible	Possible	Possible	Possible	Possible	Possible
Ozimops planiceps	LC	NOC	Possible		Possible	Possible	Possible	Possible	Possible	Possible
Ozimops ridei	LC	NOC	Possible	Possible	Definite	Possible	Possible	Possible	Definite	Definite

Species *Total Calls*	*Biodiversity Act*	*EPBC Act*	M1 – 2.3m	M1 - 30m	M1 - 70m	M2 – 2.3m	M2 - 30m	M2 - 70m	M3 – 2.3m	M3 - 30m
Rhinolophus megaphyllus	LC	NOC	Definite							
Saccolaimus flaviventris	V	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Scoteanax rueppellii	V	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible
Scotorepens sp.	LC	NOC								
Scotorepens orion	LC	NOC	Possible	Possible	Possible	Possible	Possible	Possible	Possible	Possible
Vespadelus darlingtoni	LC	NOC	Definite		Probable	Probable	Probable	Probable	Probable	Probable
Vespadelus regulus	LC	NOC	Possible		Possible	Possible		Possible	Possible	Possible
Vespadelus troughtoni	V	NOC	Probable	Possible	Probable	Probable	Probable	Probable	Probable	Probable
Vespadelus vulturnus	LC	NOC	Possible		Possible	Possible		Possible	Possible	Possible

3.2 Samples of Calls / Sequences Files

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

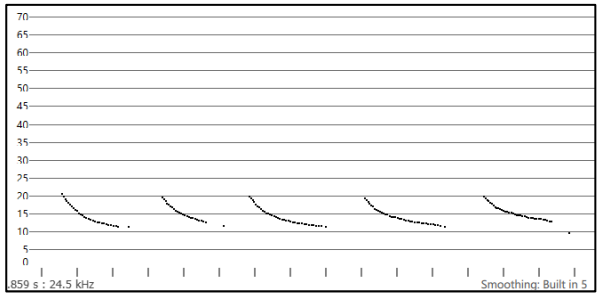
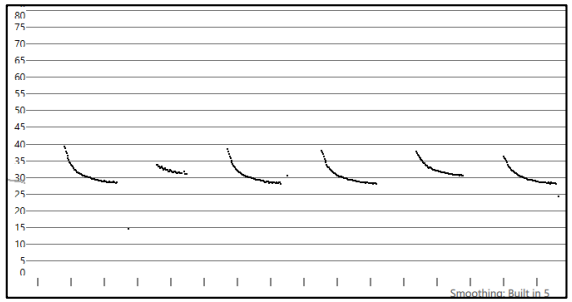
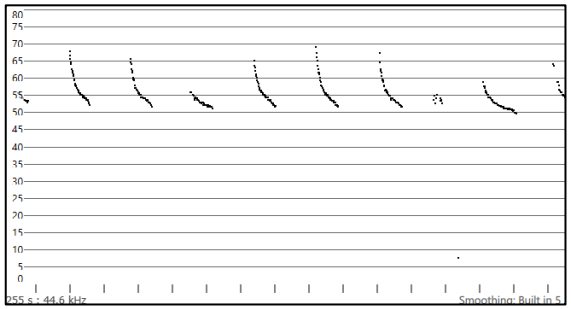
Species	Calls	Known distribution (Extract from Ausbats maps from Australian Bat Society)
Figure 1: *Austronomus australis* Definite Call This bat is easily recognised by its constant frequency calls range in bandwidth from 10.5 to 15 kHz (Pennay *et al.*, 2004).		
Figure 2: *Chalinolobus gouldii* Definite Call. This species has a curved shape call with characteristic frequency 28 to 34kHz. Pulse alternates in frequency and mostly down-sweeping tail or no tail.		

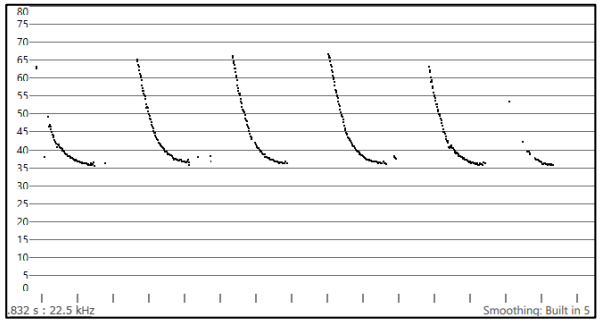
Figure 3: *Chalinolobus morio*



Definite Call.

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

Figure 4: *Falsistrellus tasmaniensis*



Possible call.

Curved and usually steep, but can be variable in shape, most pulses do not have an up-sweeping tail.

Characteristic frequency 35 to 39.5 kHz (n = 14). Can be separated from *Scotorepens sp.* (Parnaby, 1992) and *S. greyii* by lack of up-sweeping tail on most pulses. Also, most of the time the pre-characteristic section of *F. tasmaniensis* is longer than the characteristic section + tail. Except for when the drop in frequency of the pre-characteristic section is greater than 3 kHz or the characteristic frequency is 38 to 39.5 kHz, cannot be distinguished from *S. orion. F. tasmaniensis* has a shorter pre-characteristic section than *S. rueppellii*, although these two species can be difficult to separate when *F. tasmaniensis* is lower than 36 kHz.

Figure 5: *Micronomus norfolkensis*

Possible call.

Flat. Characteristic frequency 28.5 to 31 kHz in New South Wales. Unless calling at above about 33 kHz, indistinguishable from *O. ridei.*

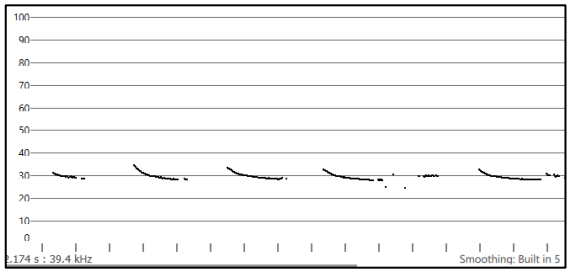


Figure 6: *Miniopterus australis*

Definite call.

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

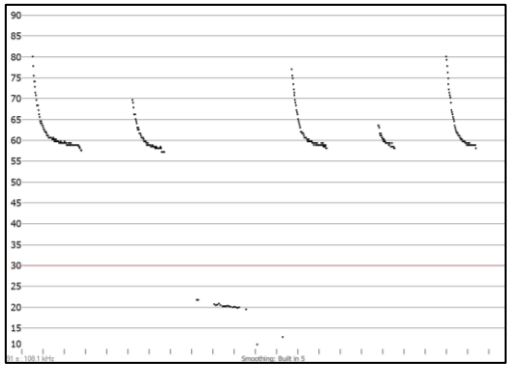
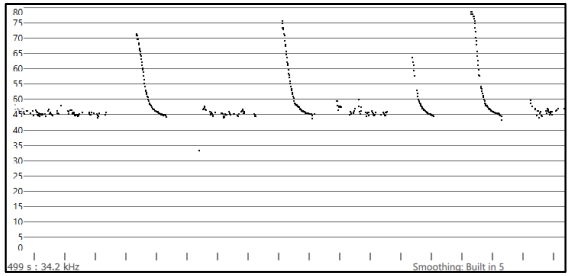


Figure 7: *Miniopterus orianae oceanensis*



Definite call.

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

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

Longer duration with no tail or relatively short up-sweeping tail, cannot be distinguished from *Vespadelus darlingtoni* at the same frequency (Reinhold, 2001).

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

Figure 8: *Myotis macropus*

Possible call.

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

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

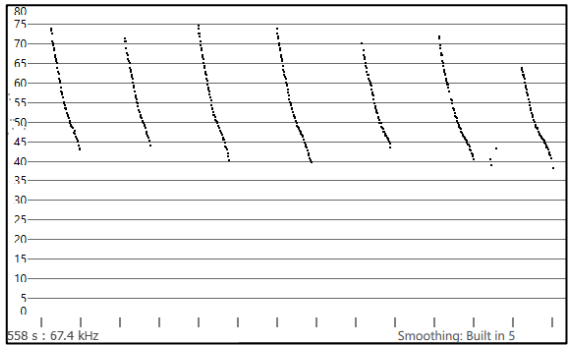
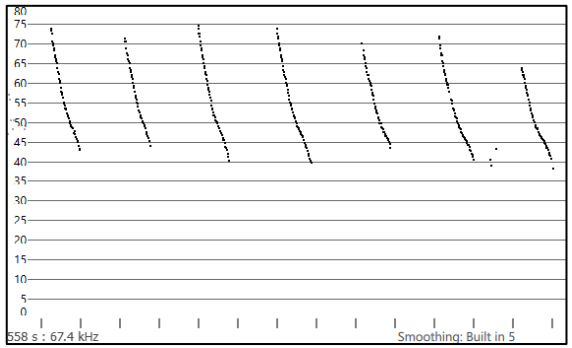


Figure 9: *Nyctophilus spp*

Possible call.

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

The species from this genus cannot be distinguished from each other. There are 3 species that are known to occur in the project area.



N. *corbeni*

N. geoffroyi

N. gouldi

Figure 10: *Ozimops planiceps*

Possible call.

Cannot be definitively distinguished from *Ozimops ridei*.

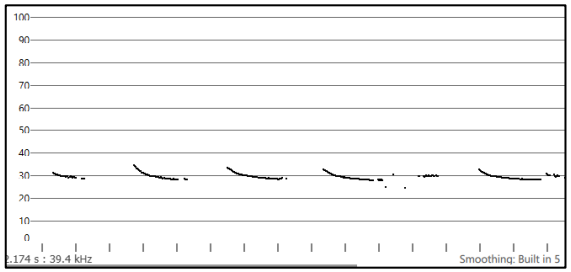


Figure 11: *Ozimops ridei*

Possible call.

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

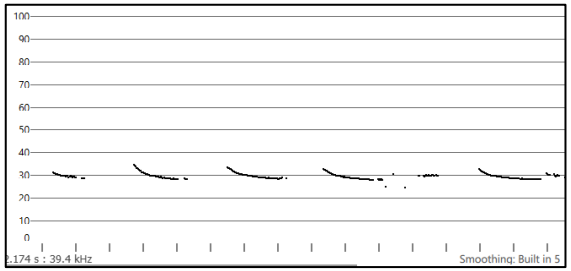
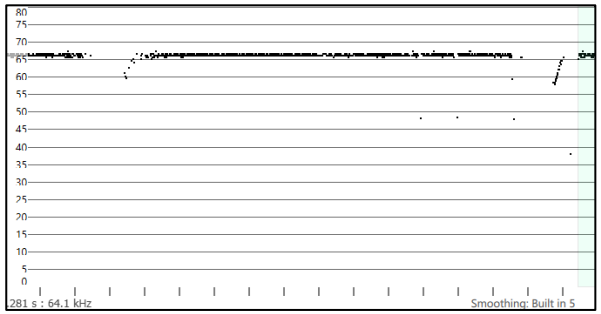


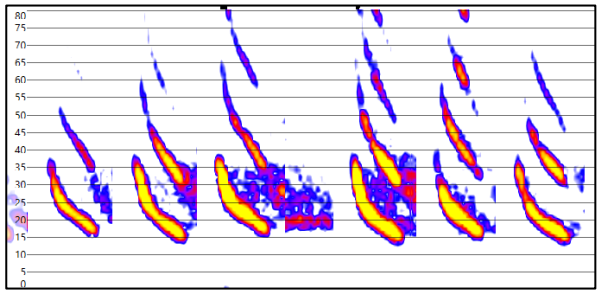
Figure 12: *Rhinolophus megaphyllus*



Definite call.

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

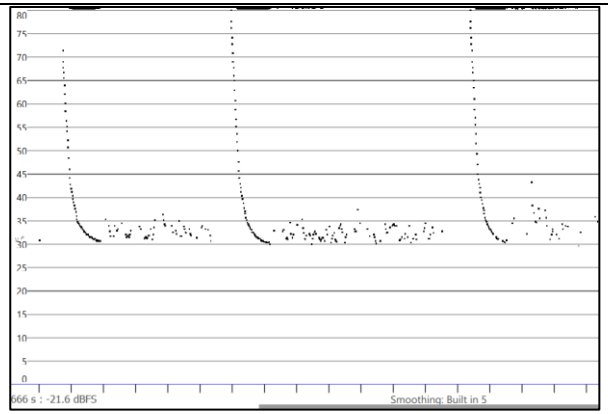
Figure 13: *Saccolaimus flaviventris*



Definite call.

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

Figure 14: *Scoteanax rueppellii*



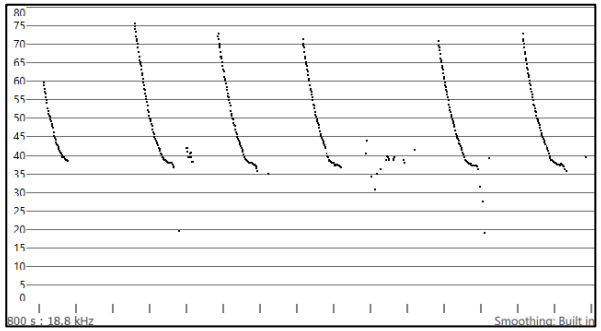
Probable call.

Curved call without tail and a characteristic frequency varying between 33 to 36 kHz. Frequency of the knee higher than 37 kHz. Pre-characteristic section drops over more than 3 kHz. This feature mostly distinguishes it from *Scotorepens spp*.

Some *Falsistrellus tasmaniensis* have a pre-characteristic section drop of greater than 3 kHz, so

for calls higher than 35 kHz characteristic frequency, these two species are difficult to be distinguished. *S. rueppellii* has a longer pre-characteristic section than *F. tasmaniensis.*

Figure 15: *Scotorepens orion*

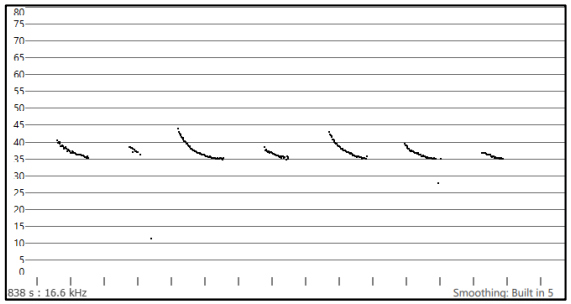


Probable call.

Characteristic frequency between 34.5 and 37.5 kHz with curved, absent tail sometime down-sweeping tail (Reinhold *et al,* 2001). Knee of the pulse is usually lower than 38 kHz.

Calls can be confused with *Scoteanax rueppelli*'s calls but *S. orion* has a longer pre-characteristic section (can be up to 70kHz) which differentiate it from other species.

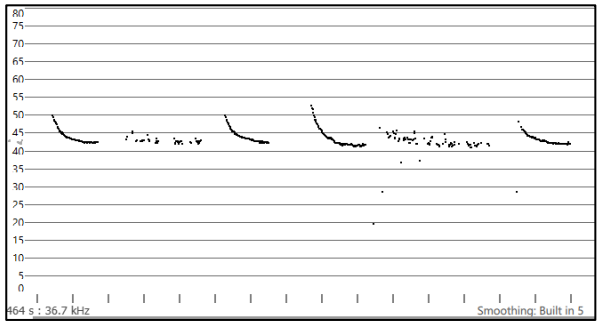
Figure 16: *Scotorepens sp*.



Probable call.

The pulse is curved with an up-sweeping tail. And a characteristic frequency between 36 to 41.5 kHz. The characteristic section and the tail of *S. sp.* takes up about half or less than half the time of the pulse.

Figure 17: *Vespadelus darlingtoni*



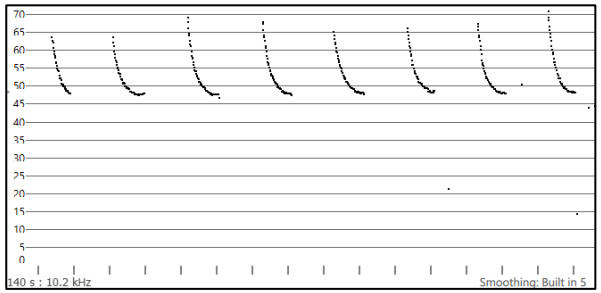
Definite call.

This species call has a curved call with no tail or sometime an up-sweeping tail. The call's characteristic frequency is between 42.5 to 48.5 kHz. Characteristic section is often, but not always, relatively long.

Shorter duration with up-sweeping tails and higher frequencies, cannot be distinguished from *V. regulus* or *V. vulturnus*.

Distinguished from *Miniopterus orianae oceanensis* by having consecutive pulses even, and lacking down-sweeping tails.

Figure 18: *Vespadelus regulus*

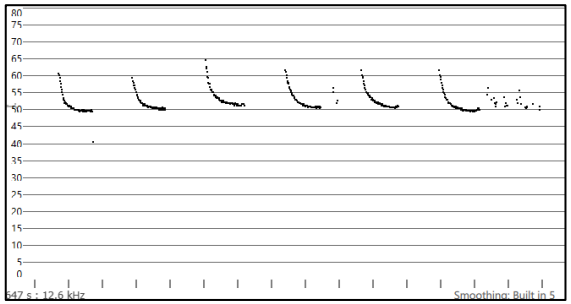


Probable call.

Characteristic frequency varies significantly over distribution from 40 to 55 kHz (n = 95). Call shape also varies between regions (see regional information). Characteristic frequency in NE usually above 47 kHz (n = 19). Curved with up-sweeping tail.

Overlaps entirely in frequency with *Miniopterus orianae oceanensis*, some calls may be identified by even consecutive pulses and up-sweeping tail.

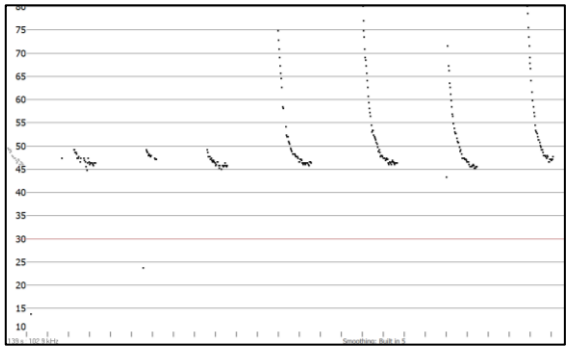
Figure 19: *Vespadelus troughtoni*



Probable call.

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

Figure 20: *Vespadelus vulturnus*



Possible call.

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

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

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

4.0 Data Analysis

To evaluate the potential impact of the wind farm on microbat species, the following analysis examines the mean calls per night for various species, with a focus on different detector heights, mast locations, and the activity levels of threatened species. The following tables and diagrams offer a detailed overview of species-specific activity patterns, helping to understand better how the wind farm may affect microbat populations. The detailed analysis of this data is provided in the ERM report for the wind farm.

Table 3: Mean calls per night by species and by mast and detector height.

Species	Device	Height	Mean calls/night
Austronomus australis	ANA001	2	1.0
Austronomus australis	AS01A	2	1.0
Austronomus australis	Chorus16	2	4.5
Austronomus australis	Chorus22	2	3.3
Austronomus australis	Chorus9	2	2.0
Austronomus australis	M1	2	18.2
Austronomus australis	M2	2	15.5
Austronomus australis	M3	2	1.8
Austronomus australis	M1	30	4.9
Austronomus australis	M2	30	3.6
Austronomus australis	M3	30	4.8
Austronomus australis	M1	70	25.3
Austronomus australis	M2	70	28.0
Chalinolobus gouldii	AS01A	2	5.2
Chalinolobus gouldii	AS02A	2	20.0
Chalinolobus gouldii	Chorus16	2	9.5
Chalinolobus gouldii	Chorus22	2	1.5
Chalinolobus gouldii	M1	2	17.3
Chalinolobus gouldii	M2	2	3.7
Chalinolobus gouldii	M3	2	1.2
Chalinolobus gouldii	M1	30	7.0
Chalinolobus gouldii	M2	30	1.4
Chalinolobus gouldii	M3	30	1.5
Chalinolobus gouldii	M1	70	2.0
Chalinolobus gouldii	M2	70	1.8
Chalinolobus morio	ANA001	2	1.3
Chalinolobus morio	AS01A	2	4.5
Chalinolobus morio	AS02A	2	104.3
Chalinolobus morio	Chorus16	2	10.9
Chalinolobus morio	Chorus22	2	1.9
Chalinolobus morio	Chorus3	2	1.3
Chalinolobus morio	Chorus9	2	1.0

Species	Device	Height	Mean calls/night
Chalinolobus morio	M27	2	1.3
Falsistrellus tasmaniensis or Scotorepense orion	ANA001	2	1.2
Falsistrellus tasmaniensis or Scotorepense orion	AS01A	2	7.9
Falsistrellus tasmaniensis or Scotorepense orion	AS02A	2	24.0
Falsistrellus tasmaniensis or Scotorepense orion	Chorus16	2	59.6
Falsistrellus tasmaniensis or Scotorepense orion	Chorus18	2	1.0
Falsistrellus tasmaniensis or Scotorepense orion	Chorus22	2	1.4
Falsistrellus tasmaniensis or Scotorepense orion	Chorus3	2	2.2
Falsistrellus tasmaniensis or Scotorepense orion	Chorus7	2	1.0
Falsistrellus tasmaniensis or Scotorepense orion	Chorus9	2	1.4
Falsistrellus tasmaniensis or Scotorepense orion	M1	2	3.0
Falsistrellus tasmaniensis or Scotorepense orion	M2	2	2.4
Falsistrellus tasmaniensis or Scotorepense orion	M27	2	2.6
Falsistrellus tasmaniensis or Scotorepense orion	M3	2	2.1
Falsistrellus tasmaniensis or Scotorepense orion	M1	30	1.3
Falsistrellus tasmaniensis or Scotorepense orion	M2	30	2.0
Falsistrellus tasmaniensis or Scotorepense orion	M1	70	1.5
Falsistrellus tasmaniensis or Scotorepense orion	M2	70	2.4
Falsistrellus tasmaniensis or Scotorepense orion or Scoteanax rueppellii	M3	30	1.1
Miniopterus australis	Chorus16	2	2.0
Miniopterus australis	M1	2	1.0
Miniopterus australis	M2	2	1.0
Miniopterus australis	M3	2	2.0
Miniopterus orianae oceanensis	ANA001	2	1.0
Miniopterus orianae oceanensis	AS01A	2	1.0
Miniopterus orianae oceanensis	AS02A	2	6.0
Miniopterus orianae oceanensis	Chorus16	2	2.0
Miniopterus orianae oceanensis	Chorus22	2	1.0
Miniopterus orianae oceanensis	M1	2	1.0
Miniopterus orianae oceanensis	M3	2	1.0
Miniopterus orianae oceanensis or Vespadelus darlingtoni	AS01A	2	3.3
Miniopterus orianae oceanensis or Vespadelus darlingtoni	AS02A	2	2.5
Miniopterus orianae oceanensis or Vespadelus darlingtoni	Chorus16	2	2.0
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M1	2	1.7
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M2	2	2.3
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M3	2	2.3

Species	Device	Height	Mean calls/night
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M2	30	1.0
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M3	30	1.0
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M1	70	1.3
Miniopterus orianae oceanensis or Vespadelus darlingtoni	M2	70	2.0
Myotis macropus	Chorus16	2	3.3
Myotis macropus	Chorus22	2	1.0
Myotis macropus	Chorus9	2	1.0
Myotis macropus	M1	2	1.1
Myotis macropus	M2	2	1.3
Myotis macropus	M27	2	1.0
Myotis macropus	M3	2	1.0
Myotis macropus or Nyctophilus spp	Chorus16	2	1.5
Myotis macropus or Nyctophilus spp	M1	2	1.2
Myotis macropus or Nyctophilus spp	M2	2	1.0
Myotis macropus or Nyctophilus spp	M3	2	1.0
Nyctophilus spp	AS01A	2	2.0
Nyctophilus spp	Chorus16	2	6.7
Nyctophilus spp	Chorus22	2	1.0
Nyctophilus spp	M1	2	1.3
Nyctophilus spp	M2	2	1.2
Nyctophilus spp	M27	2	2.0
Nyctophilus spp	M3	2	1.0
Nyctophilus spp	M1	70	1.0
Nyctophilus spp	M2	70	1.0
Ozimops planiceps	AS01A	2	1.3
Ozimops planiceps	AS02A	2	2.0
Ozimops planiceps	Chorus16	2	1.0
Ozimops planiceps	Chorus9	2	1.0
Ozimops planiceps or Ozimops ridei	ANA001	2	40.9
Ozimops planiceps or Ozimops ridei	AS01A	2	26.1
Ozimops planiceps or Ozimops ridei	AS02A	2	260.3
Ozimops planiceps or Ozimops ridei	Chorus16	2	5.0
Ozimops planiceps or Ozimops ridei	Chorus18	2	1.3
Ozimops planiceps or Ozimops ridei	Chorus22	2	7.2
Ozimops planiceps or Ozimops ridei	Chorus3	2	2.7
Ozimops planiceps or Ozimops ridei	Chorus7	2	3.0
Ozimops planiceps or Ozimops ridei	Chorus9	2	41.4
Ozimops planiceps or Ozimops ridei	M1	2	23.0

Species	Device	Height	Mean calls/night
Ozimops planiceps or Ozimops ridei	M2	2	2.2
Ozimops planiceps or Ozimops ridei	M27	2	54.4
Ozimops planiceps or Ozimops ridei	M3	2	2.0
Ozimops planiceps or Ozimops ridei	M1	30	4.6
Ozimops planiceps or Ozimops ridei	M2	30	2.6
Ozimops planiceps or Ozimops ridei	M3	30	4.9
Ozimops planiceps or Ozimops ridei	M1	70	11.5
Ozimops planiceps or Ozimops ridei	M2	70	5.4
Ozimops ridei	M1	2	18.9
Ozimops ridei	AS02A	2	20.0
Ozimops ridei	Chorus16	2	5.8
Ozimops ridei	Chorus22	2	2.0
Ozimops ridei	Chorus9	2	1.0
Ozimops ridei	M27	2	2.0
Ozimops ridei or Micronomus norfolkensis	ANA001	2	2.4
Ozimops ridei or Micronomus norfolkensis	AS01A	2	12.7
Ozimops ridei or Micronomus norfolkensis	AS02A	2	36.7
Ozimops ridei or Micronomus norfolkensis	Chorus16	2	23.5
Ozimops ridei or Micronomus norfolkensis	Chorus22	2	3.0
Ozimops ridei or Micronomus norfolkensis	Chorus3	2	1.7
Ozimops ridei or Micronomus norfolkensis	Chorus7	2	2.0
Ozimops ridei or Micronomus norfolkensis	Chorus9	2	6.2
Ozimops ridei or Micronomus norfolkensis	M1	2	12.2
Ozimops ridei or Micronomus norfolkensis	M2	2	8.0
Ozimops ridei or Micronomus norfolkensis	M27	2	8.6
Ozimops ridei or Micronomus norfolkensis	M3	2	2.3
Ozimops ridei or Micronomus norfolkensis	M1	30	3.2
Ozimops ridei or Micronomus norfolkensis	M2	30	2.0
Ozimops ridei or Micronomus norfolkensis	M3	30	4.3
Ozimops ridei or Micronomus norfolkensis	M1	70	12.1
Ozimops ridei or Micronomus norfolkensis	M2	70	8.2
Rhinolophus megaphyllus	M1	2	1.0
Saccolaimus flaviventris	AS01A	2	1.0
Saccolaimus flaviventris	AS02A	2	1.5
Saccolaimus flaviventris	Chorus16	2	5.2
Saccolaimus flaviventris	Chorus22	2	1.0
Saccolaimus flaviventris	M1	2	8.9
Saccolaimus flaviventris	M2	2	3.4
Saccolaimus flaviventris	M3	2	3.3
Saccolaimus flaviventris	M1	30	3.8
Saccolaimus flaviventris	M2	30	2.0

Species	Device	Height	Mean calls/night
Saccolaimus flaviventris	M3	30	9.4
Saccolaimus flaviventris	M1	70	22.6
Saccolaimus flaviventris	M2	70	16.7
Scoteanax rueppellii or Scotorepens orion	M3	2	1.0
Scotorepens balstoni	AS01A	2	1.3
Scotorepens balstoni	AS02A	2	9.5
Scotorepens balstoni	Chorus9	2	1.0
Scotorepens orion	ANA001	2	1.0
Scotorepens orion	AS01A	2	1.7
Scotorepens orion	AS02A	2	11.0
Scotorepens orion	Chorus16	2	3.3
Scotorepens orion	Chorus22	2	2.0
Scotorepens orion	M27	2	1.0
Scotorepens orion	M1	70	1.0
Vespadelus darlingtoni	ANA001	2	1.3
Vespadelus darlingtoni	AS01A	2	10.5
Vespadelus darlingtoni	AS02A	2	3.3
Vespadelus darlingtoni	Chorus16	2	34.3
Vespadelus darlingtoni	Chorus18	2	1.0
Vespadelus darlingtoni	Chorus22	2	3.8
Vespadelus darlingtoni	Chorus3	2	1.3
Vespadelus darlingtoni	Chorus7	2	1.0
Vespadelus darlingtoni	Chorus9	2	2.3
Vespadelus darlingtoni	M1	2	2.6
Vespadelus darlingtoni	M2	2	1.8
Vespadelus darlingtoni	M27	2	5.0
Vespadelus darlingtoni	M3	2	1.9
Vespadelus darlingtoni	M2	30	1.3
Vespadelus darlingtoni	M3	30	1.4
Vespadelus darlingtoni	M1	70	1.3
Vespadelus darlingtoni	M2	70	1.8
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	AS01A	2	4.3
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	AS02A	2	2.0
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	Chorus16	2	5.2
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	Chorus18	2	1.0
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	Chorus22	2	2.0

Species	Device	Height	Mean calls/night
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	Chorus3	2	1.0
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	M1	2	1.3
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	M2	2	1.4
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	M27	2	1.0
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	M3	30	2.0
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	M1	70	1.0
Vespadelus darlingtonior Vespadelus vulturnus or Vespadelus regulus	M2	70	1.0
Vespadelus pumilus	ANA001	2	1.8
Vespadelus pumilus	AS01A	2	5.2
Vespadelus pumilus	AS02A	2	4.0
Vespadelus pumilus	Chorus16	2	35.8
Vespadelus pumilus	Chorus22	2	12.8
Vespadelus pumilus	Chorus3	2	2.0
Vespadelus pumilus	Chorus7	2	2.0
Vespadelus pumilus	Chorus9	2	1.8
Vespadelus pumilus	M1	2	1.1
Vespadelus pumilus	M2	2	1.0
Vespadelus pumilus	M27	2	12.1
Vespadelus pumilus	M3	2	1.0
Vespadelus regulus	AS01A	2	1.0
Vespadelus troughtoni	Chorus16	2	1.0
Vespadelus troughtoni	Chorus22	2	1.2
Vespadelus troughtoni	M1	2	1.0
Vespadelus troughtoni	M27	2	1.0
Vespadelus troughtoni	M3	2	1.3
Vespadelus troughtoni or Vespadelus pumilus	ANA001	2	2.0
Vespadelus troughtoni or Vespadelus pumilus	AS01A	2	6.6
Vespadelus troughtoni or Vespadelus pumilus	Chorus16	2	3.1
Vespadelus troughtoni or Vespadelus pumilus	Chorus18	2	3.0
Vespadelus troughtoni or Vespadelus pumilus	Chorus22	2	3.3
Vespadelus troughtoni or Vespadelus pumilus	Chorus3	2	1.3
Vespadelus troughtoni or Vespadelus pumilus	Chorus7	2	1.0
Vespadelus troughtoni or Vespadelus pumilus	Chorus9	2	1.0
Vespadelus troughtoni or Vespadelus pumilus	M1	2	5.1
Vespadelus troughtoni or Vespadelus pumilus	M2	2	2.5
Vespadelus troughtoni or Vespadelus pumilus	M27	2	1.5

Species	Device	Height	Mean calls/night
Vespadelus troughtoni or Vespadelus pumilus	M3	2	1.7
Vespadelus troughtoni or Vespadelus pumilus	M1	30	1.0
Vespadelus troughtoni or Vespadelus pumilus	M2	30	1.0
Vespadelus troughtoni or Vespadelus pumilus	M3	30	1.0
Vespadelus troughtoni or Vespadelus pumilus	M1	70	1.8
Vespadelus troughtoni or Vespadelus pumilus	M2	70	2.6

Table 4: Mean calls per night for threatened species based on metmast and detector height.

Species *Falsistrellus tasmaniensis or Scotorepense orion*

Mean calls per night			
Detector	Height (m)		
	2	30	70
ANA001	1.2		
AS01A	7.9		
AS02A	24.0		
Chorus16	59.6		
Chorus18	1.0		
Chorus22	1.4		
Chorus3	2.2		
Chorus7	1.0		
Chorus9	1.4		
M1	3.0	1.3	1.5
M2	2.4	2.0	2.4
M27	2.6		
M3	2.1		

Species *Miniopterus australis*

Mean calls per night	
Detector	Height (m)
	2
Chorus16	59.6
Chorus18	1.0
Chorus22	1.4
Chorus3	2.2
Chorus7	1.0
Chorus9	1.4

Species *Miniopterus orianae oceanensis*

Mean calls per night	
Detector	Height (m)
	2
ANA001	1.0
AS01A	1.0
AS02A	6.0
Chorus16	2.0
Chorus22	1.0
M1	1.0
M3	1.0

Species *Miniopterus orianae oceanensis or Vespadelus darlingtoni*

Mean calls per night			
Detector	Height (m)		
	2	2	30
AS01A	3.3		
AS02A	2.5		
Chorus16	2.0		1.0
M1	1.7	2.3	1.3
M2	2.3	1.0	

Species *Ozimops ridei or Micronomus norfolkensis*

Mean calls per night			
Detector	Height (m)		
	2	30	70
ANA001	2.4		
AS01A	12.7		
AS02A	36.7		
Chorus16	23.5		
Chorus22	3.0		
Chorus3	1.7		
Chorus7	2.0		
Chorus9	6.2		
M1	12.2	3.2	12.1
M2	8.0	2.0	8.2
M27	8.6		
M3	2.3	4.3	

Species *Myotis macropus*

Mean calls per night	
Detector	Height (m)
	2
Chorus16	3.3
Chorus22	1.0
Chorus9	1.0
M1	1.1
M2	1.3
M27	1.0
M3	1.0

Species *Myotis macropus or Nyctophilus spp*

Mean calls per night	
Detector	Height (m)
	2
Chorus16	1.5
M1	1.2
M2	1.0
M3	1.0

Species *Nyctophilus spp*

Mean calls per night		
Detector	Height (m)	
	2	70
AS01A	2.0	
Chorus 16	6.7	
Chorus 22	1.0	
M1	1.3	1.0
M2	1.2	1.0
M27	2.0	
M3	1.0	

Species *Saccolaimus flaviventris*

Mean calls per night			
Detector	Height (m)		
	2	30	70
AS01A	1.0		
AS02A	1.5		

Chorus16	5.2		
Chorus22	1.0		
M1	8.9	3.8	22.6
M2	3.4	2.0	16.7
M3	3.3	9.4	

Vespadelus troughtoni

Mean calls per night	
Detector	Height (m)
	2
Chorus16	1.0
Chorus22	1.2
M1	1.0
M27	1.0
M3	1.3

Species *Vespadelus troughtoni or Vespadelus pumilus*

Mean calls per night			
Detector	Height (m)		
	2	30	70
ANA001	2.0		
AS01A	6.6		
Chorus16	3.1		
Chorus18	3.0		
Chorus22	3.3		
Chorus3	1.3		
Chorus7	1.0		
Chorus9	1.0		
M1	5.1	1.0	1.8
M2	2.5	1.0	2.6
M27	1.5		
M3	1.7	1.0	

Table 5: Time range and total number of calls for all microbat species

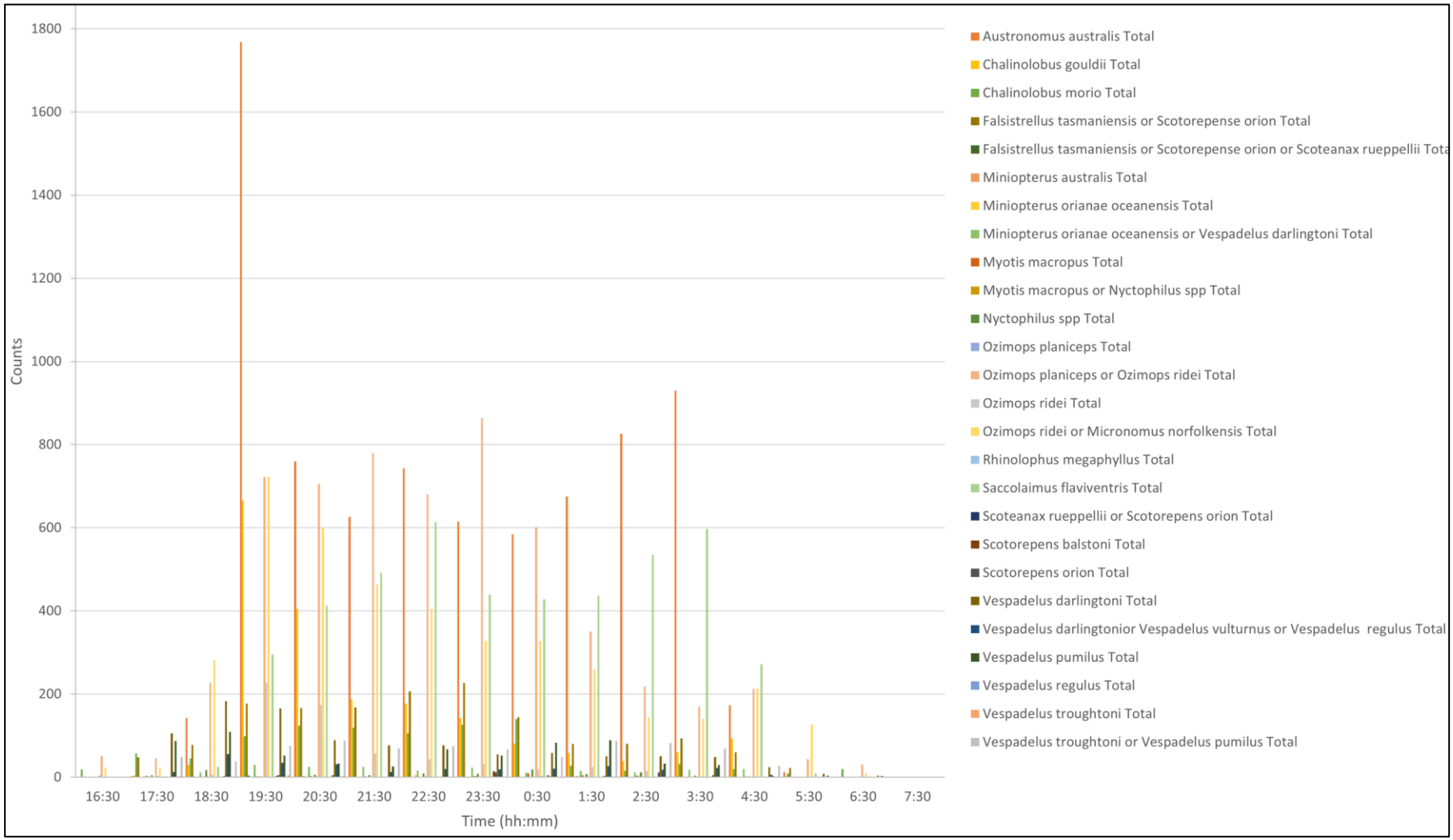
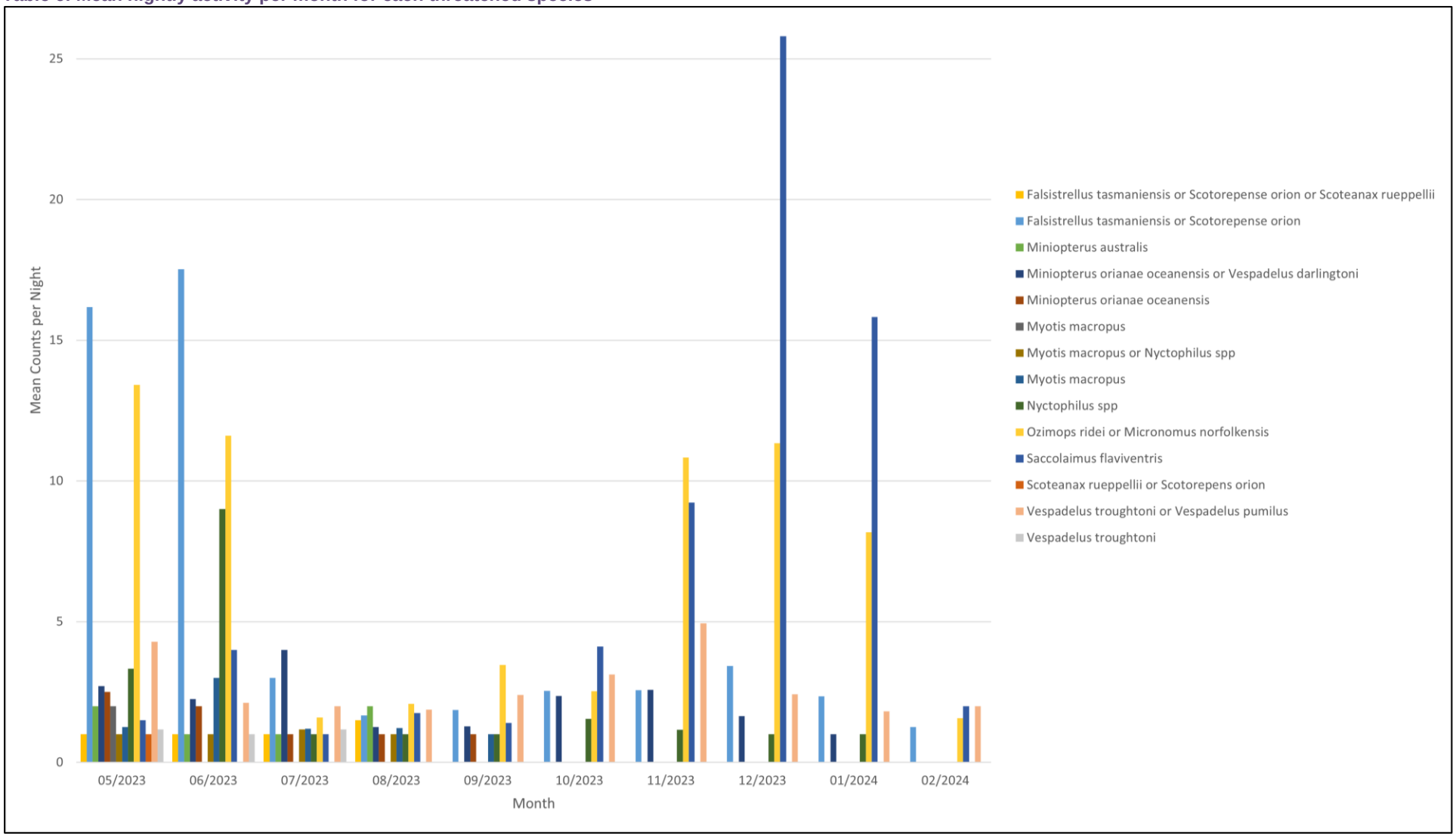


Table 6: Mean nightly activity per month for each threatened species



5.0 Conclusion

A total of 21 microbat species were either confirmed ‘definite’, ‘probable’ or ‘possible’ within the Project area. All bats identified on the site were expected to be present within the region.

A total of nine (9) species are listed under the NSW *Biodiversity Act* as Vulnerable.

Calls from *Nyctophilus sp* have been confirmed across the project areas. Three species of *Nyctophilus* possibly occur within the Project Area. *N corbeni* is listed Vulnerable under the EPBC Act and BC Act. The calls of this species cannot be distinguished from each other.

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

- Nyctophilus species
    - ✓ Steep, almost-linear linear (FM) call pulses are distinctive from those of other bat calls but cannot be reliably identified to species
    - ✓ Three species potentially occur in the project area (*N. bifax* and *N. gouldi*)

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APPENDIX G EXPERT REPORT FOR *LITORIA CASTANEA*

Winterbourne Windfarm Yellow-spotted Tree Frog Expert Report

ERM

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Template 2.8.1

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1. Introduction

1.1 Background

The Winterbourne Wind Farm is a proposed renewable energy project in the Northern Tablelands of New South Wales. The wind farm will deliver renewable, low-cost energy to the National Electricity Market (NEM). The origins of the project date back to 2001, with construction expected to start in 2025. The proposed Project Area extends over approximately 22,000 hectares, of which less than 1,000 hectares is expected to be disturbed during construction. The Winterbourne Wind Farm project will include approximately 50 km of new 330kV transmission line.

It is located within the proposed a Renewable Energy Zone (REZ) for the New England region that provides a coordinated effort to plan new transmission lines to accommodate up to 8,000 MW of renewable energy projects. Whilst the project site is within the proposed New England REZ, the Winterbourne Wind Farm project will connect into the existing TransGrid network via a proposed new 330 kV switchyard, to be built approximately 7 km south of Uralla, NSW. The proposed wind farm will be designed to minimise potential visual and noise impacts to landowners and tenants in the area. Much of the project area is currently used for livestock grazing and has been cleared of trees and other vegetation, meaning the potential for impacts to flora and fauna is greatly reduced.

One species needing consideration as part of the proposed development is *Litoria castanea* (Yellow-spotted Tree Frog or Yellow-spotted Bell Frog) that is listed as a threatened species under both the NSW *Biodiversity Conservation Act 2016* and *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. This species is predicted to have suitable habitat within the locality of the Project Area, although there are not historic records within the locality. Surveys as required under the BAM guidelines (DPE 2020) have not been completed for this species for this study due to land access restrictions and the very large size of the Project Site. Therefore, the presence and any need for offsets have not been able to be established as part of the BDAR. This expert report has been written to be included as a component of the BDAR to adequately assess the offset requirements for this species. The Project Site consists of the footprint of all the development sites and a surrounding 200 m buffer that represents the range that the Yellow-spotted Tree Frog is considered likely to move away from any breeding habitat (DPE 2020).

Consideration is also required to include minimum 50 m wide corridors of native and non-native vegetated areas to link breeding habitats, if reasonable to do so.

1.2 Project infrastructure

As described on the project website (Winterbourne Wind Farm - Generating a better tomorrow) The project will consist of up to 119 wind turbines, each with a maximum blade tip height of 230 m and a combined maximum capacity of around 700 MW. The project is expected to generate approximately 2,100,000 megawatt hours (MWh) per year of clean, renewable energy — enough to power more than 375,000 average NSW homes for a year.

The Project will involve the construction, maintenance and operation of wind turbines, a battery storage system, together with ancillary facilities such as operation and maintenance buildings, civil works and electrical

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infrastructure required to connect it into the existing transmission network. The current proposed location of this infrastructure is provided in Figure 1 and Figure 2.

1.3 Purpose of the expert report

Section 6.5.2 of the Biodiversity Assessment Method sets out the following essential requirements for the preparation of an expert report:

- Identify the relevant species or population.
- Justify the use of an expert report.
- Indicate and justify the likelihood of presence of the species or population.
- Estimate the number of individuals or area of habitat (whichever unit of measurement applies to the species/individual) for the biodiversity certification assessment area, including a description of how the estimate was made.
- Demonstrate what information was considered, rejected and discounted in relation to the determination made in the expert report.
- Identify the expert and provide evidence of their expert credentials.

The report needs to determine whether:

- The target species is unlikely to be present, in which case no further assessment is required, or
- The target species is likely to be present in which case the expert report must provide estimates of habitat area within the impact assessment area.

1.4 Impact assessment area

The location in NSW of the proposed Winterbourne Windfarm is provided in Figure 1 and the vegetation and water bodies mapped within the Project Site provided in Figures 2 and 3 respectively. The closest available records of the Yellow-spotted Bell Frog from within the Project Site are depicted in Figure 4. Information for the Project Site encompassed by this infrastructure and a further buffer zone of 10 km around the infrastructure was obtained from a range of data layers including:

- Native vegetation: provided by ERM
- Waterbodies: NSW LPI
- Yellow-spotted Tree Frog Records: NSW BioNet and the Atlas of Living Australia.

Additional information will be provided on the finalisation of the development works and footprint.

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Figure 1. Location of the Project Site within the region

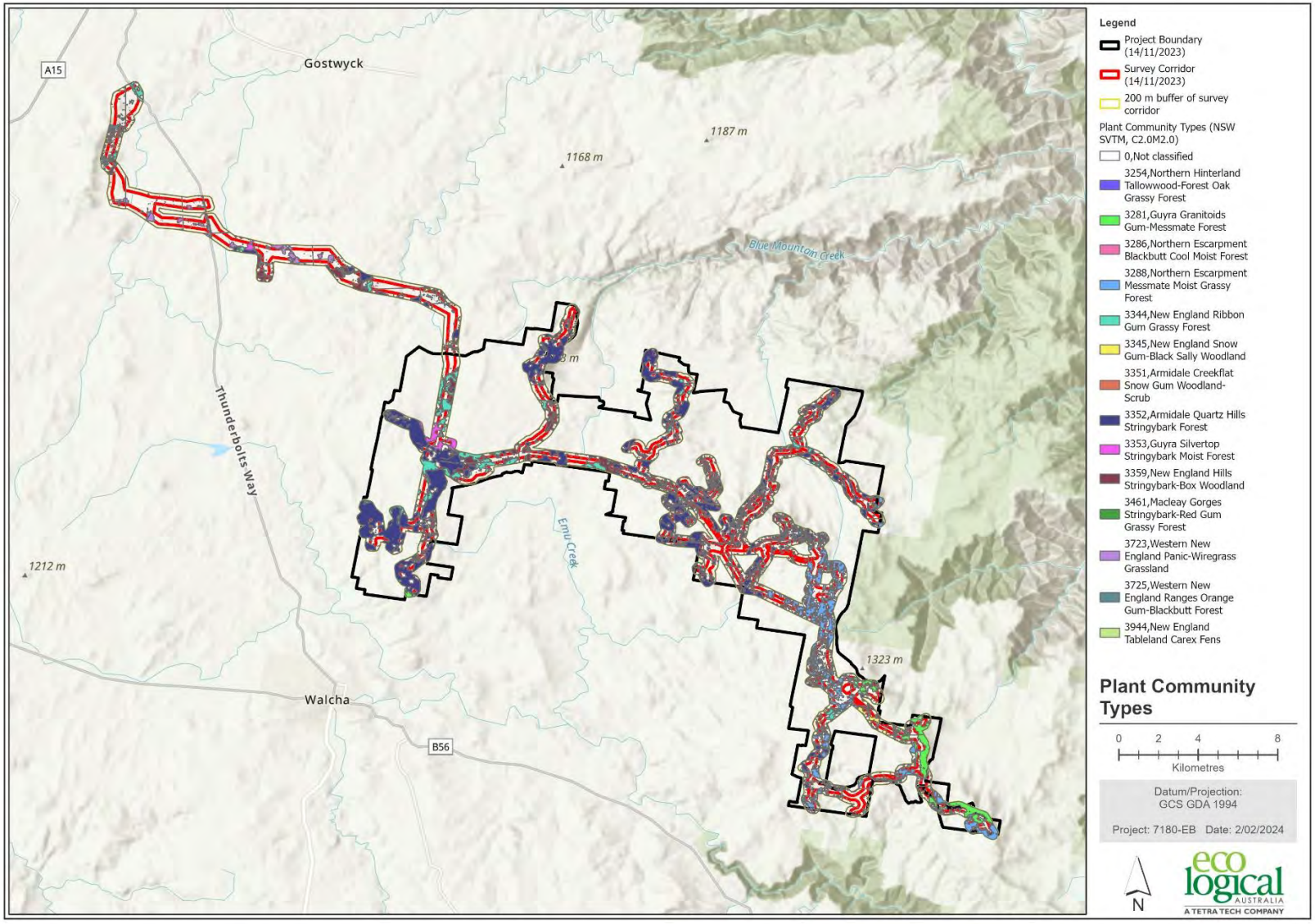

Figure 2. Project Site with mapped vegetation.

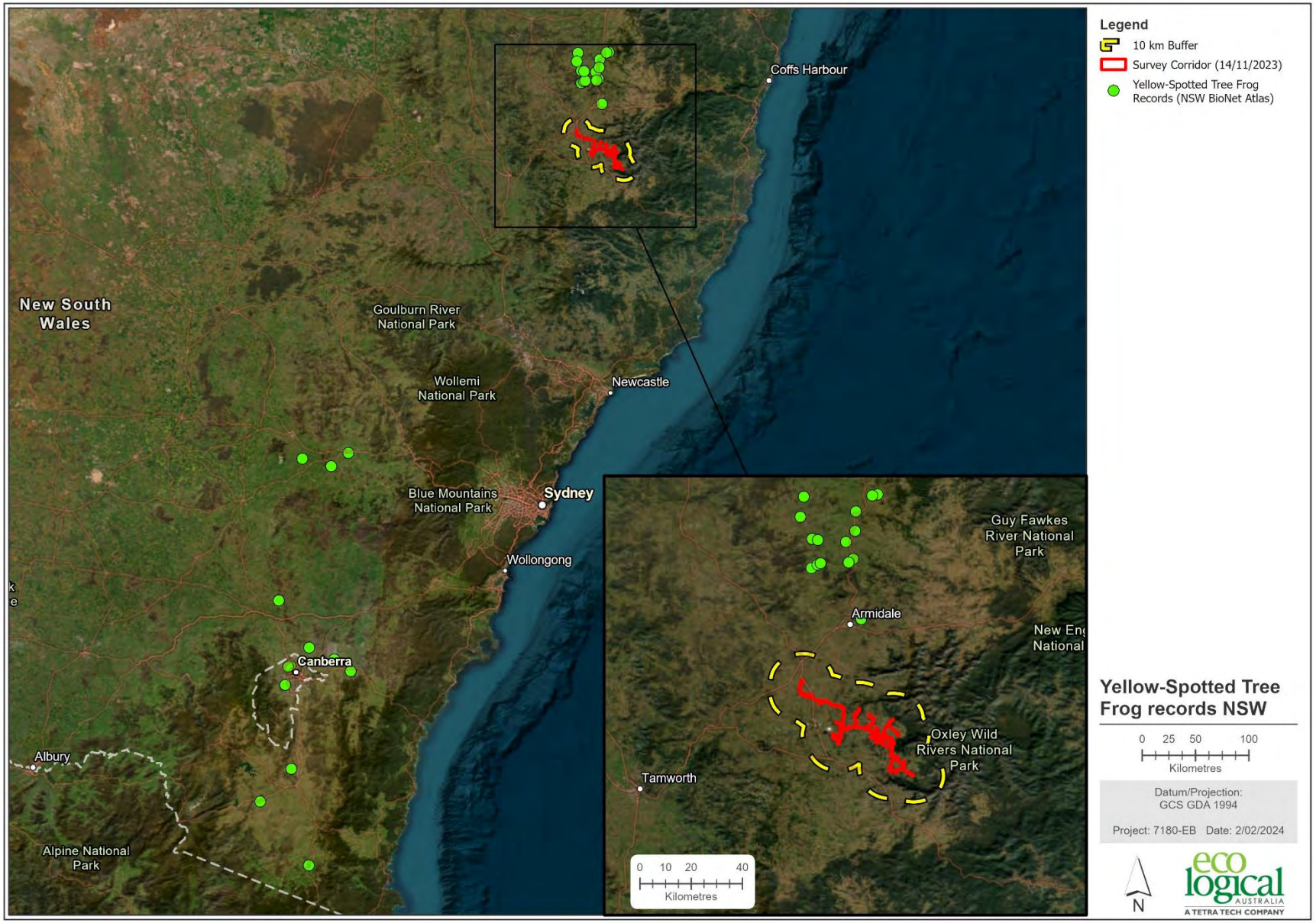

Figure 3. Records of the Yellow-spotted Tree Frog from the New England Tableland relative to the Project Site – note all records are pre-1980.

1.5 Reasons for use of an expert report

Section 6.5.2.8 b of the Biodiversity Assessment Method (OEH 2017) places two specific requirements for where an expert report can be used instead of surveys:

- An expert report can only be used instead of a survey for species to which species credits apply.
- An expert report may be obtained instead of undertaking a species survey at a development site, clearing site, land to be biodiversity certified or a biodiversity stewardship site.

The Yellow-spotted Tree Frog meets the first criteria, being a species credit species under the *Biodiversity Conservation Act 2016* (BC Act).

The Yellow-spotted Tree Frog is known to inhabit the Plant Community Types and types of water bodies present within the impact assessment area of the proposed Winterbourne Windfarm and the species is predicted to occur in the broad region in the NSW DPE Profile for the species (OEH 2022). However, I note that there are no records of the species from the locality (nearest is > 50 km to the north of the project site; Figure 3) and that all records from the New England Tableland were all obtained prior to 1980. The decline of the species to potential extinction is considered to have been completed in the region by the early 1980s at the latest (Osborne et. al. 1996). The only potentially extant population known anywhere is located somewhere near Yass (in southern NSW; OEH 2022). An expert report to assess potential presence, impacts and required offsets for the species has been completed recognising the absence of the species from the region, but in consideration of the predicted historic presence in the species profile presented by the NSW Department of Planning and Environment (OEH 2022).

CREDENTIALS OF EXPERT

Dr Lemckert is an Ecologist that has been undertaking studies into the ecology and management of frogs since 1986 and has been a principal ecological consultant since 2011. His skills include survey design/ implementation/ targeted species surveys, data handling, analysis and interpretation and the production of high level reports including papers published in international peer-reviewed journals and technical reports and recovery plans for the Commonwealth and NSW Governments. He has also been an expert witness for the assessment of the impacts of alleged illegal clearing for the Commonwealth, NSW and Local Governments (Hornsby Council) and provided expert advice to NSW DPI for legal considerations over the potential for forestry operations to impact on rock outcrop dependent species. Dr Lemckert represented Forests NSW (now Forestry Corporation NSW) as a reptile and amphibian expert in the Comprehensive Regional Assessments and Regional Forest Agreement Process carried out between 2000 and 2002 and as an expert in fauna management for negotiations over a new Threatened Species License for harvesting operations in 2014. He provided an expert review of the developed assessment process for impacts on Matters of National Environmental Significance for two proposed Coal Seam Gas Developments in Queensland and has completed two rounds of expert review of the status of Australia's amphibians for the IUCN.

Dr Lemckert is an acknowledged expert on eastern Australian frogs having completed his MSc and PhD on the ecology and management of frogs in this region and has published over 70 papers (or book chapters) in Australian and International peer-reviewed journals. He has been used by both the NSW and Commonwealth Governments as an expert witness in court cases assessing the impacts of land clearing on threatened frogs. He is a member of the Amphibian Specialist Group of the IUCN, secretary of the NSW Declining Frog Working Group of NSW and past president of the Australian Society of Herpetologists. He co-supervised two PhD students, a Master of Applied Science Student and three Bachelor of Science (Honours) students who

completed theses addressing issues of frog biology and conservation. He is listed as an accredited expert by the NSW Department of Planning, Industry and Environment (DPIE) to provide expert reports under the Biodiversity Assessment Method (BAM). Dr Lemckert wrote the survey guidelines for NSW threatened frog species to be used in assessments under the Biodiversity Assessment Method (BAM) (for the NSW Department of Planning and Environment). He was engaged by NSW DPE to assess if *Litoria raniformis* (Southern Bell Frog) should be re-listed under the NSW BC Act and advised on the design and development of a cross-tenure amphibian monitoring program for forests in coastal NSW as part of a team engaged by the NSW Natural Resources Commission.

Dr Lemckert has worked on members of the Bell Frog species complex through multiple projects commencing in the mid-1980s. This has included work for his Master of Science degree trying to locate the presence of Bell Frogs across NSW, the ACT and Victoria, assessing the habitat requirements of *Litoria aurea* (Green and Golden Bell Frog) in coastal NSW, documenting calling phenology for Bell Frogs in NSW and developing monitoring strategies for the Green and Golden Bell Frog. He has been part of multiple assessments of the conservation status of the species that have been used both by the Australian Government and the IUCN (for its Redlist) to set the conservation status of this species. He has also contributed to two recent assessments of the impacts of the 2019/2020 megafires on this and other species of frogs, both stemming from the need to understand the longer term impacts that major bushfires are likely to have on this group of vertebrates.

Additional experience and use of his expertise include:

- Engagement by RPS to conduct targeted expert surveys in the Newnes Plateau as part of assessments of impacts of mining at the Centennial Colliery (2021).
- Completion of surveys and an expert report (under the Framework for Biodiversity Assessment) for the Warragamba Dam Raising project for SMEC (2019).
- Engagement by the NSW Office of Environment and Heritage to be part of the expert panel determining the categorisation of this species under the SOS program and in determining the populations requiring specific management actions (2016/17 & 2020/21).
- Providing expert opinion on the status of this species during assessments undertaken for the IUCN in 2001 and 2016.
- Provided expert opinion on the habitat requirements, sub-population status and reservation requirements for the Yellow-spotted Tree Frog during the NSW Government's Comprehensive Regional Assessment program completed in 2000-2001.

Dr Lemckert publications and reports that deal specifically with Yellow-spotted Tree Frog are:

a. Mahony, M.J., Hines, H.B., **Lemckert, F.**, Newell, D., Roberts, J.D., Rowley, J.J.L., Scheele, B.C., & West, M. (In Press). The impacts of the 2019-20 wildfires on Australian frogs. In Australia's 2019-20 megafires: biodiversity impacts and lessons for the future. S. Legge (Ed.).
b. Mahony, M., Gould, J., Beranek, C., Callen, A., Clulow, J., Clulow, S., Klop-Toker, K., Mahony, S., Wallace, S., Stock, S., Garnham, J., **Lemckert, F.**, Thumm, K., Moses, B. & Pickett, E. (In Press). A trait-based analysis for predicting impact of wildfires on frogs. Australian Zoologist 42(2): 326-351.
c. Geyle, H.M, Hoskin, C.J., Bower, D.S., Catullo, R., Clulow, S., Driessen, M., Daniels, K., Garnett, S., Gilbert, D., Heard, G.W., Hero, J-M., Hines, H.B., Hoffmann, E.P., Hollis, G. Hunter, D.A. **Lemckert, F.L.**, Mahony, M., Marantelli, G., McDonald, K.R., Mitchell, N.J., Newell, D., Roberts, J.D., Scheele, B.C., Scroggie, M., Vanderduys, E., Wassens, S., West, M., Woinarski, J.S.C. & Gillespie, G.R. (2021). Red hot

frogs: identifying the Australian frogs most at risk of extinction. Pacific Conservation Biology. https://doi.org/10.1071/PC21019.

d. Gillespie, G.R., Roberts, J.D., Hunter, D., Hoskin, C.J., Alford, R.A., Heard, G.W., Hines, H. **Lemckert, F.**, Newell, D. & Scheele, B.C. 2020. Status and Priority Conservation Actions for Australian Frog Species. Biological Conservation 247, 108543. https://doi.org/10.1016/j.biocon.2020.108543.
e. **Lemckert, F.L.**, & Mahony, M.J. 2018. The status of Decline and Conservation of Frogs in Temperate Coastal South-eastern Australia. **Pp 59-72** In: *Amphibian Biology Volume 11 - Conservation and Decline of Amphibians: Eastern Hemisphere (Australia, New Zealand and Pacific Islands)*. H. Heatwole and J. Rowley (Eds.). CSIRO Publishing, Melbourne.
f. Mahony, M.J., Hamer, A.J., Pickett, E.J., McKenzie, D.J., Stockwell, M.P., Garnham, J.I., Keely, C.C., Deboo, M., O'Meara, J., Pollard, C.J., Clulow, S., Lemckert, F.L., Bower, D.S., & Clulow, J. 2013. Identifying conservation and research priorities in the face of uncertainty: a review of the threatened bell frog complex in eastern Australia. Herpetological Conservation and Biology 8:519-538.
g. Lemckert, F.L. & Penman, T. 2012. Climate Change and Australia's frogs: how much do we need to worry? Pp 92-98 In: Wildlife and Climate Change: towards robust conservation strategies for Australian fauna. D. Lunney & P. Hutchings (Eds.). Royal Zoological Society of NSW, Mosman, NSW, Australia.
h. Penman, T. D. and Lemckert, F. L. 2010. Predicted impact of climate change on threatened amphibians. Unpublished report to the Department of the Environment, Climate Change and Water, Hurstville.
i. Lemckert, F.L. & Mahony, M.J. 2008. Core calling periods of the frogs of temperate New South Wales, Australia. Herpetological Conservation and Biology 3:71-76.
j. Hero, J-M, Richards, S, Alford, R., Allison, A., Bishop, P., Gunther, R., Iskandar, D., Kraus, F., Lemckert, F., Menzies, J., Roberts, D. & Tyler, M. 2008. Amphibians of the Australasian Realm. Pp 65-73 In: Threatened Amphibians of the World. S.N. Stuart, M. Hoffman, J.S., Chanson, N.A. Cox, R.J. Berridge, P.J. Ramani & B.E. Young (Eds.). Lynx Edicions, Barcelona.
k. Hero, J-M., Hines, H., Lemckert, F., & Roberston, P. 2008. *Litoria castanea*. Pp 257 In: Threatened Amphibians of the World. S. N. Stuart, M. Hoffman, J. S., Chanson, N. A. Cox, R. J. Berridge, P. J. Ramani & B. E. Young (Eds). Lynx Edicions, Barcelona, Spain.

Dr Lemckert's full CV is provided as Appendix A of this report.

2. Species information

2.1 Species description

The Yellow-spotted Tree Frog is an endemic Australian tree frog that is a member of the Australian frog family Hylidae and forms one member of the Bell Frog species group. It is a large, long-snouted terrestrial species reaching an average adult snout to vent length of 53-83 mm (Cogger, 2014; NSW NPWS 2001), although the species can grow to 100 mm. It is dull olive to bright green on the back (colour can brighten at night), with scattered black spots and varying amounts of irregular bronze spotting and blotches. A pale green strip typically runs down the back. The groin and hind side of the thighs are blue-green, with large yellow or cream spots that can reach up the flank of the animal and give it its common name. The belly is white, but the throat region of the male is darkened. A narrow black stripe runs dorso-laterally from the nostril, extending over the tympanum and along the top of the flanks (Cogger, 2014). The species has fully webbed toes and noticeable toe discs, but with toe discs are narrower than the toe itself (Robinson, 1996), a feature used to distinguish the Yellow-spotted Bell Frog from other Bell Frogs. The tadpoles are large, growing to about 8 cm long with a pinkish-grey body and yellowish fins (OEH, 2022).

The taxonomic status of the New England Tableland population of the Yellow-spotted Tree Frog remains unclear. The New England population was given the name *Litoria flavipunctata* by Courtice and Grigg (1975) based on genetics and body colouration. The species was synonymised with *L. castanea* by Cogger et. al. (1983) who considered the highland populations along the Great Dividing Range in NSW to represent one separate species. Combining the species based on morphology was supported by Thompson et al. (1996). However, genetic research has recently indicated that there is low genetic difference between *L. castanea* and *L. raniformis* and that *L. castanea* is simply part of the "inland" population of *L. raniformis* (Voros et. al. 2023). Further genetic material and work is required to determine whether the New England Tableland Population is a separate taxonomic unit as suggested by Courtice and Grigg (1975) and may still be a separate species (G. Grigg Pers. Comm.). Unfortunately, no viable DNA has been extracted from specimens from the New England Tablelands (all preserved in formalin) and it remains impossible to establish at this time if this population the distinctness of the population.

Plate 1: Yellow-spotted Bell Frog images (Photo 1: David Hunter, NSW Office of Environment and Heritage)

2.2 Life cycle

The biology of the Yellow-spotted Tree Frog has not been well documented, however it is expected to be similar to that of better studied *L. aurea* and *L. raniformis* (Gillespie et al. 1995). The best information is likely to come from the population study of a frog community near the ACT by Humphries (1979) that included what he clearly identified as the southern highlands form of the Yellow-spotted Tree Frog. This study looked at populations present around a number of farm dams and found that adults are active once the weather warms during spring and summer, and bask on sunny days and forage on grassy banks. They become dormant once colder weather sets in in autumn and adults over-winter in hollow logs and in earth amongst the roots of fallen trees (Courtice and Grigg 1975) and in the base of grass tussocks (Humphries 1979).

According to Hero et al. (2004) males and females likely reach sexual maturity at three years of age, but females almost certainly mature later than males and time to maturity is very likely dependent on the altitude they live at that may limit their growing seasons. Humphries (1979) recorded individuals living for at least 6 years and he estimated that males survived an average of 1.8 breeding seasons and females 3.3 breeding seasons. Generation length would be somewhere between three and five years.

The call of the male is a series of loud, droning grunts made by males floating on the water surface in relatively open water, or sometimes on top of vegetation (Humphries 1979). Calling will likely occur most intensely at night, but can also be expected during the day, especially where conditions are overcast and rainy. Male territoriality and fighting in the breeding chorus was often observed by Humphries (1979).

Breeding is considered to generally occur during or following rain (OEH, 2022). Information on egg laying is lacking, but presumably clutches of eggs would have been laid amongst aquatic vegetation with the eggs sinking after several hours. Clutch size was likely large and up to several thousand eggs, just as for *Litoria raniformis* (Anstis 2013).

Again, information on live tadpoles is not available, but preserved specimens and old records indicate that the tadpoles were large, growing to at least 80 mm with a pinkish-grey body and yellowish fins (Threatened Species Scientific Committee 2017). Development time was likely between 2 and 4 months, depending on the climatic conditions and the site conditions (shallower ponds are warmer and development in those faster)

2.3 Distribution and abundance

2.3.1 Distribution

Historically, this species was recorded mainly in two somewhat separate biogeographical regions in south-eastern Australia: the South Eastern Highlands Bioregion centred around Lake George – Canberra and Bombala – Delegate and a New England Tableland Bioregion population known from around Guyra and Armidale, which is the population covered in this study (Figure 3). However, there were frogs that were identifiable as Yellow-spotted Tree Frogs also recorded from the Bathurst Region (White and Pyke 1999) and so the population may have been more widespread than understood, with other recorded *L. raniformis* potentially being Yellow-spotted Tree Frogs. Based on all available ALA records in NSW, the estimated Extent of Occurrence for the species is 125161 square kilometres and Area of Occupancy for the species is 19656 square kilometres.

The northern populations is known from a relatively restricted distribution on the New England Tablelands, from (Figure 3), which represents an area of occupancy of only (104 km2 – based on ALA data). The records

for this population are also restricted to a relatively narrow altitudinal range of between 1,000 and 1,500 m (Mahony, 1999; Threatened Species Scientific Committee, 2017).

2.3.2 Abundance

The Yellow-spotted Bell Frog was once likely common throughout the highland areas of NSW and the species was even reported to be common enough to be used for the New England Population to be used in biology dissections at the University of New England (G. Grigg Pers. Comm.) and frogs in the Bathurst area to be as a regular food source for snake keepers (White and Pyke 1999). It was also a regularly recorded frog in the studies by Courtice (1972) and Humphries (1979). However, the species underwent a major and rapid decline in the mid to late 1970s (NSW Scientific Committee 2009). The last individual recorded in the southern tablelands was in 1980 (Osborne et al. 1996, Mahony 1999; Mahony et al. 2000) and even earlier for the New England Tableland Bioregion in 1975 (White and Ehmann 1997a). Although White and Pyke (1999), provided information that the species was recorded in the Bathurst area into the 1990s, by 2000 it was considered likely extinct (OEH 2022). Various reasons for the decline were put forward including habitat destruction, introduced fish and pollution, but the most likely cause ultimately appears to have been the amphibian Chytrid fungus (Mahony et al. 2013; Lemckert and Mahony 2018). This was supported by the fact that a number of areas of habitat previously supporting Yellow-spotted Tree Frogs are protected in National Parks and Wildlife Service estate, including Little Llangothlin and Mother of Ducks Lagoon Nature Reserves on the New England Tableland and Namadgi National Park on the South-eastern Highlands (Threatened Species Scientific Committee, 2017).

A population of Yellow-spotted Tree Frogs was rediscovered in the southern tablelands near Yass, north of Canberra in 2009 (Threatened Species Scientific Committee 2017). This population was located on difficult to access private property and its long term status was considered tenuous. Tadpoles were collected to start an ex situ breeding population at Taronga Zoo in Sydney. In autumn of 2018, captive bred individuals were reintroduced to the wild (OEH 2022).

Targeted surveys conducted in the New England Tablelands Bioregion in 2000 and 2016 did not record this species (D. Hunter pers. comm. 2016 in Threatened Species Scientific Committee 2017) and multiple previous other searches within the broader area also failed to detect the species (M. Mahony Pers. Comm.). Given the highly restricted historical range of the New England population, the chances of the species remaining present appear to be very low.

2.4 Habitat requirements

2.4.1 Breeding Habitat

The Yellow-spotted Tree Frog is recorded as occupying a wide variety of water bodies including permanent ponds, swamps, lagoons, farm dams and the still backwaters of rivers usually with tall reeds present (Courtice and Grigg 1975, White and Ehmann 1997a,b). Hence it is not likely restricted to natural water bodies, although the historic sites from the New England Tablelands were mainly large upland swamps (Threatened Species Scientific Committee 2017).

Breeding occurs in still or slowly flowing water bodies during warmer months following reasonable rainfall (Anstis 2013). Frogs lay large egg masses on the water surface, usually attached to emergent vegetation

(Courtice and Grigg 1975) and males are highly likely to call from low emergent vegetation. So emergent vegetation is an important consideration for this frog.

Another likely significant consideration is shading of the water bodies. Work completed for the Green and Golden Bell Frog has indicated a preference for unshaded water that has higher water temperatures (Pyke and White 1996, Pyke et al. 2002). This appears to provide better conditions for both tadpole growth and also allows for basking by the adult frogs. A similar result has been found for the Southern Bell Frog (Wassens et al. 2010) and it can be assumed that the same will be true for the Yellow-spotted Bell Frog. Minimal shading that leads to warmer water may also be important in reducing the impacts of the amphibian chytrid fungus (Penman 1998). Unshaded water bodies appear to be an important consideration in habitat suitability for the Yellow-spotted Tree Frog.

Another factor that likely determines the quality/suitability of a water body as breeding habitat is the presence of fish and particularly introduced fish species. The presence of the Plague Minnow is known to impact on the quality of a water body for the Green and Golden Bell Frog, with success being low in its presence and dependent on the presence of more complex aquatic vegetation, which allows the GGBF to breed successfully (Hamer et. al. 2002). The Plague Minnow is present widely on the New England along with Trout and these fish may be of detriment when considering the likely presence of the Yellow-spotted Tree Frog.

2.4.2 Non-breeding habitat

The Yellow-spotted Tree Frog appears to occupy similar non-breeding habitats recorded for other Bell Frogs based on the information provided by Courtice and Grigg (1975) and Humphries (1979). So unlike most other frog species in Australia, they spend their non-breeding time also around water bodies, although not necessarily in breeding water bodies (Courtice and Grigg 1975, White and Ehmann 1997a,b). This includes pools and ponds with emergent vegetation, but they can also be found in ponds or slow moving streams with overhanging grassy banks in the absence of reed beds (Courtice and Grigg 1975). Hence there is little specialisation in non-breeding habitat.

One unusual behaviour shared by all of the Bell Frog group is their habit of basking, typically within areas of aquatic vegetation, apparently to increase body temperatures. Basking in frogs is unusual, but such activities in ectotherms typically allow for periods of greater activity or faster digestion of food items. Whilst the importance of this activity for its physiological requirements is not known, individual Bell Frogs appear to bask regularly and so it is likely an important activity. Basking on emergent aquatic vegetation likely allows individuals the option to make a rapid escape from diurnal predators by diving into the water. The presence of water bodies that contain emergent vegetation are known important determinants of the presence of GGBF (Pyke and White 1996; Hamer et al. 2002) and is very likely just as important for Yellow-spotted Tree Frogs.

Whilst the species may show a willingness to use a wide variety of water bodies for breeding and non-breeding activities, one important aspect may be the abundance and proximity of multiple water bodies that allows for movements between pools as environmental conditions vary. This has been found to be a very important factor in determining the presence of the Green and Golden Bell Frog and Southern Bell Frog (Mahony et al. 2013). Green and Golden Bell Frogs move along and between different water bodies, particularly as part of migrations to and from breeding sites (Hamer et al. 2002). Hamer et al. (2008) noted that male GGBFs at Kooragang Island often moved > 200 m to reach an ephemeral breeding site, crossing over extended grassland areas and other habitats including disturbed habitats. These movements allow for uses of different water bodies as conditions change, including for breeding depending on circumstances.

The movement habits of the Yellow-spotted Bell Frogs are relatively unknown for the New England population, although Humphries (1979) found that his frogs showed an apparently similar behavioural pattern with frogs sticking to water bodies for most of the year, but changing the water body being used, depending on conditions.

The large lagoons that the species was noted to use historically on the New England Tablelands would have offered a range of environments internally, with permanent pools in the central areas radiating out to more temporary pools towards the edges, allowing the frogs to find a suitable water body at any given time. And the other parts of the swamps would have been well within typical migratory distances for Bell Frogs. Hence connectivity may not have been so critical for frogs in this sort of environment. The development footprint does not have such large swamps and so it appears likely that the relative frequency and connectivity of available smaller water bodies will be the factor determining the quality of habitat for the Yellow-spotted Bell Frog in the study area. Or it may indicate a lack of suitability for the study area if frogs in that region were adapted to life in larger swamps. There is no way to be certain of their habitat preferences.

2.4.3 Overwintering habitat

The species has been recorded to over-winter in the hollow centres of rotting logs and in the earth surrounding the roots of uprooted trees (Courtice and Grigg 1975), and in the base of sedge tussocks that included communal brumation by numbers of individuals that would awaken if weather permitted (Humphries 1979).

2.4.4 Connectivity requirements

Based on the broad body of work on Bell Frogs, the spatial arrangement of permanent wetlands must provide a short enough distance and suitable matrix of intervening habitat for frogs to move between ponds as well as a large enough number and types of wetlands within a 1 km radius to provide multiple interactive breeding sites (Hamer et al. 2002; Hamer & Mahony 2010; Valdez et al. 2015; Hamer 2018). The study area is essentially cleared grazing land or retained native vegetation, both of which should not restrict movements of frogs. Figure 5 shows that there is an extensive area of drainage lines present in the landscape and the site inspection confirmed a large number of farm dams to be present (e.g. Plate 10), as would be expected across this rural landscape. So connectivity would not have been hampered to any degree in the current environment.

2.5 Diet

The diet of the Yellow-spotted Tree Frog has not been investigated in any detail, but adults presumably consume a variety of invertebrates. Furthermore, being a larger frog, they probably will also eat any small vertebrates they can capture and subdue. This includes other frogs as indicated by Humphries (1979) and are likely cannibalistic (Pyke and White 2001; Mahony et al. 2013).

Similarly, the tadpoles show a very standard set of mouth parts (Anstis 2013) and are again likely to eat a broad range of food items during that stage.

Hence there is no expectation of any dietary specialisation and so little likelihood that the species has a specific foraging habitat or method that might provide a limitation on where the species can exist.

2.6 Metapopulation dynamics

A critical consideration in the likely presence/absence of Bell Frogs are metapopulation dynamics. The species group is considered to follow a classical metapopulation structure with the “local” population consisting as a series of patchy populations within the larger single metapopulation. Individuals move regularly between a

mosaic of wetlands across a broad area throughout a single breeding season (Hamer et al. 2008; Hamer & Mahony 2010; Mahony et al. 2013). There is high site-specific population turnover with local extinctions being balanced by colonisations of other ponds or parts of the local area by regularly dispersing individuals, but with the overall metapopulation remaining stable. There are core sites that provide ongoing and regular reproductive success and that maintain long-term populations, but the major part of the population dynamics is driven by inter-year success of breeding at a range of available breeding sites, with years of very good reproductive success leading to opportunities to expand ranges and colonise new sites. In times of poor rainfall, the core sites become the refuges for the species and Valdez et al. (2015) found that probability of occupancy of a site increased at large and permanent wetlands. The work of Humphries (1979) supports this for the Yellow-spotted Tree Frog with one pond being used continuously through his study, but other ponds were used more sporadically, depending on conditions.

2.6.1 Vegetation associations

The OEH profile records the Yellow-spotted Tree Frog to be associated with a range of vegetation formations and classes within the New England Tablelands Interim Biogeographic Region in which the Project Site is located and is geographically restricted to above 1000 m altitude within the region (https://www.environment.nsw.gov.au/threatenedSpeciesApp/profileData.aspx?id=10486&cmaName=New+England+Tablelands). These are:

Dry sclerophyll forests (shrub/grass sub-formation)

- Central Gorge Dry Sclerophyll Forest

Dry sclerophyll forests (shrubby sub-formation)

- South East Dry Sclerophyll Forests
- Southern Tableland Dry Sclerophyll Forests

Forested wetlands

- Eastern Riverine Forests
- Inland Riverine Forests

Freshwater wetlands

- Inland Floodplain Swamps
- Montane Bogs and Fens
- Montane Lakes

Grasslands

- Temperate Montane Grasslands

Grassy woodlands

- Southern Tableland Grassy Woodlands
- Subalpine Woodlands
- Tableland Clay Grassy Woodlands
- Western Slopes Grassy Woodlands

Heathlands

- Northern Montane Heaths

Miscellaneous ecosystems

- Water bodies, rivers, lakes, streams (not wetlands)

Wet sclerophyll forests (grassy sub-formation)

- Southern Tableland Wet Sclerophyll Forests.

The Yellow-spotted Tree Frog is predicted to occur in both wet and dry forest types with both grassy and shrubby/heathy elements and can also be found in woodlands and wetlands and even in relatively cleared environments. The presence of suitable breeding habitat with emergent vegetation is considered to be the best determinant of the likelihood of this species being present in an area.

2.6.2 Threats

The Yellow-spotted Bell Frog is currently Listed as Critically Endangered under the BC Act and Endangered under the EPBC Act (OEH, 2022). It is currently listed as Critically Endangered (possibly extinct) under the IUCN Redlist criteria (IUCN, 2023).

The Office of Environment and Heritage profile for this species lists the following threats to the Yellow-spotted Bell Frog:

- Loss or modification of wetlands, swamps and slow-flowing creeks and the adjacent vegetation.
- Changes to natural water flows and water quality.
- Removal of fallen timber, rocks or other debris used as shelter.
- Application of herbicides or pesticides in or adjacent to habitat.
- Disease - chytrid fungus.
- Predation of eggs and tadpoles by introduced fish, including Carp, Redfin and Gambusia
- Predation of frogs by foxes and cats.
- Restricted in-situ distribution / population size.
- Lack of knowledge of additional populations, extent of suitable habitat or distribution of the species in the surrounding area.
- Tussock and gorse encroaching on suitable habitat, limits availability of open space habitat used by the frogs.
- Domestic stock; direct disturbance from cattle and sheep.

(see: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10486)

The IUCN Redlist profile states:

"Listed as Critically Endangered (Possibly Extinct) because its population size in the wild is currently estimated to be zero as the one known subpopulation was recently reintroduced and is not yet established and stabilised. There is a chance that it may occur elsewhere in its historical range as yet undetected, but further surveys are needed. Furthermore, there is ongoing decline in the quality and extent of its habitat due to climatic changes. These are causing unprecedented and severe weather events, which further threaten a species that has been decimated by chytridiomycosis and the negative effects of past and current agricultural practices".

Even the one population noted above is present in southern NSW and so there are still no extant populations on the New England Tablelands.

that the cause for declines for this species are unclear (Gillespie et al. 1995), however lists two major threats:

- Chytrid Fungus; "…chytridiomycosis infection, and similar declines have been observed in the co-occurring species *Litoria aurea* and *L. raniformis*" (IUCN, 2023).
- Agricultural Impacts; It is suggested that chemical use together with "modification and loss of wetland habitats extraction of surface water, alteration of stream flow and the removal of stream side vegetation" (IUCN, 2023).

In consideration of the above listed threats, it should be noted that little is known about the decline of this species, and much of the predicted threats are based on closely related members of the Bell Frog complex (Mahony et al. 2013). But its rapid decline (<10 years) from a very common frog to likely extinct in the Bioregion strongly indicates a novel disease, the chytrid fungus, was the primary cause.

In regard to the Project Site, the majority of these threats would already be in place and not significantly added to by the proposed development. The following are considered to be of relevance as the proposed development may significantly add to already existing threats:

- Loss of streamside vegetation through clearing or frequent burning.
- Changes to natural water flows and water quality.
- Predation of eggs and tadpoles by introduced fish.
- Infection by amphibian chytrid fungus.
- Intense wildfire resulting in destruction of habitat.

2.6.3 Habitat fragmentation by roads

Hamer (2016) found that extinctions of GGBF were significantly more likely to occur at ponds in areas with higher densities of roads. Similar findings have been obtained for pond occupancy by frogs in the United States (Marsh et al. 2017). A high density of roads and the presence of larger roads with high volumes of traffic provides a negative environment for the GGBF. Their habit of migrating between water bodies to maintain a metapopulation requires free movement to allow populations to remain connected, allow new breeding sites to be colonised and allow local extinctions to be repopulated by dispersing individuals. Large roads represent barriers in both distances that frogs must cover in exposed conditions and the typically heavier volumes of traffic prohibit the successful crossing by frogs. Numerous smaller roads provide the same effect. Rural areas generally have a low density of roads and so provide what would be expected to still be a relatively suitable environment for the Yellow-spotted Tree Frog where there are water bodies present. The study area and surrounds have only one larger road occasionally dissecting it and relatively few smaller roads with minimal traffic use (**Error! Reference source not found.**). So roads currently are unlikely to result in the isolation or fragmentation of any local population of frogs except potentially where the one large road is adjacent to ponds or streams.

2.6.4 Variables determining Yellow-spotted Tree Frog presence

This information provides the following important points when trying to assess the potential presence of the Yellow-spotted Tree Frog in any area:

- The Yellow-spotted Tree Frog requires the presence of permanent and semi-permanent water bodies with emergent vegetation for it to be present within a landscape.
- The Yellow-spotted Tree Frog is much more likely to inhabit an area where there are multiple (preferably dozens) suitable water bodies connected or within close enough proximity (maximum of 500 m) such that the species will be to be able to move easily and regularly enough between sites to maintain a metapopulation.
- The Yellow-spotted Tree Frog is more likely to be present at a location when there are other Yellow-spotted Tree Frog occupied ponds in close proximity.
- The Yellow-spotted Tree Frog is unlikely to be present within areas containing a large number of introduced fish and especially *Gambusia sp*. (Plague Minnow).

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3. Description of the Project Site

The footprint of the Winterbourne Wind Farm in provided in Figure 4Figure 4. The development is located is located approximately north-west of Armidale and north and east of Walcha (approximately 400 km north of Sydney) in the New England Tablelands region of north-eastern NSW (Figure 1). It is roughly bounded by Thunderbolts Way and the Oxley Highway to the west, the Oxley Wild Rivers National Park to the south and east, and the Salisbury Plains to the north. The project area extends over approximately 22,000 ha, with less than 1,000 ha expected to be disturbed during construction. The project area is located at approximately 1,100m-1,300m elevation and is comprised of hills and ridgelines rising out of the Walcha Plateau. The project area is dissected by Winterbourne Creek, Toms Creek, and Two Mile Water.

The project area falls within the Armidale Regional Local Government Area (LGA). The preliminary survey corridor comprises approximately 5000 ha zoned as RU1 Primary Production within the Armidale Dumaresq Local Environment Plan (LEP) 2012. Surrounding land is also primarily zoned RU1 except for the Winterbourne Nature Reserve (C1 National Parks and Nature reserves) which is located directly adjacent north-east of the survey corridor.

The project will be constructed primarily on freehold land within the Walcha and Uralla Local Government Areas. Land to be used for the project will be secured under lease arrangements with local landholders. The land area is broadly cleared and has many low peaks and ridgelines that provide locations for wind turbines. Ther there are several existing access roads to and within the site (Figure 4). Some of the existing roads may need to be upgraded and several new access roads will be constructed within the site as part of the proposed project. The location of these roads and the final position of turbines will be determined based on the environmental assessment outcomes.

The proposed wind farm will be designed to minimise potential visual and noise impacts to landowners and tenants in the area. Much of the Project Area is currently used for livestock grazing and has been mostly cleared of trees and other vegetation, leaving cleared paddocks and infrastructure with patches of retained trees across the landscape (Plate 2, Plate 3).

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Plate 2: Cleared paddock, small sealed road and pond environment typical of habitat found within the study area

Plate 3: Retained trees on hillside, fencing, paddocks and dirt track typical of study area

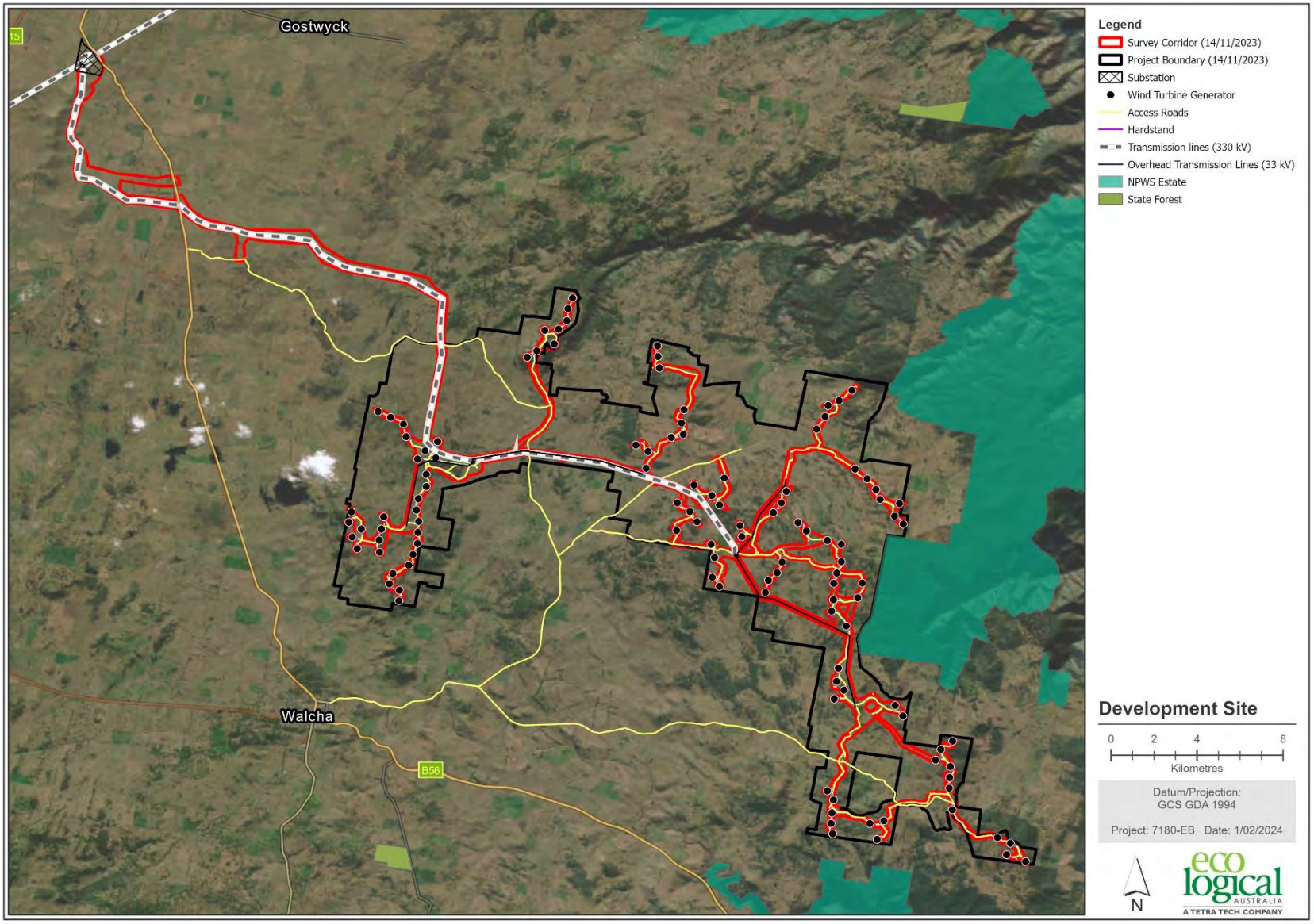

Figure 4. Development footprint

3.1 Landscape features

The following landscape features, as defined by the BAM, are relevant to the project.

3.1.1 Bioregions

The Project Site is located within the New England Tablelands Interim Biogeographic Regionalisation for Australia (IBRA) Region. The following description for the region is taken from NSW NPWS (2003) The Bioregions of New South Wales: their biodiversity, conservation and history:

The New England Tableland Bioregion has an area of 3,004,202 ha of which 2,860,758 ha or 95.23% of the bioregion lies within NSW. This bioregion is one of the smaller bioregions in NSW, occupying 3.57% of the state. The bioregion lies between the North Coast and Nandewar bioregions in northeast NSW, extending north just into Queensland. In NSW, the bioregional boundary extends from north of Tenterfield to south of Walcha and includes towns such as Armidale and Guyra, with Inverell just outside the boundary.

The bioregion includes parts of the MacIntyre, Clarence, Gwydir, Macleay, Namoi and Manning River catchments.

Subregions

The Project Site is located within three IBRA subregions – Moredun Volcanics, Bundarra Downs and Armidale Plateau (Figure 1). Details on these subregions are also taken from NSW NPWS (2003) and provided in Table 1.

Table 1. Description of the subregions covering the Project Site (from NSW NPWS 2003).

Subregion	Geology	Characteristic landforms	Typical Soils	Vegetation
Moredun Volcanics	Lower Permian acid volcanics with minor granite and Tertiary basalts.	Undulating plateau at 1100 m with steep western slope and rugged hills falling to 850 m.	Harsh yellow texture contrast soils with stony brown loams on basalts.	Open forest and woodland of snow gum, black sallee, New England stringybark, McKie's stringybark, silver-top stringybark, ribbon gum, yellow box, and some black cypress pine on the plateau. Mugga, Caley's ironbark, tumbledown gum, white box, yellow box and Youman's stringybark on western slopes
Bundarra Downs	Lower Carboniferous mudstones, lithic sandstones and conglomerates.	Upper catchment of the Gwydir River undulating to low hilly country with dendritic drainage pattern. Hills rise to the east on granite metamorphic contact ridges.	Harsh texture contrast soils, generally yellow, thinner and stonier on steep slopes. Some areas of slightly saline soils.	In the west: white box, grey box, yellow box and Blakely's red gum with mugga on stony ridges and river red gum along streams. In the east: broad-leaved stringybark, Youman's stringybark, tumble down gum, white box, yellow box, black cypress pine and kurrajong
Armidale Plateau	Fine grained Permo-Carboniferous	Undulating to hilly plateau at 1100 m.	Texture contrast soils on sedimentary rocks and	Open ribbon gum forest and woodland with snow gum and

Subregion	Geology	Characteristic landforms	Typical Soils	Vegetation
	Sedimentary rocks, granites and multiple Tertiary basalt flows.	Stepped landscape across basalt flows, broad valleys, steepening to the east at the head of Great Escarpment gorges.	granite, mellow (soft and friable) and well drained on upper slopes, harsh and poorly drained on lower slopes. Variable stony loams to deep black earths in valley floors on basalt. Deep, dark loamy alluvium in swampy valleys.	black sallee on basalt. Cold air drainage influence inverts the tree patterns in wide valleys. Yellow box, Blakely's red gum, rough-barked apple, apple box on sedimentary rocks. Silver-top stringybark, New England stringybark on dry aspects, Blakely's red gum, yellow box and apple box on moist, well-drained slopes, and New England peppermint with ribbon gum on flats.

3.1.2 NSW (Mitchell) Landscape

The Project Site covers four different Mitchell Landscape Types. The following description of each is taken directly from DECC (2002).

Dingo Spur Metasediments

Steep ranges and hills intersected by a dendritic drainage pattern leading into deep gorges with high waterfalls on the Great Escarpment, extends west onto the tablelands. Gorges incised into faulted, steep dipping Devonian quartzose sandstone, greywacke, massive argillite and slate. Tablelands area on Permo-Carboniferous mudstone, lithic sandstone, tuff, slate, hornfels and some schist. General elevation 300 to 1400m, local relief 600m. Shallow stony loam on steep scree slopes with moderate organic content. Shallow gradational loam and sandy loam elsewhere with deeper uniform profiles in low valleys. A very complex vegetation environment encompassing coastal closed forests, dry hardwood forests and cold high plateau components. Open forest of New England Blackbutt (*Eucalyptus andrewsii ssp. campanulata*), Messmate (*Eucalyptus obliqua*), Silvertop Stringybark (*Eucalyptus laevopinea*) with New England Peppermint (*Eucalyptus cinerea*), Snow Gum (*Eucalyptus pauciflora*) and Black Sallee (*Eucalyptus stellulata*) in high cool environments. Dry closed forest species such as; Shatterwood (*Backhousia sciadophora*), Giant Stinging Tree (*Dendrocnide excelsa*), Shiny-leaved Stinging Tree (*Dendrocnide photinophylla*), and Yellow Tulip (*Drypetes australasica*) in lower moister environments and in patches on scree slopes where protected from fire. River Oak (*Casuarina cunninghamiana*) along all streams and dry hardwood forests of; Yellow Box (*Eucalyptus melliodora*), Blakely's Red Gum (*Eucalyptus blakelyii*), Broad-leaved Stringybark (*Eucalyptus caliginosa*) and Cabbage gGum (*Eucalyptus amplifolia*) on valley floors.

Moonbi-Walcha Granites

Complex of steep ranges, plateau and rounded peaks with abundant large tors and rock domes on Permian granite, granodiorite and porphyry, general elevation 500 to 1320 m, local relief 100 to 300 m with the plateau at an average of 1000 to 1150 m. Soils vary with rock type, depth of alteration and topographic position. Thin gritty loams near rock outcrop on crests, uniform to gradational earths on gentle slopes and red and yellow texture-contrast profiles in valleys. Vegetation also varies and includes open forest and woodland of; White Cypress Pine (*Callitris glaucophylla*), White Box (*Eucalyptus albens*), Caley's Ironbark (*Eucalyptus caleyi*), Tumbledown Red Gum (*Eucalyptus dealbata*), Silver-leaved Ironbark (*Eucalyptus melanophloia*), Yellow Box

(*Eucalyptus melliodora*), Orange Gum (*Eucalyptus prava*), Silvertop Stringybark (*Eucalyptus laevopinea*), Western Golden Wattle (*Acacia decora*), Lightwood (*Acacia implexa*), Kangaroo Thorn (*Acacia paradoxa*), and Hickory Wattle (*Acacia obliquinervia*) on lower western slopes. *Prostanthera nivea - Acacia viscidula* shrubland adjacent to rock outcrop with; Orange Gum, Black Cypress Pine (*Callitris endlicheri*), Tumbledown Red Gum, Kurrajong (*Brachychiton populneus*), and Port Jackson Fig (*Ficus rubiginosa*).

Uralla Basalts and Sands

Undulating stepped high plateau on Tertiary basalt with underlying fluvial sand and gravel resting on an exhumed landscape of Permian granites. General elevation 950 to 1250 m, local relief 150 m. Red structured loams on ridges, brown structured gradational clay loams on slopes, dark self-mulching clays in valleys and red or yellow earth on sands and exposed granite. Open forest or woodland of Manna Gum (*Eucalyptus viminalis*) with some Rough-barked Apple (*Angophora floribunda*). Snow Gum (*Eucalyptus pauciflora*) and Black Sallee (*Eucalyptus stellulata*) on cold valley floors and exposed peaks. Silvertop Stringybark (*Eucalyptus laevopinea*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyii*) on lower elevations in the west.

Guyra Tops Granite

Undulating stepped high plateau on Tertiary basalt with underlying fluvial sand and gravel resting on an exhumed landscape of Permian granites. General elevation 950 to 1250 m, local relief 150 m. Red structured loams on ridges, brown structured gradational clay loams on slopes, dark self-mulching clays in valleys and red or yellow earth on sands and exposed granite. Open forest or woodland of Manna Gum (*Eucalyptus viminalis*) with some Rough Barked Apple (*Angophora floribunda*). Snow Gum (*Eucalyptus pauciflora*) and Black Sallee (*Eucalyptus stellulata*) on cold valley floors and exposed peaks. Silvertop Stringybark (*Eucalyptus laevopinea*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyii*) on lower elevations in the west.

3.1.3 Native vegetation

NSW NPWS (2003) provide a broad assessment of vegetation communities across the New England Tableland:

Granitic soils derived from the prominent New England batholith support a variety of open forests and woodlands. These mainly consist of Silver-top Stringybark (Eucalyptus laevopinea), Blakely's Red Gum (Eucalyptus blakelyi), Youman's Stringybark (Eucalyptus youmanii), Yellow Box (Eucalyptus melliodora), Apple Box (Eucalyptus bridgesiana), Rough-barked Apple (Angophora floribunda), Black Cypress Pine (Callitris endlicheri), Manna Gum (Eucalyptus viminalis) and Snow Gum (Eucalyptus pauciflora).

The western slopes are dominated by Tumbledown Gum (Eucalyptus dealbata), Western New England Blackbutt (Eucalyptus andrewsii), Caley's Ironbark (Eucalyptus caleyi), Red Stringybark (Eucalyptus macrorhynca), McKie's Stringybark (Eucalyptus mckiena), White Cypress Pine (Callitris glaucophylla) and Black Cypress Pine, Rough-barked Apple and Silver-leaved Ironbark (Eucalyptus melanophloia nophloia).

Areas at higher altitudes comprise vegetation communities dominated by Messmate (Eucalyptus obliqua) and Mountain Gum (Eucalyptus dalrympleana ssp. heptantha), with Snow Gum, Black Sallee (Eucalyptus stellulata) and Ribbon Gum (Eucalyptus nobilis). Orange Gum (Eucalyptus prava) and Black Cypress Pine are widespread in rocky outcrops in the north of the bioregion. Protected high rainfall areas near the Great Escarpment display cool temperate rainforest elements, including Beech (Notofagus moorei) forests. River Oak (Casuarina

cunninghamiana) lines rivers and streams in the western part of the bioregion below an elevation of 800 m, with sedgelands found in some of the smaller streams.

Vegetation found on basalt-derived soil consists of open forests and woodlands of Manna Gum, Snow Gum and Black Sallee. Cold-air drainage inverts the tree patterns in wide valleys, as the distribution of these species is largely determined by climate parameters. Vegetation communities growing on basaltic soils consist of New England Stringybark (Eucalyptus calignosa) New England Blackbutt (Eucalyptus campanulata), and Narrow-leaved Peppermint (Eucalyptus radiata) on the hills, with Yellow Box, Wattle-leaved Peppermint (Eucalyptus acaciiformis), New England Peppermint (Eucalyptus nova-anglica), Snow Gum, Black Sallee and Ribbon Gum in the valleys. Open forest of New England Stringybark, Yellow Box, Blakely's Red Gum and Rough-barked Apple occurs on Tertiary sands. Vegetation growing on soils derived from Permian sedimentary rocks in the west is dominated by White Box (Eucalyptus albens), Grey Box (Eucalyptus moluccana), Yellow Box and Blakely's Red Gum, with localised occurrences of Mugga (Eucalyptus sideroxylon) on stony ridges. Youman's Stringybark, Tumble Down Gum and Black Cypress Pine also occur on sediments with Silver-leaved Ironbark, White Cypress Pine and the occasional Kurrajong. Snow Gum and Black Sallee dominate the coldest ridges while Ribbon Gum, Mountain Gum, Silver-top Stringybark, New England Blackbutt and Narrow-leaved Peppermint dominate moist areas on higher ground. New England Stringybark, Ribbon Gum, and cool temperate rainforest elements are found in moist, sheltered gullies.

Table 1 provides descriptions of soils present in the different Mitchell Landscape areas, but which follow closely the above descriptions. Both description sets indicate a broad variety of vegetation types are present where native vegetation has been retained. Given that the Yellow-spotted Tree Frog has no specific habitat limitations, any of these vegetation communities can potentially be used by the species if suitable breeding habitat is present.

ERM have identified 14 plant community types (PCTs) within the study area, 11 of which intersect with the survey corridor and a 200 m buffer around the corridor (buffer for the Yellow-spotted Tree Frog listed in the BAM), only two of which (highlighted in bold) are listed as being associated with the Yellow-spotted Tree Frog:

- PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- ***PCT 518* - Heath swamps wetland on leucogranite and granite of the New England Tableland Bioregion**
- *PCT 526* - Mountain Ribbon Gum - Messmate - Broad-leaved Stringybark open forest on granitic soils of the New England Tableland *Bioregion*
- PCT 534 - New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
- PCT 565 - Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- PCT 568 - Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- **PCT 766 - Carex sedgeland of the slopes and tablelands**
- PCT 970 - Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
- *PCT 997* - New England stringybarks - peppermint open forest of the New England Tableland Bioregion
- *PCT 1194* - Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion.

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3.1.4 Rivers, streams and ponds

Five significant waterways have been identified as present within the Project Site and are:

- Boorolong Creek.
- Rileys Creek.
- Toms Creek.
- Teatree Creek.
- Tigers Gully Creek.

The location of these creeks and interaction with the Project Site are indicated in Figure 5 and it is evident that there are a network of mapped drainage lines crossing over the footprint. These may form potential breeding and non-breeding habitat for the Yellow-spotted Tree Frog and provide migratory corridors for the species to move around the landscape. However, these creeks generally are highly disturbed by stock and often lacked even semi-permanent pools along parts of their lengths and contain little or no emergent vegetation that the species would use for shelter (Plate 4,

Plate 5, Plate 6). The streams also were not permanent flowing streams when in cleared farmlands and often had few pools that were highly disturbed by stock. So their suitability as habitat is rated as typically poor, but there remain some points where habitat was good (see Plate 7). One rocky creek was observed (Plate 8), but its flowing water and smaller pools would not suit the species.

Farm dams are located regularly and consistently across the study area and range in size and quality from small dams with no emergent vegetation to large dams with significant areas of emergent vegetation (see Plates 9 to 13). Typically they were located in very open locations with no real connection to native vegetation and lacked shelter sites around the dams such as logs or rocks or the base of trees. The ponds provide a range of potential habitats of highly variable quality that the species could sometimes use for breeding and shelter and, along with the streams, provide connectivity and stepping stones to allow metapopulation processes to proceed.

Of significance was that few of the isolated water bodies appeared to have any introduced fish present. The Plage Minnow (*Gambusia holbrooki*) was seen at a couple of points on the more permanent sections of creeks and is assumed likely to be in or to be able to penetrate most of the larger drainage lines. However it appears not to be reaching the majority of isolated dams and so is not reducing their potential to be suitable breeding habitat. Trout may be present on the rocky creek areas noted in the northern end of the survey footprint.

The Project Site does not contain any water bodies listed on the Directory of Important Wetlands in Australia or that are classified as a Ramsar wetland (see (https://www.awe.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands). This may be of some importance given that the New England records for the Yellow-spotted Tree Frog were mainly associated with several large upland swamps. If these sorts of swamps were the core habitat for this frog in the region and they did not commonly inhabit farm dams, then this would significantly reduce the potential for the species to use water bodies present in the study area.

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Plate 4: Dry stream bed leading to pool under bridge

Plate 5: Dry stream bed with no aquatic vegetation to act as emergents

Plate 6: Isolated pools on creek lines with some emergent vegetation

Plate 7: Pools on stream with emergent vegetation and open water – good habitat for Yellow-spotted Tree Frogs

Plate 8: Rocky creek in northern part of study area (flowing water not preferred by the species)

Plate 9: Isolated farm dams in study area showing very limited surrounding vegetation or emergent vegetation

Plate 10: Another isolated farm dams in study area noting minimal to no aquatic vegetation or surrounding native vegetation

Plate 11. Relatively uncommon situation of a dam located adjacent to disturbed retained native vegetation

Plate 12: Isolated dams with emergent aquatic vegetation

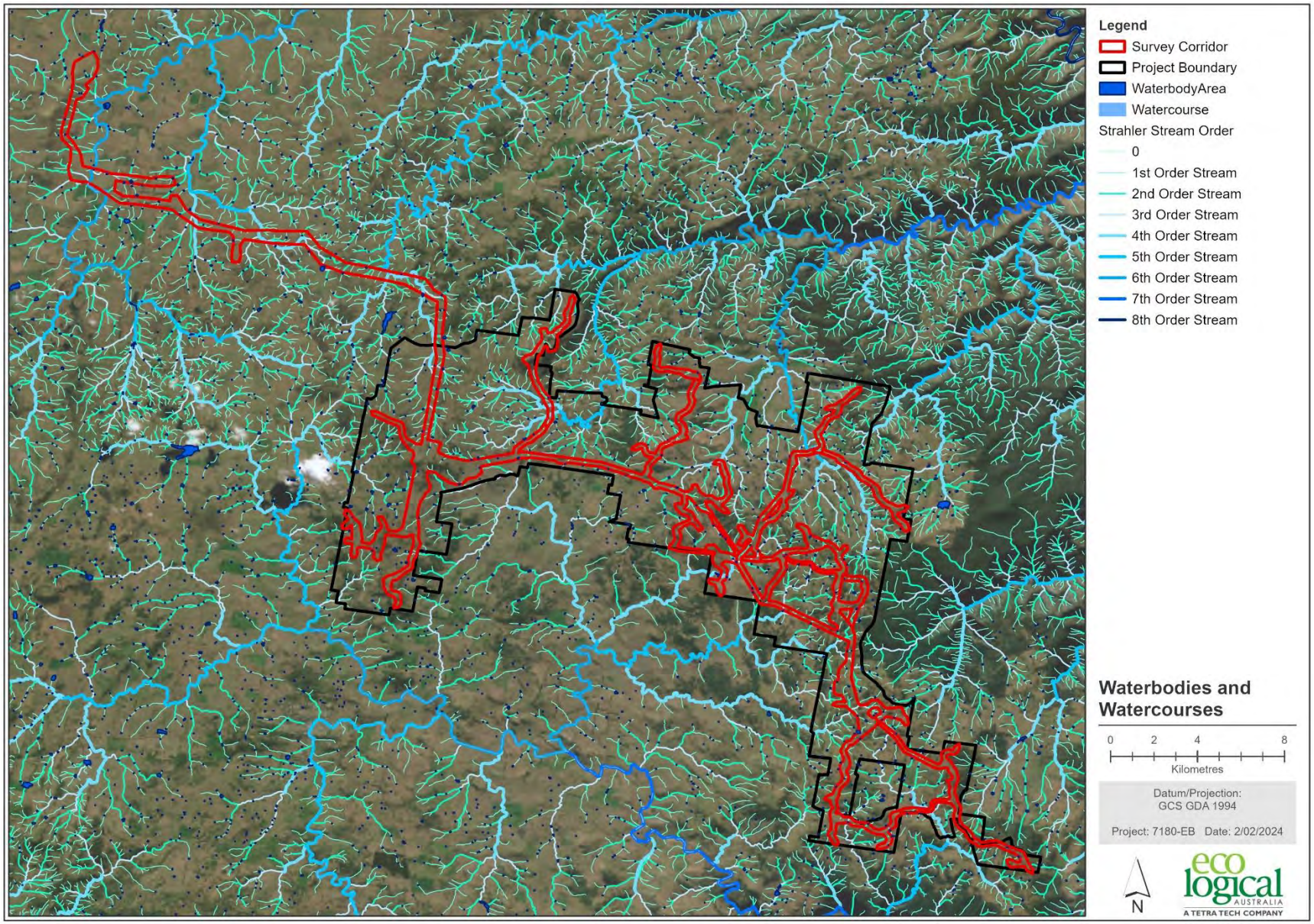

Figure 5. Location of mapped water bodies associated with the Project Site

3.2 Connectivity features

Habitat connectivity is moderate through the survey corridor due to the presence of the network of drainage lines and farm dams. These can be used by the species as a network of lines or stepping stones to move across the landscape when conditions are dryer. The intervening habitats are mostly cleared grazing lands with little cover outside of the patches of retained trees and sometimes remaining grass tussocks and downed timber. Most ponds are likely to be within 200 m of another pond or drainage line, although many of these would be dry or offer very limited protection during the day. So permanent pools or ponds with emergent vegetation and/or surrounding vegetation and cover would be critical resources within this environment and places frogs retreat to when conditions dry out, as was the case in the study by Humphries (1979). The Yellow-spotted Tree Frog can probably easily enough cross the grazing lands during wet periods.

The absence of an extensive road network in the study areas is a positive for maintaining connectivity and it appears unlikely that this will change in any significant way even with the proposed infrastructure for the windfarm as the roads are likely to remain little trafficked.

3.2.1 Areas of geological significance

No important karsts or crevices located within the preliminary survey corridor.

3.2.2 Climate

Key climate statistics for the weather stations located for the Project Site is provided in Table 2. This demonstrates that the Project Site receives moderate rainfall and has a relatively cool climate compared to coastal NSW. This reflects the higher altitude of the Project Site and the colder conditions likely lead to a relatively shorter breeding season and activity period for the species compared to Bell Frogs from more lowland and coastal areas.

Table 2: Climatic statistics for Armidale and Guyra (data from the Bureau of Meteorology)

Rainfall station	Mean total rainfall (mm)	Mean January maximum (°C)	Mean January	Mean July	Mean July
Armidale	1005.9	24.3	13.5	9.6	2.6
Guyra	1062.5	23.0	12.0	8.8	1.7

3.3 Land use history

The Walcha District Historical Society (see https://walchansw.com.au/portfolio/history/) provides the following information on the historic land use in the Walcha area:

The Danggadi people lived in this region for about 6,000 years in the colder months retreated in the gorge country to the east, where fish and animals were plentiful. The tablelands had places for ceremonies and trade of goods, and there are traces of bora grounds near Walcha.

The explorer John Oxley passed through the area in 1818 and named the Apsley River after the secretary of state for the colonies. He also noted the Apsley Falls, the spectacular waterfall where the river begins its descent to the coast. European settlement began in 1832 as squatters moved from the Hunter Valley and from Port Macquarie seeking pastures for their sheep.

The first squatter in the district was a Scot, Hamilton Collins Sempill, who made his base near Oxley's Camp beside a good waterhole on the Apsley River. This became known as Wolka or Walcha. The name perhaps came from an Aboriginal word Wolka. But the spelling and possibly the origins came from the association of the two early pastoral properties- the Walcha run and the Bergen-op-Zoom Run- with places in The Netherlands where the town of Bergen-op-Zoom stands on the Walcheren River. These places were well known to the early settlers because of a major campaign of 1809 called the Walcheren Expedition, fought during the British wars with Napolean.

Other settlers arrived in the 1830s and 1840s, runs were taken up and a town began to appear. In the 1850s and 1860s some of the early squatters were able to start purchasing their runs, and selectors struggled on their smallholdings. The town had its first school and churches established in these years. The population grew in the 1870s with the small gold rushes to Glen Morrison, Tia and Nowendoc. By 1900 the town had almost a thousand people and the surrounding districts another 1600. In Walcha there were four hotels, four blacksmiths, two flour mills and a tannery, as well as over thirty shops.

There was an attempt after disastrous floods in the 1860's to move the town centre up the hill to the west: a former bank, a hotel and some shops stand as witness to this attempt. The town has not changed a lot in the last hundred years: timber has replaced wheat as a major employer, trucking is as prominent an activity as horse and bullock wagons were in the past. The region still relies on fine wool, prime lamb and cattle production, but the pastoral properties employ fewer workers than in the past due to industrial advancements enabling faster, more economical solutions to labour.

Hence, prior to European settlement, the local area would have been covered in native forests and woodlands that were progressively cleared for agriculture, particularly grazing, and with some townships. This still remains the case to this time.

The preliminary survey corridor is zoned as RU1 Primary Production within the Armidale Dumaresq Local Environment Plan (LEP) 2012. The majority of land that surrounds the project site is also zoned RU1 Primary Production, however the Boorolong Nature Reserve (directly north-east and adjacent to the preliminary survey corridor) is zoned as C1 National Parks and Nature Reserves.

The New England Highway is situated approximately 9 km east of the preliminary survey corridor (eastern most extent) and Thunderbolts Way is approximately 7 km south-west of the preliminary survey corridor. Boorolong Road traverses the preliminary survey corridor (north to south direction), intersecting it nearby the township of Dumaresq.

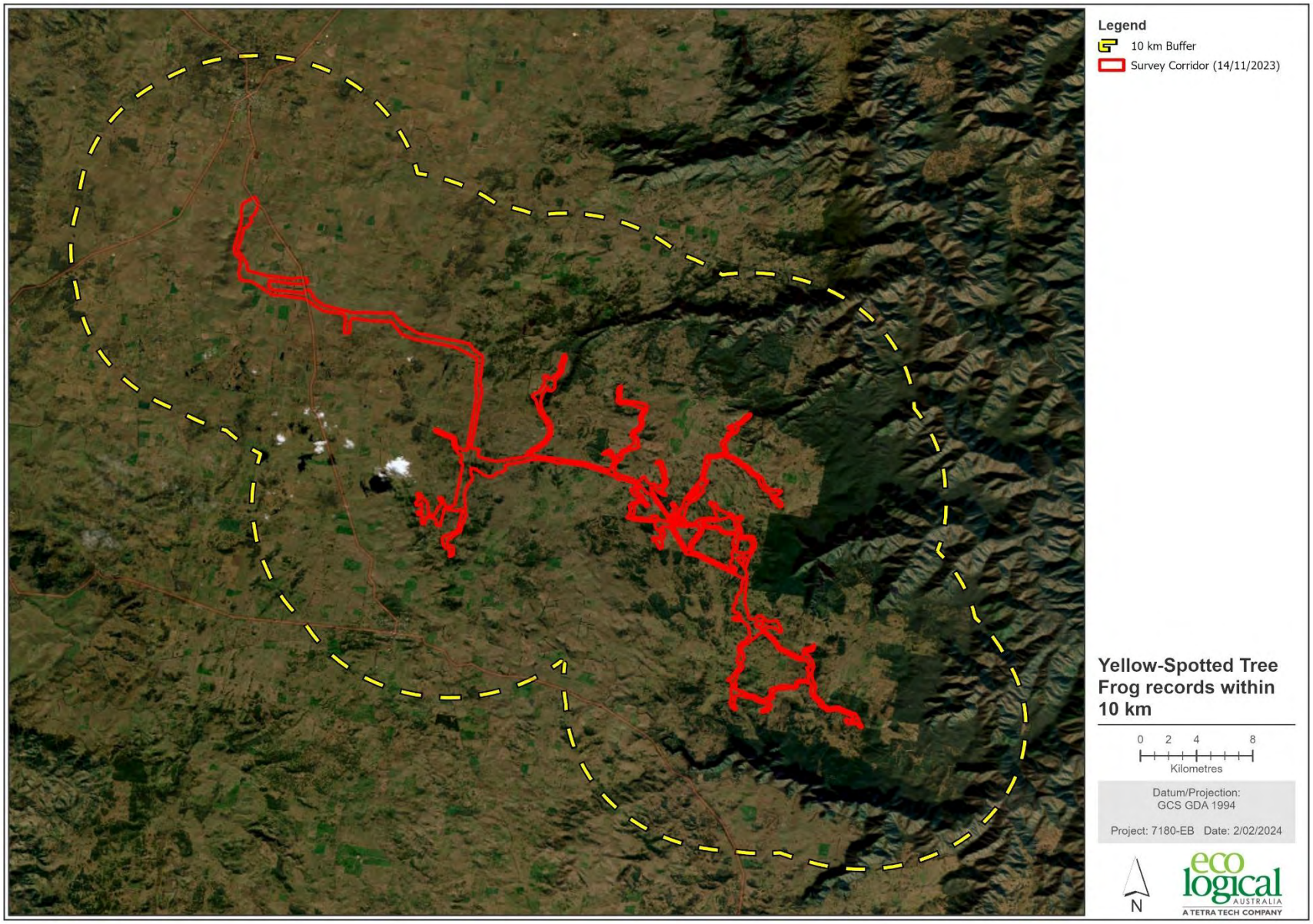

Figure 6: Records of the Yellow-spotted Tree Frog within 10 km of the survey corridor

4. Assessment of GGBF to be present on the Development Site

4.1 Yellow-spotted Tree Frogs in the region

The OEH species profile for the Yellow-spotted Tree Frog indicates that the species is predicted to occur withn the locality of the survey footprint and there are records of the species to the north and to the south. However, those records are all distant (at least 40 km and mostly >100 km) and there has never been an indication of this or any other Bell Frog species being found within or near to the locality. The Yellow-spotted Tree Frog population recorded on the New England Tableland may have been isolated from other populations by a significant geographic gap (Figure 3) and there remains a suggestion that the population may have even potentially been a separate taxa. Given that Bell Frogs are relatively conspicuous frogs and that they were once a common species wherever they occurred, and the lack of success of researchers in finding the species in the area around Walcha (Heatwole et al. 1995), there is reasonably strong evidence to indicate that the Yellow-spotted Bell Frog has never been present in the locality of the proposed Winterbourne Windfarm.

Regardless of the historic range, the ongoing searches for this species across highland areas of norther NSW (e.g. Mahony et al. 2000, D. Hunter pers. comm. 2016 in Threatened Species Scientific Committee 2017, J. Rowley, Pers. Comm.) further indicate the species is absent not just from the study area, but also the New England Tableland broadly. I recognise that the rediscovery of the population near Yass indicates it is still always possible that the species remains somewhere, but the chances appear diminishingly small.

4.2 Subject land as potential habitat

4.2.1 Breeding habitats

There are numerous water bodies present within the development site that form potential breeding habitat, although they were highly variable in quality and nearly all suffer significant and ongoing disturbance from grazing by stock. Aquatic vegetation provides protection from predators for both frogs and tadpoles and also provides a basking location for frogs and so is a very important habitat component. Most sites had little to no fringing sedges or emergent vegetation and so represented what would be relatively poor habitat broadly for the adult frogs as they provided little or no basking or shelter habitat. However, there were a few dams or pools on streams that that were recorded to have moderate (>30%) coverage of emergent vegetation and fringing vegetation. This would be less than 10% of sites based on the site inspection, but these areas could provide core environments that frogs could use most of the time, moving to other aquatic habitats under suitable conditions.

The best temporary flooded habitat would be the overflow and fringes of dams where there were sedges and grasses present that would become emergent vegetation for days to weeks after flooding and so provide protection for eggs and tadpoles. Being shallow, they would also provide warmer waters that tadpoles appear to prefer for development.

Permanent pools along drainage lines are likely to be more useful as foraging, shelter and movement habitat given that fish were seen in some areas and likely will be able to access the streams when they are flowing.

Most ponds would provide potentially suitable habitat for egg deposition and tadpoles, having shallow margins and were little shaded, with likely warm water to aid in tadpole development. As noted, the absence of introduced fish from most isolated water bodies that were observed adds to the belief that they provide

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potential suitable habitat for tadpoles to develop in, even if the adults would not likely use them for any extended periods of time.

4.2.2 Sheltering and foraging habitat

Most dams had little to no fringing vegetation and little evident ground cover (e.g. Plate 9, Plate 10) and drainage lines appeared most likely to form most important shelter habitat, given that they had occasional pools and often had dense grasses and/or sedges growing in the bed adjacent to the pools (Plate 6). These features would allow for the Yellow-spotted Tree Frogs to find some suitable water bodies for their non-breeding activities even without other shelter options such as logs, rocks or in the roots of trees.

Sheltering habitat away from the water bodies is very poor with the site having only occasional scattered down timber or rocks in an otherwise uniform area of low grassy grazing lands. This provides very little in the way of shelter for frogs to use to protect them when moving overland between water bodies and so migratory movements outside of the drainage line may necessarily have to be done in one night to avoid desiccation and predation the following day. These low grassed areas are otherwise considered as favourable migratory pathways for at least the Green and Golden Bell Frog because they are easily traversed (Muir 2008) and Humphries (1979) found Yellow-spotted Bell Frogs migrated each season away from ponds out through grazing lands.

Given the lack of cover in areas adjacent to most water bodies it appears likely that frogs would remain around water bodies to find shelter in the dense vegetation, as recorded by Humphries (1979). This puts them at some risk in winter floods when they are relatively inactive and so vulnerable to being washed out of shelter sites.

Grassy areas are considered to be preferable areas for foraging for the GGBF (Muir, 2008) as they represent open environments where frogs can see prey and easily move to catch them. But the very short cover present and very simple vegetation structure strongly suggests that invertebrate numbers and diversity is very low in this environment and food would be very limited. As for shelter, it is likely the best foraging habitat remains around the water bodies where the tussocks and aquatic environment might provide better habitat for invertebrates and small vertebrates that the frog can eat. And the water bodies have other species of frogs present and the GGBF is well known for eating other frogs (including cannibalising its own species) and so the areas of water would also likely provide favourable foraging along with the fringing vegetation. Hence foraging and shelter habitat looks to be present across the study area, albeit in probably somewhat limited supply.

4.2.3 Dispersal habitat

Assuming that Yellow-spotted Bell Frogs follow similar patterns of movement to those of other Bell Frogs studied, the ponds and drainage lines present within the survey corridor appear to be consistently close enough and extensive enough to allow for regular movements between them by individuals. The drainage line form suitable dispersal habitat, and would be best used after rainfall events when moisture would be retained in the vegetation. The terrain between ponds is easily traversable and this all extends out into the broad locality. Hence the study area and its surrounds broadly provide good dispersal opportunities for the GGBF.

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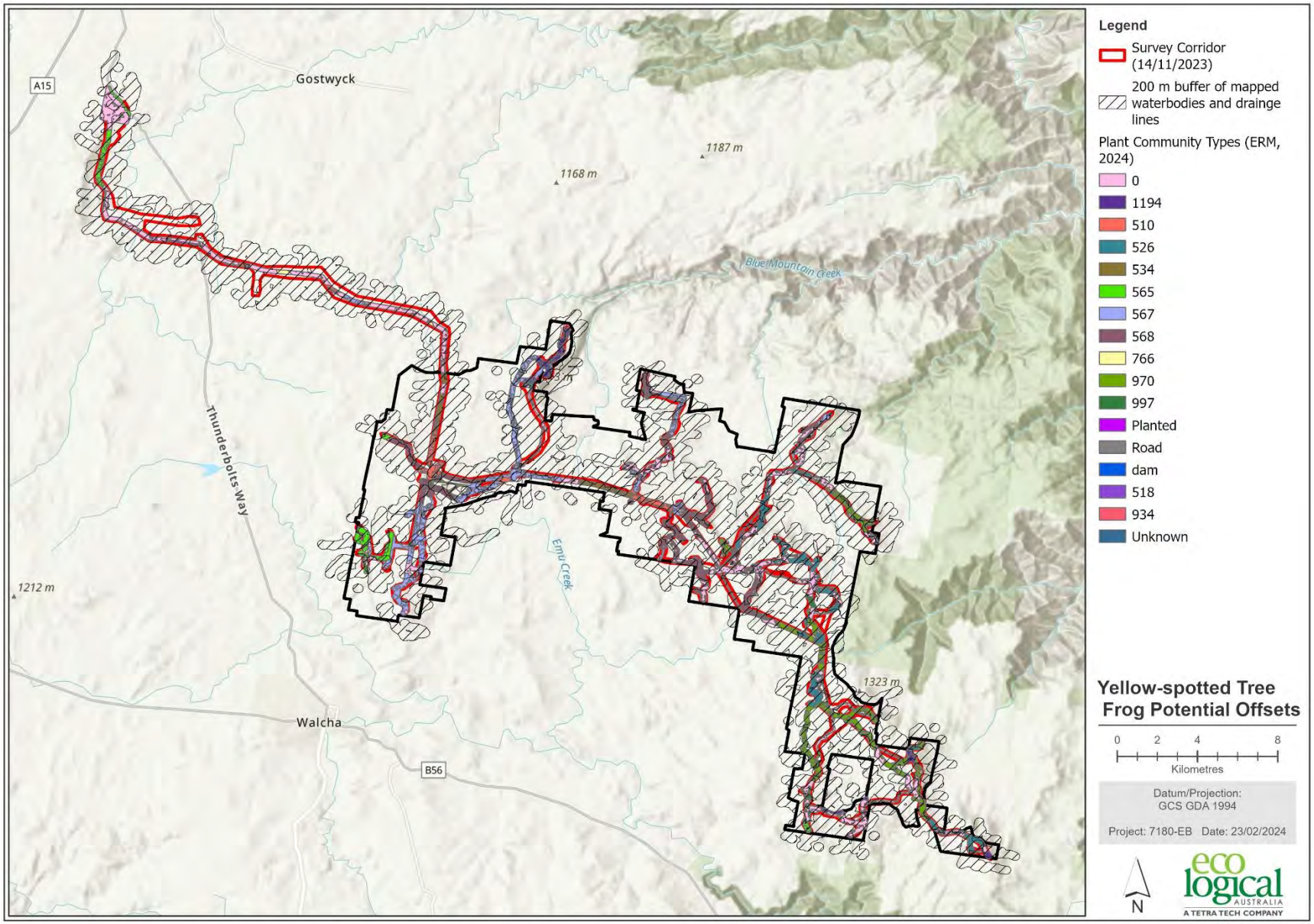

Figure 7: PCTS present within survey corridor and also within 200 m of mapped water bodies

5. Assessment of species presence

5.1 Suitability of habitat on the subject land

The information in Sections 2 and 4 demonstrates the likely ability of the Yellow-spotted Tree Frog to use water bodies located in rural lands and it would appear that sufficient numbers of interconnected pools and ponds are present to provide opportunities for metapopulation processes to take place. Whilst most isolated ponds lack significant emergent or fringing vegetation and surrounding ground cover, there are enough ponds present to likely allow for individuals to use the better sites and still be able to move across the study area and find adequate breeding and shelter opportunities. Thus the environment, whilst not of great quality in the broad sense, still looks potentially useable by the Yellow-spotted Tree Frog. The main issue is the lack of large wetlands that the species was most identified with on the New England Tableland. If the frogs of this region are adapted strongly to living in large and complex wetlands, the current arrangement may be much more marginal, which is supported by the absence of historic records outside of the large swamps near Armidale.

5.2 Historic distribution

In assessing the potential of the Yellow-spotted Tree Frog to be present in the study area, the most significant consideration to me is whether the species was ever present in the locality of the survey corridor? The absence of any records along with the extent of historic and more recent surveys along and the usual ease of detecting Bell Frogs strongly suggests to me that the species was never present within the area around Walcha. Whether this was due to the absence of numbers of larger swamps or some other less obvious factor, the fact remains that the species has not been recorded in the locality and I conclude it was never present.

5.3 Importance of the subject land to the Green and Golden Bell Frog

I conclude that the species was never present within the locality of the survey corridor. Given that, the land would not be important to the species. If it was once present, there is no realistic chance it is now present given all of the efforts to locate it, including the recent efforts of the Australian Museum and people using the FrogID citizen science project to provide a million records of frogs across Australia. The widespread effects of the amphibian Chytrid fungus appears to make it highly unlikely the species could persist given its severe impacts on Bell Frogs (and many other species) throughout the east coast and adjacent ranges where sites are more than 10 km from coastal waters (Mahony et al. 2013).

Broadly speaking, the site contains a sufficient variety of closely located water bodies and drainage lines that it would seem likely that the species would be able to maintain populations if it could colonise the locality. The lands immediately surrounding the survey corridor provide no barrier to dispersal and so a population could move more broadly into and out of the study area if a population could somehow establish. Two PCTs present within the survey corridor are considered to be used by the Yellow-spotted Tree Frog with 0.563 ha of PCT 518 and 33.399 ha of PCT 766 being located both within the survey corridor and within 200 of potential breeding habitat (Figure 7).

Based on the BAM guidelines (DPIE 2020) the following applies when assigning any species polygon for the GGBF:

> *The species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 200 m radius from the top of bank. The polygon should include minimum 50 m wide corridors of native and non-native vegetated areas linking the*

available water bodies, where relevant.

As there are no records for the species in the subject land at any time, and none in the locality, and as I consider that the Yellow-spotted Tree Frog was not ever present within the locality, there is no reason to produce a polygon to protect PCTs within a 200 m radius of the available ponds.

On a final note, if the species was ever to be located in the final footprint of the Winterbourne Windfarm, or for any other location, it is not possible to conceive how an offset could be calculated for the species. There would be no other populations or areas that could be used as an offset and any extant population would be so valuable that it would be essentially impossible to justify its destruction for a development. For a development such as a windfarm, the most logical and simplest answer would be to exclude any development from directly or indirectly impacting the habitat being used by the species.

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7. Appendix A Dr Frank Lemckert CV

Frank Lemckert **PRINCIPAL SCIENTIFIC ECOLOGIST**

Frank has been a professional scientist since 1992, specialising in understanding and managing the ecology and management of threatened species. Frank has conducted ecological work throughout eastern Australia (NSW, Victoria, Queensland), establishing long-term research and monitoring programs into the management of fauna and developing strategies to mitigate the impacts of human disturbances. He has worked extensively with the NSW state and federal Governments on varying issues of fauna and flora management including the preparation of a draft NSW/National recovery plan for the Giant Burrowing Frog (*Heleioporus australiacus*) and recent expert review roles on fauna management plans and monitoring strategies for the NSW Natural Resources Commission. Frank is an accredited expert under the NSW Biodiversity Assessment Method (BAM) for a range of threatened frogs and wrote the BAM survey guidelines for NSW's threatened frogs. Frank has prepared reports on endemism and representation in reserves of flora and fauna for the Commonwealth, represented the NSW Forestry Commission in license negotiations for the Comprehensive Regional Assessment process (2000), been a member of a state regulators advisory group for the management of Cane Toads across Australia and the Taren Point Cane Toad Advisory Group, and provided expert ecological advice on illegal land clearing for the NSW and Commonwealth Governments. He has authored over 90 peer-reviewed publications. Frank is a research associate with the Australian Museum and University of Newcastle and convenor of the NSW Declining Frog Working Group. He is a recognised expert in frog ecology and management, but has completed management related projects and works on a range of terrestrial vertebrate fauna.

Frank's primary role as a consultant has been to use his expertise and experience in technical writing and threatened species legislation to develop and maintain quality assurance in project reporting including:

- Species Impact Statements.
- >100 flora and fauna reports and assessments of significance using the EP&A Act and EPBC Act.
- Biodiversity Assessment Reports for Warragamba Dam Raising, Nowra Bridge, Golden Highway and Eurobodalla Dam.
- Manager for the Oxley Highway to Kempsey and Frederickton to Eungai ecological monitoring program.
- Lead fauna survey design for the HumeLink transmission line project for Snowy Hydro 2.0.
- Complete targeted survey and monitoring works for threatened frog species including Giant Barred Frogs, Wallum Froglets, Green-thighed Frog and Green and Golden Bell Frogs.
- Construction and Environmental Management Plans, Monitoring Plans and Vegetation Management Plans for roads at Port Macquarie, Berry to Bomaderry and South Nowra.
- Nest Box, microbat and Green and Golden Bell Frog management plans for the Berry to Bomaderry and Oxley Highway to Kempsey Highway Upgrades.
- Review of monitoring strategies for the Woolgoolga to Ballina and Warrell Creek to Nambucca Heads programs for the Pacific Highway Upgrade.
- Review of two proposed Coal Seam Gas Impact Assessment methods for Matters of National Environmental Significance (contracted by the Commonwealth Government).
- Provision of species credit species expert reports for the Warragamba Dam raising project and Western Sydney Growth Centres Biocertification.

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- Roadside mapping, survey and management strategies for the Wallum Froglet and Mahony's Toadlet.
- Develop frog and reptile survey guidelines and impact offset guidelines for the Biodiversity Assessment Method.

QUALIFICATIONS

- Bachelor of Science, University of Sydney, 1984 (Terrestrial Ecology and Marine Management)
- Master of Science, University of Sydney, 1991 (Population biology of the Common Froglet)
- PhD, University of Newcastle, 2009 (Management of forest frogs in timber production forests of NSW).

PROJECT EXPERIENCE

ECOLOGICAL IMPACT ASSESSMENT

- MONITORING OF BAT POPULATIONS AND ASSESSMENT OF POTENTIAL IMPACTS OF THE PROPOSED JEREMIAH WINDFARM AT ADJUNGBILLY, NSW (2019-PRESENT).
- MANAGEMENT OF IMPACTS ON GREEN AND GOLDEN BELL FROGS FOR THE KIWEF PROJECT AT KOORAGANG ISLAND, NSW FOR DARACON (2019-PRESENT).
- IMPACT ASSESSMENTS FOR HOUSING DEVELOPMENTS ON KOALAS IN THE CAMPBELLTOWN AREA (PRIVATE DEVELOPMENT AND CAMPBELLTOWN COUNCIL (2019)
- EXPERT REPORT ON THE GREEN AND GOLDEN BELL FROG FOR TWO WESTERN SYDNEY GROWTH AREAS BIOCERTIFICATION PROJECT (2018-PRESENT)
- WARRAGAMBA DAM RAISING PROJECT TARGET SURVEYS, IMPACT ASSESSMENTS, EXPERT REPORTING (SIX SPECIES) AND Q/A FOR WATER NSW (2018-19)
- GRANITE HILLS WINDFARM BIRD AND BAT STRIKE MODELLING AND ECOLOGICAL IMPACT ASSESSMENT, NIMMITABEL, AKUO ENERGY (2018) AND ELYSIAN WINDFARM, NIMMITABEL, AKUO ENERGY (2018)
- VEGETATION REMOVAL AND THREATENED FROG MANAGEMENT STRATEGIES, NEW INTERCITY FLEET MANAGEMENT FACILITY, JOHN HOLLAND GROUP (2018-PRESENT)
- NOWRA BRIDGE EIS ECOLOGICAL ASSESSMENTS, NSW RMS (2018)
- HEATHCOTE ROAD UPGRADE IMPACT ASSESSMENT AND REVIEW OF MITIGATION MEASURES, NSW RMS (2018-2019)
- EUROBODALLA DAM BIODIVERSITY ASSESSMENT REPORT, EUROBODALLA SHIRE COUNCIL (2017-18).

GOVERNMENT REVIEWS/REPORTS

- BIODIVERSITY ASSESSMENT METHOD FROG SURVEY GUIDELINES FOR SPECIES CREDIT SPECIES (2020)
- EXPERT WORKSHOP TO DEVELOP A NSW-WIDE NIL-TENURE FAUNA MONITORING PROGRAM, NSW NATURAL RESOURCES COMMISSION (2020)
- REVIEW OF SPECIES MANAGEMENT PLANS FOR THE YELLOW-BELLIED GLIDER, GIANT BURROWING FROG, EASTERN BRISTLEBIRD AND SOUTHERN BROWN BANDICOOT PREPARED UNDER THE NSW THREATENED SPECIES LICENSE FOR FORESTRY OPERATIONS, NSW NATURAL RESOURCES COMMISSION (2019)
- PROVISION OF INFORMATION AS THE BASIS FOR THE DEVELOPMENT OF SIX THREATENED FLORA SPECIES MANAGEMENT PLANS TO BE PREPARED UNDER THE NSW THREATENED SPECIES LICENSE FOR FORESTRY OPERATIONS, NSW NATURAL RESOURCES COMMISSION (2019)
- EXPERT REVIEW OF BIODIVERSITY IMPACT ASSESSMENT REPORT FOR THE HORNSBY QUARRY REHABILITATION PROJECT (2019)
- HORNSBY COUNCIL EXPERT WITNESS FOR DEVELOPMENT IMPACTS AT DURAL, HORNSBY SHIRE COUNCIL (2016)

- EXPERT ADVICE ON IMPACTS OF ILLEGAL LAND CLEARING AT EVANS HEAD, NSW STATE GOVERNMENT (2016)
- EXPERT ADVICE ON IMPACTS OF ILLEGAL LAND CLEARING AT SOMERSBY, COMMONWEALTH GOVERNMENT (2015)
- REVIEW OF MONITORING STRATEGIES FOR THE WOOLGOOLGA TO BALLINA AND WARRELL CREEK TO NAMBUCCA HEADS PROGRAMS FOR THE PACIFIC HIGHWAY UPGRADE, NSW RMS (2014)
- REVIEW OF IMPACT ASSESSMENT PATHWAYS FOR TWO LPNG PROJECTS, COMMONWEALTH GOVERNMENT (2013)
- REVIEW OF THREATENED SPECIES MODELLING IN FORESTRY AREAS, VIC FORESTS (2012)
- FLORA AND FAUNA REPRESENTATION IN THE AUSTRALIAN RESERVE SYSTEM, COMMONWEALTH GOVERNMENT (2010)
- FLORA AND FAUNA ENDEMISM PATTERNS ACROSS AUSTRALIA, COMMONWEALTH GOVERNMENT (2009)
- REVIEW IMPACTS TO THREATENED REPTILES AND AMPHIBIANS IN THE SOUTHERN BRIGALOW BELT, FOR WPS (2008)
- EXPERT REPRESENTING FORESTS NSW IN THE COMPREHENSIVE REGINAL ASSESSMENT PROGRAM FOR THE REGIONAL FOREST AGREEMENT PROGRAM (1999-2001)
- EXPERT REVIEW OF FAUNA AND FLORA IMPACTS FOR 13 NSW FORESTRY COMMISSION EIS REPORTS (1992-94).

EPBC REFERRALS

- AUSTEN QUARRY (*EUCALYPTUS PULVERULENTA*), HARTLEY, HY-TEC INDUSTRIES (2014-15)
- MARYS MOUNT KOALA (*PHASCOLARCTOS CINEREUS*) REFERRAL, GUNNEDAH QUARRY PRODUCTS (2015)
- GREEN AND GOLDEN BELL FROG (*LITORIA AUREA*) REFERRALS FOR THE PRINCES HIGHWAY UPGRADE AT SOUTH NOWRA, NSW RMS (2011-2012).

MONITORING PROGRAMS

- NIL-TENURE FERAL MANAGEMENT AND MONITORING STRATEGY FOR THE NARRABRI COAL SEAM GAS PROJECT, SANTOS (2019).
- THREATENED FAUNA MONITORING HUME HIGHWAY, KAPOOKA, NSW RMS (2018)
- GREEN AND GOLDEN BELL FROG BASELINE MONITORING PROGRAM AT MEROO LAKES, NSW OEH (2016-17)
- OXLEY HIGHWAY TO KEMPSEY THREATENED BIODIVERSITY MONITORING, NSW RMS (2013-2017)
- FCNSW STATE-WIDE ECOLOGICAL MONITORING PROGRAM, FORESTRY CORPORATION OF NSW (2009-10)

PLANS OF MANAGEMENT / STRATEGIES

- GREEN AND GOLDEN BELL FROG PRE-CLEARING WORKS KOORAGANG ISLAND (DARACON 2016 & CURRENT)
- REVIEW OF SPECIES MANAGEMENT PLANS FOR THE YELLOW-BELLIED GLIDER, GIANT BURROWING FROG, EASTERN BRISTLEBIRD AND SOUTHERN BROWN BANDICOOT PREPARED UNDER THE NSW THREATENED SPECIES LICENSE FOR FORESTRY OPERATIONS, NSW NATURAL RESOURCES COMMISSION (2019)
- PROVISION OF INFORMATION AS THE BASIS FOR THE DEVELOPMENT OF SIX THREATENED FLORA SPECIES MANAGEMENT PLANS TO BE PREPARED UNDER THE NSW THREATENED SPECIES LICENSE FOR FORESTRY OPERATIONS, NSW NATURAL RESOURCES COMMISSION (2019)
- NESTBOX, MICROBAT AND GREEN AND GOLDEN BELL FROG MANAGEMENT PLANS, BERRY TO BOMADERRY UPGRADE OF THE PRINCES HIGHWAY, NSW RMS (2017)
- GREEN AND GOLDEN BELL FROG SURVEYS AND MONITORING, PRINCES HIGHWAY UPGRADES AT SOUTH NOWRA AND BERRY TO BOMADERRY, NSW RMS (2012-2017)
- THREATENED FROG MODELLED HABITAT REQUIREMENTS, HORNSBY SHIRE COUNCIL (2016)
- MICROBAT MANAGEMENT PLAN FOR CLARENCETOWN BRIDGE, NSW RMS (2016)

- EASTERN BENTWING-BAT MANAGEMENT PLAN, GERRINGONG, NSW RMS (2014)
- GREEN AND GOLDEN BELL FROG MANAGEMENT STRATEGY, PRINCES HIGHWAY UPGRADE, NSW RMS (2012-2014)
- EXPERT REVIEW OF THREATENED FROG MANAGEMENT PLAN - WOOLGOOLGA TO BALLINA UPGRADE, NSW RMS (2014)
- THREATENED MICROBAT MANAGEMENT PLAN FOR WARRINGAH MALL, NORTHERN BEACHES COUNCIL (2014)
- COMMONWEALTH/NSW GIANT BURROWING FROG RECOVERY PLAN, DEWHA/DECC (2012)
- NSW DPI REPRESENTATIVE FOR THE NATIONAL ADVISORY GROUP ON CANE TOAD MANAGEMENT (2009-2011)
- TAREN POINT CANE TOAD MANAGEMENT ADVISORY GROUP (2007-2008).

TRAINING

- LEAD INSTRUCTOR > 50 WILDLIFE TRAINING SCHOOLS RUN IN NSW, ACT AND VICTORIA PROVIDING PRESENTATIONS ON THE SURVEY, IDENTIFICATION AND MANAGEMENT OF ALL FLORA AND FAUNA. THIS INCLUDED DETAILED INSTRUCTION ON THE MANAGEMENT OF THREATENED WADING AND AQUATIC BIRDS AND OTHER AQUATIC SPECIES PRESENTED TO QUEENSLAND, VICTORIAN, NSW AND COMMONWEALTH GOVERNMENT STAFF (1993-2017)
- PRIVATE FORESTRY SURVEY REQUIREMENTS, VICTORIAN TIMBER (2016).

PUBLICATIONS

Book Chapters

Hecnar S. J., & Lemckert, F.L. 2012. Habitat Protection: Refuges and Reserves. Pp 3636-3675 In Biology of the Amphibia Volume 10 - Conservation and Decline of Amphibians: Ecology, Effects of Humans, and Management. H. Heatwole (Ed.). Surrey-Beattey and Sons, Sydney.

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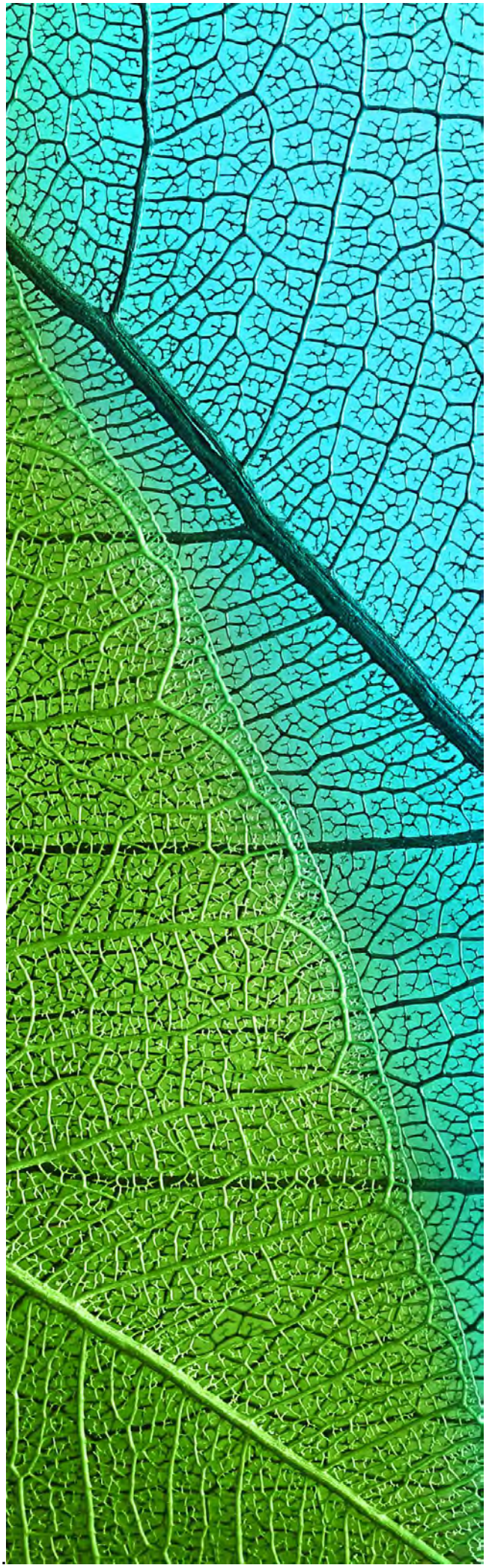
APPENDIX H BIRD UTILISATION AND RAPTOR SURVEYS 2020 – 2022 (NATURE ADVISORY, 2022)



Winterbourne Wind Farm

Bird Utilisation and Raptor Surveys 2020 - 2022

Prepared for NGH consulting

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Report No. 19180.02 (1.3)

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1. Introduction

NGH Consultants Pty Ltd engaged Nature Advisory Pty Ltd to implement bird and bat surveys for the Winterbourne Wind Farm, 30km east of Walcha in the northern tablelands of NSW. This investigation was commissioned to provide baseline data on the utilisation by birds and bats of the wind farm site. This report presents the methods, results and findings of the bird utilisation and raptor surveys. The results of the bat surveys are presented in another report.

The bird utilisation survey (BUS) was undertaken consistent with the requirements for a "Level One" bird risk assessment in accordance with 'Wind Farms and Birds - Interim Standards for Risk Assessment' issued by the Australian Wind Energy Association (AusWEA 2005) and endorsed by the Clean Energy Council's Best Practice Guidelines for Wind Energy Developments in Australia (2018).

The raptor surveys were undertaken consistent with the requirements of the NSW Office of Environment and Heritage. All observed raptors were recorded and flight paths plotted.

Three pre-construction bird utilisation and raptor surveys were undertaken by experienced zoologists in spring 2020, autumn 2021 and summer 2022 to account for seasonal differences in bird activity and presence of species (due to migration). The dates and surveyors are detailed below.

- **Spring:** October 2020 (Dr Ahmad Barati and Candice Larkin)
- **Autumn:** March and April 2021 (Candice Larkin)
- **Summer**: January 2022 (Dr Ahmad Barati and Peter Lansley).

This report is divided into the following sections.

Section 2 describes the methods used and presents results for the bird utilisation survey

Section 3 describes the methods used and presents the results for the raptor survey

Section 4 provides conclusions in relation to bird activity and observed species of concern.

This investigation was undertaken by a team from Nature Advisory comprising Ahmad Barati (Zoologist), Candice Larkin (Zoologist), Peter Lansley (Senior Zoologist), Curtis Doughty (Senior Zoologist), Bernard O'Callaghan (Project Manager) and Brett Lane (Principal Consultant).

2. Bird Utilisation Survey

2.1. Methods

2.1.1. Fixed-point bird count method

The fixed-point bird count method involved an observer stationed at a survey point for 15 minutes. The adequacy of using 15 minutes as an interval to record the presence of birds during bird utilisation surveys was investigated in an earlier study at another wind farm site (Brett Lane & Associates Pty Ltd, unpublished data). This showed that 82 to 100 percent (average 88 percent) of species actually seen in one hour of surveying were seen in the initial 15 minutes of observation. Based on this result, the period of 15 minutes used in the formal bird utilisation surveys was considered adequate to generate representative data on the bird species in the area during the survey.

During this period of observation, all bird species and numbers of individual birds observed within 200 metres were recorded. The species, the number of birds and the height of the bird when first observed were documented. For species of concern (threatened species, waterbirds and raptors), the minimum and maximum heights were recorded.

Flight height was recorded in 10 metre intervals up to 60 metres, 20 metre intervals up to 120 metres then as 'above 120 metres'. The data are presented as below, at or above rotor swept area (RSA) height.

For Winterbourne Wind Farm (hereafter WWF) these heights are detailed below:

- A = Below RSA (< 40 metres above ground)
- B = At RSA (40 – 150 metres above ground)
- C = Above RSA (> 150 metres above ground).

2.1.2. Timing of bird surveys

The location of Bus points is shown in Figure 1. Table 1 and Table 2 indicate when each point was counted on each survey day. This schedule ensured that all points were visited equally during four different times of day to allow for time-of-day differences in bird movements and activity. The periods were:

- Before 10.00am;
- 10.00am to 12.30pm;
- 12.30 pm to 2.30 pm; and
- After 2.30 pm.

Every survey point (impact and reference) was visited eight times over the survey period

The bird utilisation surveys were undertaken during eight days in October 2020, six days in March-April 2021 and 5 days in January 2022 (Table 1). The timing included suitable periods for surveying birds. The spring survey gathering data on species richness during the breeding season and when spring/ summer migrants visit the wind farm area. The autumn survey covered a period when bird populations are usually at their maximum abundance following summer recruitment.

This schedule ensured that all points were visited at all times of day equally in both seasons, so that no time-of-day or seasonal biases affected the pooled count data.

Table 1: Fixed-point count schedule for each fixed-point bird count survey day (Oct 2020, Mar-Apr 2021, Jan 2022)

	Time/ date	5-Oct	6-Oct	10-Oct-	11-Oct	13-Oct	14-Oct	15 Oct-	16-Oct
Spring 20	8:00				REF1		BUS5	BUS5	
	8:30	BUS3	BUS1	REF1	BUS4	BUS8	BUS6	BUS6	
	9:00	BUS1	BUS3	BUS4		RF2	RF2		
	9:30		BUS2	BUS2		BUS7	BUS8	BUS7	
	10:00				BUS1			BUS8	BUS5
	10:30	BUS4	BUS4	BUS3	BUS2		BUS7	RF2	BUS6
	11:00	REF1	REF1	BUS1			BUS8	BUS7	
	11:30			BUS2	BUS3	BUS5	RF2	BUS6	
	12:00		REF1	BUS1	BUS3				
	12:30		BUS4		BUS1	BUS6	BUS5	BUS5	
	13:00			REF1	BUS2	RF2		BUS8	
	13:30			BUS4		BUS8	BUS7		
	14:00	BUS2	BUS3			BUS7	RF2	BUS6	
	14:30			BUS3	BUS2	RF2	BUS7	BUS5	
	15:00	REF1	BUS1			BUS8	BUS8	BUS6	
	15:30			BUS2			RF2	BUS5	
	16:00	BUS1	BUS3		REF1		BUS7	BUS6	
	16:30			BUS4	BUS4				
Autumn 21	Time/ date	8-Mar-	2-Apr	6-Apr	8-Apr	20-Apr	22-Apr		
	7:30					BUS6			
	8:00		RF2	BUS7	BUS3	RF1			
	8:30		BUS8	BUS9	BUS2	BUS4, RF1	BUS3		
	9:00		BUS9	BUS8	BUS6	BUS5	BUS5		
	9:30		BUS7	RF2		BUS4	BUS2		
	10:00			BUS6	BUS4, RF1	BUS3			
	10:30		BUS2	BUS8	BUS4	BUS5	BUS9		
	11:00		BUS6	BUS9	RF1	BUS3	BUS7		
	11:30	BUS2	RF2	BUS7, BUS8	BUS5				
	12:00		BUS8	RF2	BUS6	RF1			
	12:30	BUS4	RF2	BUS9	BUS2	BUS5	BUS4		
	13:00		BUS7	BUS7					
	13:30		BUS2	BUS9, BUS8		BUS3	RF1, BUS3		
	14:00		BUS6			BUS5			
	14:30	BUS3	RF1		BUS8, RF2	BUS4, BUS6	BUS5		
	15:00		BUS6		BUS7				
	15:30				BUS9	BUS2	BUS3		

	16:00				BUS7, BUS9	BUS5, BUS4			
	16:30				BUS8	RF1			
	17:00				RF2	BUS2			
Summer 22	Time/ Date	3-Jan	4-Jan	5-Jan	6-Jan	7-Jan			
	6:30					BUS 8			
	7:00				BUS2	REF2			
	7:30			BUS3	BUS 7				
	8:00			BUS 13	REF1	BUS 13			
	8:30			REF 2/REF1	BUS 8/BUS4	BUS2			
	9:00			BUS 12		BUS 7			
	9:30		BUS3	BUS4	BUS12/ BUS5	BUS5			
	10:00		BUS 7	BUS 8/BUS3	REF2/R EF1				
	10:30	BUS 8				BUS 12			
	11:00	BUS2	REF1	BUS5	BUS 13/BUS 5	BUS4			
	11:30	BUS2	BUS 13	BUS 7	BUS 12				
	12:00		REF 2/BUS4						
	12:30		BUS 12	BUS13/ BUS3		BUS 8			
	13:00	BUS 7/REF1		REF2/B US2					
	13:30	REF1	BUS8/B US5		BUS 8	BUS7/B US2			
	14:00	BUS4		BUS12/ BUS5	REF 2	BUS3			
	14:30	REF2/B US4	BUS 13			BUS3			
	15:00		REF2/B US2	REF1					
	15:30		BUS 12	BUS4		BUS3			
	16:00	BUS12/ BUS5	BUS3	BUS 7					
	16:30	BUS5	BUS 8	REF1		BUS2			
	17:00	BUS 13			BUS 13	BUS4			
	17:30		BUS 7						

Note: See Figure 1 for survey point locations. The prefix 'RF' refers to reference points and BUS to impact points. See below for explanation of changes in points.

2.1.3. Locations of survey points

Ten fixed survey points were established: eight impact points and two reference points. Impact points were located near proposed turbine sites and reference points were located at least 500 metres away from proposed turbine sites in areas of similar habitat (see Figure 1). In autumn 2021, BUS 1 was replaced by a new BUS 9 point and in summer 2022, BUS 1 and BUS 9 were abandoned and replaced

by BUS 12 and BUS 13. The changes in some of the BUS points was necessitated by change in the basic layout of the turbines and weather-related access constraints.

The survey points were distributed as evenly as possible (subject to access constraints) across the wind farm to sample the various habitat types and maximise coverage in areas where wind turbines are proposed (Figure 1). Impact points were positioned on elevated ground, allowing a clear view in all directions. Table 2 below provides a description of the habitats associated with each impact and reference point.

Table 2: Habitat associated with each BUS point at Winterbourne Wind Farm

Survey Point	Habitat Description
BUS1	Located on the top of the ridge, scattered stringybark with grass understory.
BUS2	Sheep pasture with a few paddock trees, and one riparian strip close by.
BUS3	Scrappy stringybark timbered ridge adjacent to pasture.
BUS4	Stringybark grassland ridge.
BUS5	Sheep pasture with few, small scattered trees, approximately 500m away from woodland patch.
BUS6	Dirt road on side of sloped wooded paddock, with some shrub ground cover.
BUS7	Mid-slope pasture surrounded by open woodland with mature New England Peppermint (*Eucalyptus nova-anglica*) and Blakely's Red Gum - adjacent to large ridge.
BUS8	Pasture surrounded by open woodland with mature New England Peppermint and small tree ferns.
BUS9	Top of ridge in cleared grassland paddock.
BUS12	Cleared mixed native and exotic pasture on a saddle between two hills, scattered paddock eucalypts and some bracken and little or no shrub cover with few fallen branches.
BU13	Ridge line, with cleared pasture, mostly exotic grass and forest block close by to the south-east and degraded understorey.
Ref1	Stringybark grassland gully with stream.
Ref2	Open paddock near roadside with scattered mature New England Peppermint and stringy bark.

2.1.4. Incidental observations

In addition to the observations during fixed-point counts, incidental observations of birds of concern (threatened species, raptors, waterbirds) were made whilst travelling throughout the wind farm site. Notes are also made on woodland birds observed in remnant woodlands and any early morning and evening roosting movements. Emphasis was placed on observing birds that were moving through the site at RSA height.

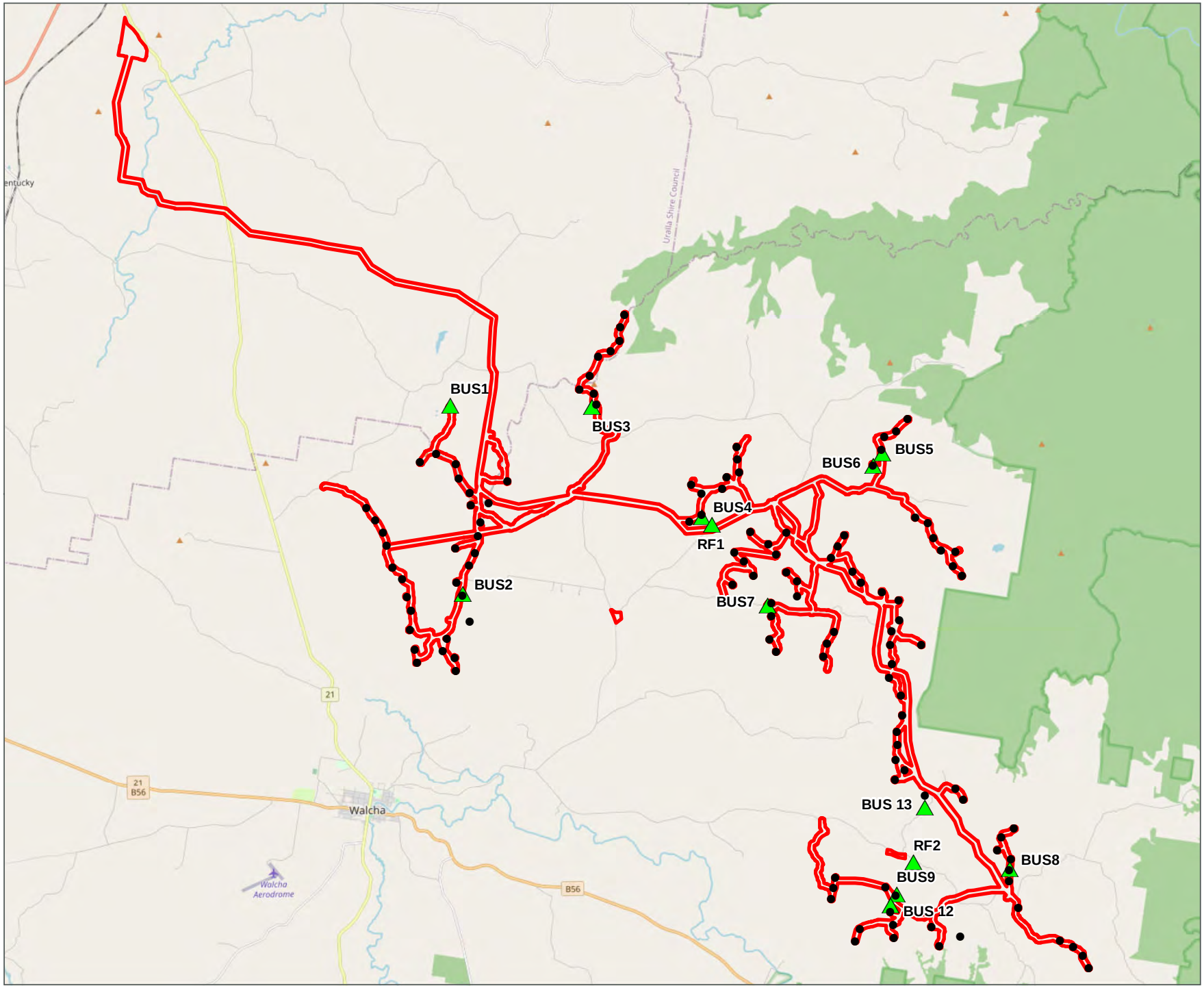


Figure 1: Location of bird utilisation survey sites at WWF

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 17/01/2022

- Winterbourne wind farm boundary
- Proposed turbine
- BUS points

N

Metres
0 2,000 4,000

Nature Advisory
PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
03 9815 2111 - info@natureadvisory.com.au

2.1.5. Data preparation and statistical analysis

All observations were recorded in pre-defined data sheets. Raw data were then entered into an Excel spreadsheet, and tables and graphs were extracted. Graphs were generated in Microsoft Excel and R (R Core Team 2018). First, the suitability of the survey method was checked using a cumulative species number graph (Figure 2). Frequency of observation of each species (i.e. the number of surveys in which a species was detected) was determined for impact and reference points separately. The distribution of individuals in height categories was calculated as a percentage for impact and reference points. To investigate the variations of species diversity and abundance between impact and reference points, analysis of variance (ANOVA) was performed, with number of species (termed 'species diversity' here) and abundance as dependent factors and points type (impact/reference) as the predicting parameter. Abundance data were log-transferred to meet normal distribution in ANOVA tests. All statistical analyses were undertaken in R environment (R Core Team 2018).

2.1.6. Limitations

The purpose of the surveys was to collect data on the usage of the site by resident and migratory birds. For these reasons, the utilisation rates and species relative abundances recorded during the current surveys are representative of the site for the period covered as they take into consideration time-of-day and seasonal differences in bird activity and species occurrence. They are therefore considered to provide a valid basis on which to assess the bird risks associated with the WWF.

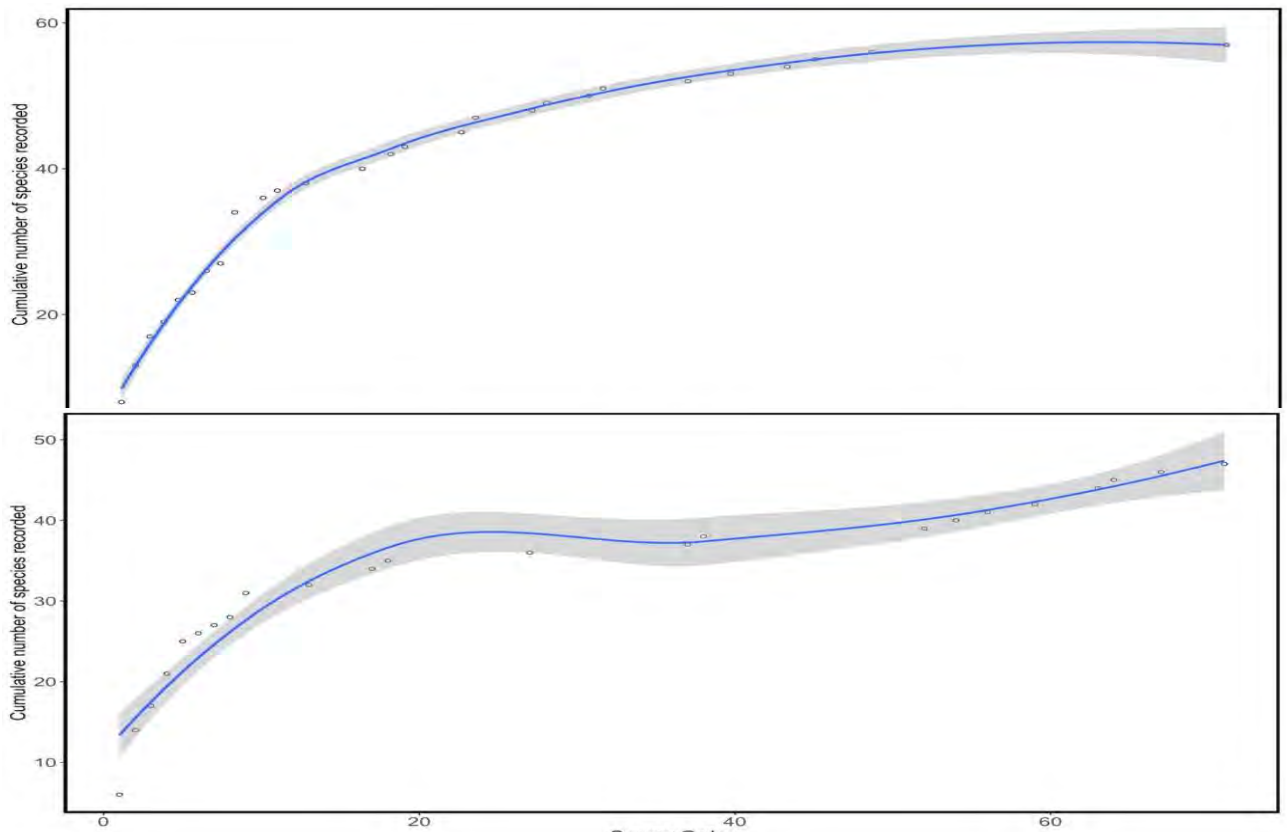
2.2. Results

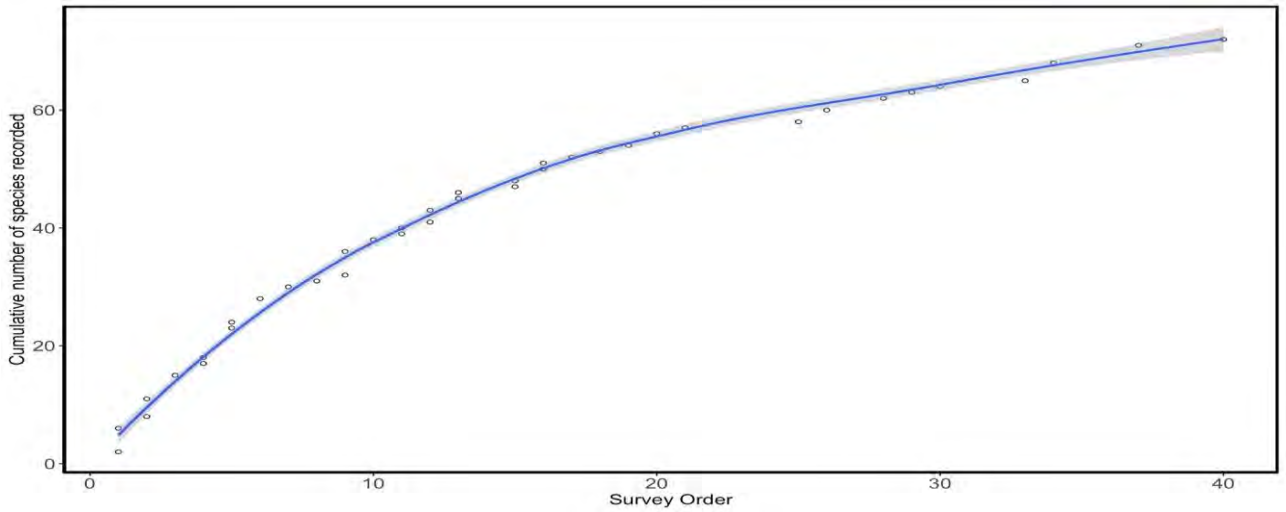
2.2.1. Survey suitability

The cumulative number of species observed from the consecutive fixed-point bird counts conducted at the observation points during the BUS are plotted in Figure 2.

The cumulative species–count sequence curve shows a clear asymptote for the three surveying periods, suggesting that the number of new species added to the diversity levelled off after around 50 counts in the spring and summer BUS and about 30 counts in the autumn BUS, with only a few species added afterwards. This supports the adequacy of using eight replicates to generate representative data on the bird species in the area during the survey period.

Figure 2: The cumulative number of species of birds recorded during consecutive counts of the Spring (upper), autumn (middle) and summer (lower) BUS at WWF





2.2.2. *Species composition*

The number of bird species recorded during BUS was over 90 species. A total 65 bird species were recorded during the spring 2020 and autumn 2021 surveys, and a total of 72 bird species were recorded during the summer 2022 survey. Of all species recorded, 64 species were recorded at the impact points and 35 at the reference points during spring and autumn and 67 and 29 birds respectively at the impact and reference points in summer 2022 (Table 3).

Species recorded were predominantly farmland and bushland species with some records of raptors and waterbirds. Total utilisation (cumulative counts) of each species recorded at the observation point is presented in Table 3 for the impact sites and Table 4 for the reference sites.

Species diversity varied between the three seasons. Diversity was highest in summer and lowest in autumn. Species composition (diversity) differs between months due to seasonal changes in presence and abundance of migratory species, changes in foraging behaviour and seasonal distribution of birds among various habitats.

The five most common species (percent of total birds recorded during the three seasons) at the impact and reference points are presented below.

Impact points	Reference points
1. Australian Magpie (12.5%),	Eastern Rosella (16.3%),
2. Torresian Crow (8.9%),	Torresian Crow (14.5%),
3. Yellow-rumped Thornbill (8,3%),	Noisy Miner (13,2%),
4. Eastern Rosella (7.0%),	Australian Magpie (10.5%),
5. Superb Fairywren (5.8%),	Galah (8.8%).

These five species comprised 42.5% of all birds recorded at the impact points and 63.3% at the reference points. On seasonal basis, the same species were also the dominant forms at the impact and reference points, however, other species such as Galah, Noisy Miner and Common Staling were part of the dominant five in certain seasons.

The number of species, their abundance and flight heights are summarized for each of the three seasons of the survey in Table 3 for the impact sites, and in Table 4 for the reference sites. More details of each observation point at each of the three seasons are detailed in appendix 1 – 5.

Diversity (i.e., number of species recorded per site) varied between the observation points, and was influenced mainly by surrounding habitat, and number of species was usually higher at points surrounded by remnant woodland vegetation, with lower species richness occurring at grazed, open, agricultural land.

Species also differed in terms of their seasonal abundance (i.e., total number of individuals) at both impact (Table 3) and reference points (Table 4). Bird numbers also differed between each of the observation points, but generally there were no indication that the difference was significant and birds, were almost homogenously distributed between the observation points.

Generally, bird abundance was lower in the summer survey compared with both spring and autumn, however, diversity was in reverse, as it was much higher in summer compared to spring and autumn (Table 3).

The pattern of bird numbers and diversity at the reference points was like that of the impact points with the same bird species dominating the counts (Table 4).

Table 3: Summary of the diversity, numbers and height distribution of bird at the impact survey points recorded during three seasons at WWF.

Species	spring 20				autumn 21				Summer 22				Grand Total				% Imp.
	A	B	C	Tot	A	B	C	Tot	A	B	C	Tot.	A	B	C	Tot.	
Australian Magpie	134			134	213			213	100	2		102	447	2		449	12.4
Torresian Crow	109			109	205	2		207	3			3	317	2		319	8.8
Yellow-rumped Thornbill	183			183	53			53	63			63	299			299	8.3
Eastern Rosella	90			90	108			108	55			55	253			253	7
Superb Fairy-wren	115			115	59			59	35			35	209			209	5.8
Noisy Miner	54			54	95			95	54			54	203			203	5.6
Galah	74			74	103	3		106	18			18	195	3		198	5.5
Striated Pardalote	98			98	16			16	32			32	146			146	4
Wedge-tailed Eagle	10	31		41	13	51		64		1	27	28	23	83	27	133	3.7
Common Starling					2			2	80			80	82			82	2.3
Crimson Rosella	22			22	36			36	22			22	80			80	2.2
White-throated Treecreeper	29			29	22			22	27			27	78			78	2.2
Red-rumped Parrot	8			8	60			60	8			8	76			76	2.1
Australian Wood Duck	4			4	58			58	7			7	69			69	1.9
Grey Butcherbird	28			28	17			17	10			10	55			55	1.5
Red Wattlebird	5			5	30			30	16			16	51			51	1.4
White-winged Chough	5			5	13			13	30			30	48			48	1.3
Willie Wagtail	18			18	11			11	18			18	47			47	1.3
Black-faced Cuckoo-shrike	24			24	5			5	14			14	43			43	1.2
Varied Sitella	3			3	23			23	17			17	43			43	1.2
Sulphur-crested Cockatoo	16			16	3			3	17	5		22	36	5		41	1.1
Little Corella	14			14					26			26	40			40	1.1
Pied Currawong	21			21	11			11	4	1		5	36	1		37	1
Noisy Friarbird	24			24	2			2	6			6	32			32	0.9
Nankeen Kestrel	10	3		13	6	1		7	2	6		8	18	10		28	0.8

Species	spring 20				autumn 21				Summer 22				Grand Total				% Imp.
	A	B	C	Tot	A	B	C	Tot	A	B	C	Tot.	A	B	C	Tot.	
Welcome Swallow	2			2	6			6	20			20	28			28	0.8
Laughing Kookaburra	7			7	12			12	7			7	26			26	0.7
Rufous Whistler	12			12	2			2	10			10	24			24	0.7
Striated Thornbill					9			9	15			15	24			24	0.7
Australian Raven	6	3		9					4	8		12	10	11		21	0.6
Dusky Woodswallow									21			21	21			21	0.6
Black-chinned Honeyeater	19			19									19			19	0.5
Rainbow Lorikeet					17			17	2			2	19			19	0.5
White-browed Scrubwren	14			14	2			2	2			2	18			18	0.5
Yellow-faced Honeyeater									17			17	17			17	0.5
Brown-headed Honeyeater									16			16	16			16	0.4
Grey Fantail					6			6	10			10	16			16	0.4
Weebill	16			16									16			16	0.4
Fuscous Honeyeater	14			14					1			1	15			15	0.4
Straw-necked Ibis	14			14									14			14	0.4
Tree Martin	5			5	4			4	5			5	14			14	0.4
Buff-rumped Thornbill									13			13	13			13	0.4
Masked Lapwing	4			4	7			7	2			2	13			13	0.4
Eastern Spinebill									12			12	12			12	0.3
Yellow Thornbill									12			12	12			12	0.3
Australasian Pipit					4			4	7			7	11			11	0.3
Brown Falcon	3			3	2	1		3	1	4		5	6	5		11	0.3
Forest Raven									10	1		11	10	1		11	0.3
White-throated Gerygone	9			9	2			2					11			11	0.3
Magpie-lark	6			6					4			4	10			10	0.3
Australian King Parrot	9			9									9			9	0.2

Species	spring 20				autumn 21				Summer 22				Grand Total				% Imp.
	A	B	C	Tot	A	B	C	Tot	A	B	C	Tot.	A	B	C	Tot.	
Diamond Firetail									9			9	9			9	0.2
Grey Shrike-thrush	8			8	1			1					9			9	0.2
Pied Butcherbird	2			2					6			6	8			8	0.2
Stubble Quail									8			8	8			8	0.2
Leaden Flycatcher	7			7									7			7	0.2
Little Raven									7			7	7			7	0.2
Restless Flycatcher	5			5	2			2					7			7	0.2
Rufous Songlark	2			2					5			5	7			7	0.2
Olive-backed Oriole	4			4	2			2					6			6	0.2
Crested Pigeon	2			2	2			2	1			1	5			5	0.1
Brown Honeyeater									4			4	4			4	0.1
Fairy Martin									4			4	4			4	0.1
Fan-tailed Cuckoo									4			4	4			4	0.1
Little Friarbird	4			4									4			4	0.1
Speckled Warbler					4			4					4			4	0.1
Pallid Cuckoo									3			3	3			3	0.1
Yellow-tailed Black Cockatoo	3			3					0				3			3	0.1
Australian Ibis									2			2	2			2	0.1
Black-shouldered Kite	1			1		1		1					1	1		2	0.1
Brown Goshawk	1			1					1			1	2			2	0.1
Eastern Yellow Robin	2			2									2			2	0.1
Glossy Black Cockatoo					2			2					2			2	0.1
Musk Lorikeet									2			2	2			2	0.1
Spotted Pardalote	2			2									2			2	0.1
White-eared Honeyeater									2			2	2			2	0.1
White-naped Honeyeater									2			2	2			2	0.1

Species	spring 20				autumn 21				Summer 22				Grand Total				% Imp.
	A	B	C	Tot	A	B	C	Tot	A	B	C	Tot.	A	B	C	Tot.	
Australasian Darter		1		1										1		1	0.0
Brown Quail									1			1	1			1	0.0
Jacky Winter	1			1									1			1	0.0
Little Lorikeet									1			1	1			1	0.0
Mistletoebird									1			1	1			1	0.0
Olive-backed Oriole					1			1					1			1	0.0
Pacific Black Duck									1			1	1			1	0.0
Whistling Kite		1		1										1		1	0.0
Grand Total	1282	38	0	1320	1251	59	0	1310	923	29	27	979	3456	126	27	3609	100

Notes: A = below (<40m); B = at (40-150 m); C = over (.150m) RSA heights; Tot = Total; % Imp = percentage impact.

Table 4: Summary of the diversity, numbers and height distribution of bird at the reference survey points recorded during three seasons at WWF

Species	Spring 2020				Autumn 2021				Summer 2022				Combined seasons			
	R1		R2		R1		R2		R1		R2					%
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	Tot,	Imp.
Eastern Rosella	25		32		47		34		19		18		**175**	**0**	**175**	16.3
Torresian Crow	16		48		23		69						**156**	**0**	**156**	14.5
Noisy Miner	15		23		28		20		39		17		**142**	**0**	**142**	13.2
Australian Magpie	13		19		28		30		9		14		**113**	**0**	**113**	10.5
Galah	17		6		63		5		4				**95**	**0**	**95**	8.8
Red-rumped Parrot					83				3		1		**87**	**0**	**87**	8.1
Crimson Rosella	6	2	2		4		17		7				**36**	**2**	**38**	3.5
Striated Pardalote	6		20				6		2		2		**36**	**0**	**36**	3.4
Straw-necked Ibis	5		25										**30**	**0**	**30**	2.8
Grey Butcherbird	2		5		5		8		3				**23**	**0**	**23**	2.1
Sulphur-crested Cockatoo	10				1	2	1		5		2		**19**	**2**	**21**	2
Yellow-rumped Thornbill	17								3				**20**	**0**	**20**	1.9
Black-faced Cuckoo-shrike	8						2		4		3		**17**	**0**	**17**	1.6
Noisy Friarbird	10		1						2				**13**	**0**	**13**	1.2
Wedge-tailed Eagle				2	4	5	1						**5**	**7**	**12**	1.1
Nankeen Kestrel			6		1		1		2	1	1		**11**	**1**	**12**	1.1
Laughing Kookaburra			1						9				**10**	**0**	**10**	0.9
Little Corella	9												**9**	**0**	**9**	0.8
Pied Currawong	2		4								3		**9**	**0**	**9**	0.8
Magpie-lark	2						5						**7**	**0**	**7**	0.7
Common Starling	1								5				**6**	**0**	**6**	0.6
Willie Wagtail	1		1				1		3				**6**	**0**	**6**	0.6
Little Raven											5		**5**	**0**	**5**	0.5
Red Wattlebird							2				2		**4**	**0**	**4**	0.4
Masked Lapwing	3												**3**	**0**	**3**	0.3

Species	Spring 2020				Autumn 2021				Summer 2022				Combined seasons			
	R1		R2		R1		R2		R1		R2					%
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	Tot,	Imp.
Weebill					3								3	0	3	0.3
Tree Martin			3										3	0	3	0.3
Australian Raven									2				2	0	2	0.2
Australian Wood Duck	2												2	0	2	0.2
Pacific Black Duck					2								2	0	2	0.2
Welcome Swallow					2								2	0	2	0.2
Australasian King Parrot									1				1	0	1	0.1
Crested Pigeon									1				1	0	1	0.1
Dollarbird									1				1	0	1	0.1
Grey Shrike-thrush									1				1	0	1	0.1
White-throated Treecreeper					1								1	0	1	0.1
Australasian Pipit							1						1	0	1	0.1
Forest Raven											1		1	0	1	0.1
Olive-backed Oriole							1						1	0	1	0.1
White-throated Gerygone			1										1	0	1	0.1
Totals	170	2	197	2	295	7	204	0	127	1	69	0	1062	12	1074	100

Notes: A = below RSA (<40m); B = at RSA (40-150 m); % Imp. = percentage impact. No birds were recorded over 150m, thus not included in table.

2.2.3. *Flight height*

Bird heights were classified as (A) below RSA (< 40 metres), (B) at RSA (40–150 metres), and (C) above RSA (> 150 metres) heights based on current specifications of proposed operational turbines at WWF. Table 5 present the detailed results of the number of birds recorded at the different flight heights during the three seasonal of surveys. The same data is further summarised in Figure 3.

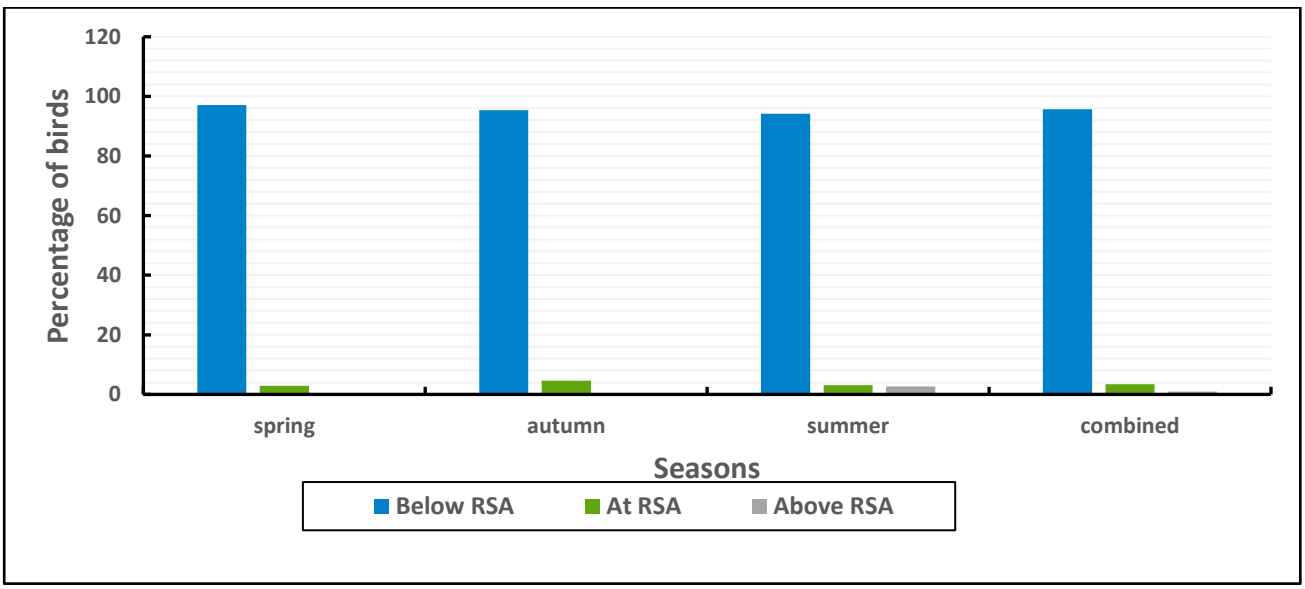
Most birds were recorded below RSA height at impact points with an overall percentage of 95.7, 3.4, and 0.9 below, at and above RSA heights, respectively. These flight heights are very comparable to height distribution of birds at many other wind farms in Australia (Nature Advisory data), Notably, the percentage of birds flying above RSA height was unusually high, comprising 27 individual observations of Wedge-tailed Eagles.

Flight heights at the reference sites was comparable to the impact points; however, the majority were recorded flying below RSA heights (98.5 below; 1.5 at, and 0 Above RSA heights, respectively).

Table 5: Summary of number of birds recorded at the three flight heights at WWF

Flight Height	Impact survey points		Reference survey points	
	Number of birds	Percentage of all birds	Number of birds	Percentage of all birds
A (below RSA)	2533	96.3	867	98.7
B (at RSA)	98	3.7	11	1.3
C (above RSA)	0	0	0	0
Total birds recorded	**2631**		**878**	

Figure 3: The number of birds recorded at three heights (data from table 5) at WWF



A combined three seasons summary of the most abundant species flying at RSA is provided below in Table 6. These accounted for 3.5% of the total birds observed at impact survey points. The Wedge-tailed Eagle was by far the most observed bird flying at RSA height, making up 72.8% of the five most important birds at RSA heights and 62.4% of all observed eagle flights (Table 6). In addition, a considerable number was also observed flying above RSA heights.

Table 6: The five most abundant species flying at RSA height at WWF

The five most dominant species at RSA heights	Number of birds at				% at RSA	% Of imp. sps.	% all birds
	A	B	C	Total			
Wedge-tailed Eagle	23	83	27	133	62.4	72.8	3.7
Australian Raven	10	11	0	21	52.4	9.6	0.6
Nankeen Kestrel	18	10	0	28	35.7	8.8	0.8
Sulphur-crested Cockatoo	36	5	0	41	12.2	4.4	1.1
Brown Falcon	6	5	0	11	45.5	4.4	0.3
Total of five important species	**93**	**114**	**27**	**234**	**48.7**	**100.0**	**6.5**
Total all birds at impact points	**3456**	**126**	**27**	**3609**	**3.5**		**100.0**

RSA heights: Below (,40m), at (40-150m); Above (.150 m).

2.2.4. Raptors

Seven raptor species were recorded during the season surveys at impact points, comprising 179 individual observations (Table 7). Of all raptors counted, 57% of observations were recorded at RSA height. The presence of these raptors varied between the seasons and were recorded in relatively low numbers except the Wedge-tailed Eagle (The raw data are presented in Appendices 1 -3). Two raptors were recorded at the reference sites, namely Wedge-tailed Eagle and Nankeen Kestrel. Both were recorded from 12 observations comprising 1.1% of all birds at the reference sites (Table 4).

Wedge-tailed eagle was the most abundant raptor species at WWF impact sites during the three seasons of BUS. It was seen regularly throughout the study area across all seasons. Numbers observed were particularly high during autumn (64 observations), less in spring (41) and fewer in summer (28) (Table 3). Of the total number of eagles seen (133), 62.4% were observed flying at RSA heights. Similarly, they formed 74.3% of all raptors. And 3.7% of all birds observed during the three seasons of BUS.

Nankeen Kestrel and Brown Falcon were next in abundance but in much lower numbers than the Wedge-tailed Eagle. The remaining four raptors were seen occasionally in very low numbers (Table7).

Raptors are at risk of collision with operating turbines. Based on experience at other wind farms, carcasses of Wedge-tailed Eagles, Nankeen kestrels and Brown Falcons are found consistently under wind turbines (Nature Advisory data).

At the WWF, the number of Wedge-tailed Eagles was noticeably higher compared with other wind farms with similar settings (Nature Advisory data). The utilisation rate of eagles was estimated as 0.66 eagles per hectare per hour, a value higher than the range of observed values (0.01 – 0.44) calculated from ten other wind farms (Nature Advisory data).

No raptor nesting activities within the wind farm was confirmed in the surveys, however Wedge-tailed Eagles were observed performing courtship behaviour, as well as one individual carrying a stick, a behaviour associated with nest building.

2.2.5. Waterbirds

During this survey, six waterbird species were recorded at impact points, comprising a total of 100 observations. The most common waterbird species was the Australian Wood Duck with a total of 69 observations recorded (Table 7). The Australian Wood Duck is a very common farmland waterbird which commonly roosts along the edges of farm dams and forages in open paddocks next to farm dams.

The Straw-necked Ibis is another waterbird species which can regularly be seen flying and foraging in flocks. Like the Australian Wood Duck, it is also regularly seen near farm dams and adjacent pasture. The other four waterbirds were less abundant and were recorded on fewer occasions (Table 7). Only one observation of a waterbird was made at RSA height on one impact points during the three seasonal BUS.

The risk of waterbirds colliding with turbines is considered low.

Table 7: Raptor and waterbird species recorded at impact points during spring, autumn and summer BUS at WWF

Species	Number raptors/waterbirds at				% at RSA	% Of Rap. / waterbirds	% Of all birds
	A	B	C	Tot.			
Wedge-tailed Eagle	23	83	27	133	62.4	74.3	3.7
Nankeen Kestrel	18	10	0	28	35.7	15.6	0.8
Brown Falcon	6	5	0	11	45.5	6.1	0.3
Black-shouldered Kite	1	1	0	2	50.0	1.1	0.1
Brown Goshawk	2	0	0	2	0.0	1.1	0.1
Peregrine Falcon	0	2	0	2	100.0	1.1	0.1
Whistling Kite	0	1	0	1	100.0	0.6	0.0
Total raptors	**50**	**102**	**27**	**179**	**57.0**	**100.0**	**5.0**
Waterbirds							
Australian Wood Duck	69	0	0	69	0.0	69.0	1.9
Straw-necked Ibis	14	0	0	14	0.0	14.0	0.4
Masked Lapwing	13	0	0	13	0.0	13.0	0.4
Australian Ibis	2	0	0	2	0.0	2.0	0.1
Australasian Darter	0	1	0	1	100.0	1.0	0.0
Pacific Black Duck	1	0	0	1	0.0	1.0	0.0
Total waterbirds	**99**	**1**	**0**	**100**	**1.0**	**100.0**	
Total all impact birds	**3456**	**126**	**27**	**3609**			**100.0**

2.2.6. Threatened Species

The majority birds found to utilise the proposed wind farm site were common farmland and woodland bird species. Of all species recorded during the formal bird utilisation surveys, six species were listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act) (Figure 4). These species are considered below. An additional species, the Little Eagle was recorded incidentally.

Diamond Firetail (*Stagonopleura guttata*): Recorded from nine observation during summer BUS. These birds are usually found in small flocks inhabiting grassy undercover underneath open forests or woodlands, and feed exclusively on the ground. Do not fly at RSA height.

Little Lorikeet (*Glossopsitta pusilla*): Recorded from a single observation of one bird during the summer BUS. This species usually congregates in small flocks where they feed on nectar and pollen in the canopy of open eucalyptus forest and woodland. Usually fly at tree canopy height below the RSA height.

Speckled Warbler (*Chthonicola sagittate*): Recorded from four observation during autumn BUS. The species inhabits open eucalyptus woodland with rocky gullies, ridges and tussocky grass. Forage on ground often with other small birds. Do not fly at RSA height.

Varied Sitella (*Daphoenositta chrysoptera*): Recorded from 43 observations during BUS divided almost equal over the three seasons of the survey. Small birds of upper branches often unnoticed with incessant twittering. Forage downward on branches and tree trunks. Do not fly at RSA height.

The above four species are strictly small bush birds and rarely venture outside cover, therefore not exposed to collision with operating turbines.

Dusky Woodswallow (*Artamus cyanopterus cyanopterus*): Recorded on six occasions at BUS point 3 during the summer BUS, likely a summer migrant to the region. Frome three to five birds recorded together. Usually occurring in dry open forest and woodland but can occur in a variety of habitats. This species has a preference of flying from ground level to canopy heights, though is known to fly at RSA heights on some occasions.

Glossy Black-Cockatoo (*Calyptorhynchus lathami*): Recorded from a single observation of a pair of birds during autumn BUS near the Oxley Wild Rivers National Park. The bird occurs at low densities in the New England Region and rarely found away from Allocasuarina or Casuarina (she-oak) trees, which provide their primary food source (Crowley, G. M. & Garnett, S.T. (2001).

Little Eagle (*Hieraaetus morphnoides*): Recorded in the region outside the wind farm and not during formal bird utilisation surveys counts. The Little Eagle is a vulnerable under the BC Act, found across the New England Tablelands, and is at risk of colliding with operating turbines, as they routinely fly at RSA heights. The species may be displaced by the presence of Wedge-tailed Eagle and is unlikely to have occurred at any of the BUS locations due to high Wedge-tailed Eagle densities. The bird was located on Moona Plains Rd, near the intersection of the Emu Creek Road approximately five kilometres from the nearest proposed turbine location. There are historic records of this species breeding at Eastlake a large dam along Jacks Creek, as recently as 2017 (Larkin *et al.,* 2020), a property bordering the proposed wind farm site to the north. This nesting site was recently been overtaken by a pair of White-bellied Sea-Eagle which now nest here each year (Larkin pers.comm)

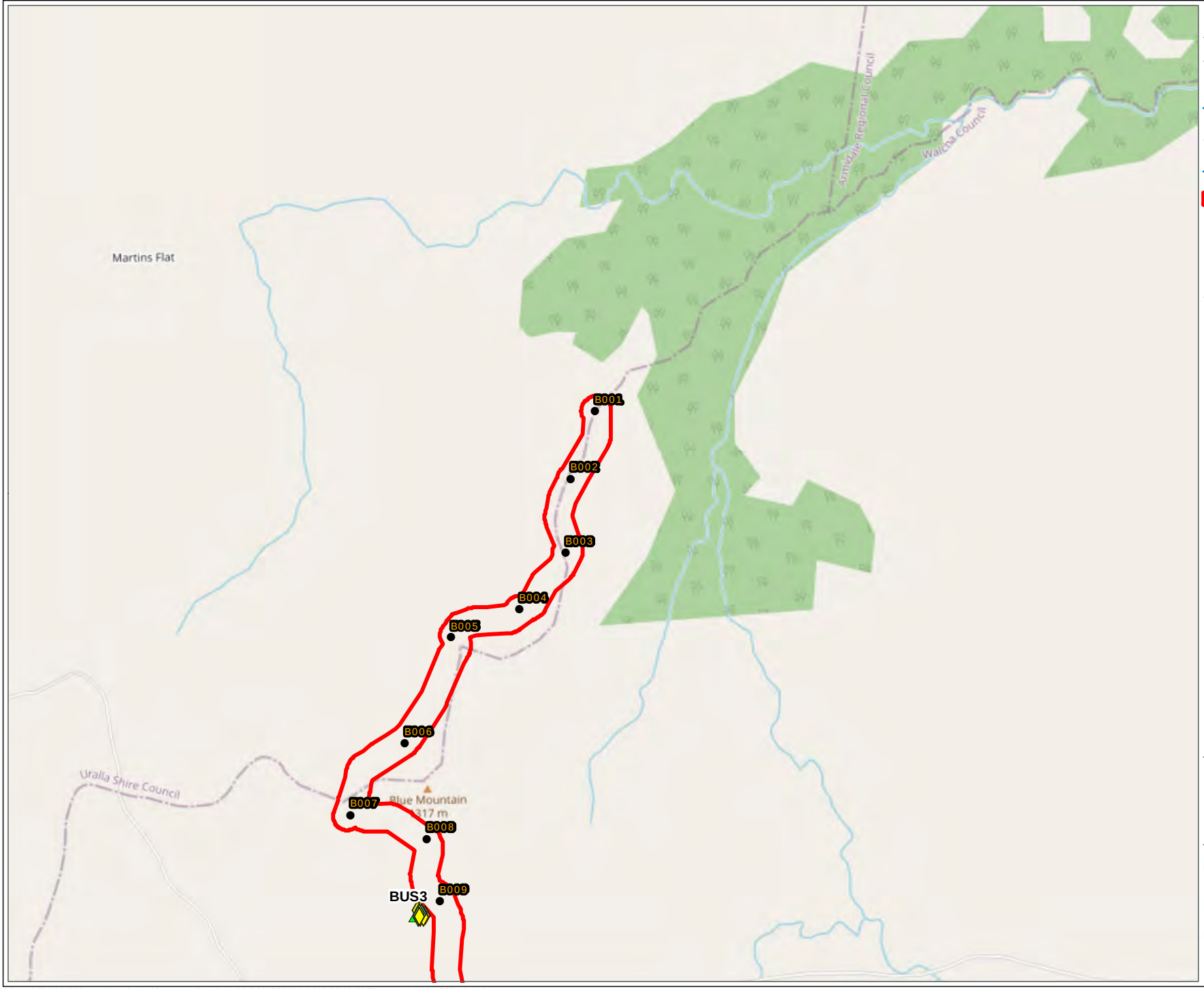


Figure 4: Locations of threatened birds recorded in the study area

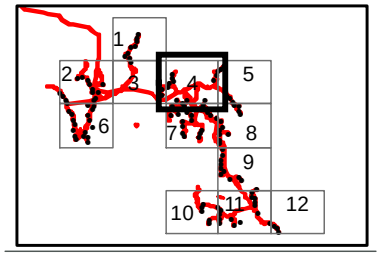
Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

- Proposed turbine
- BUS points

Species name

- Diamond Firetail
- Dusky Woodswallow
- Speckled Warbler
- Varied Sitella



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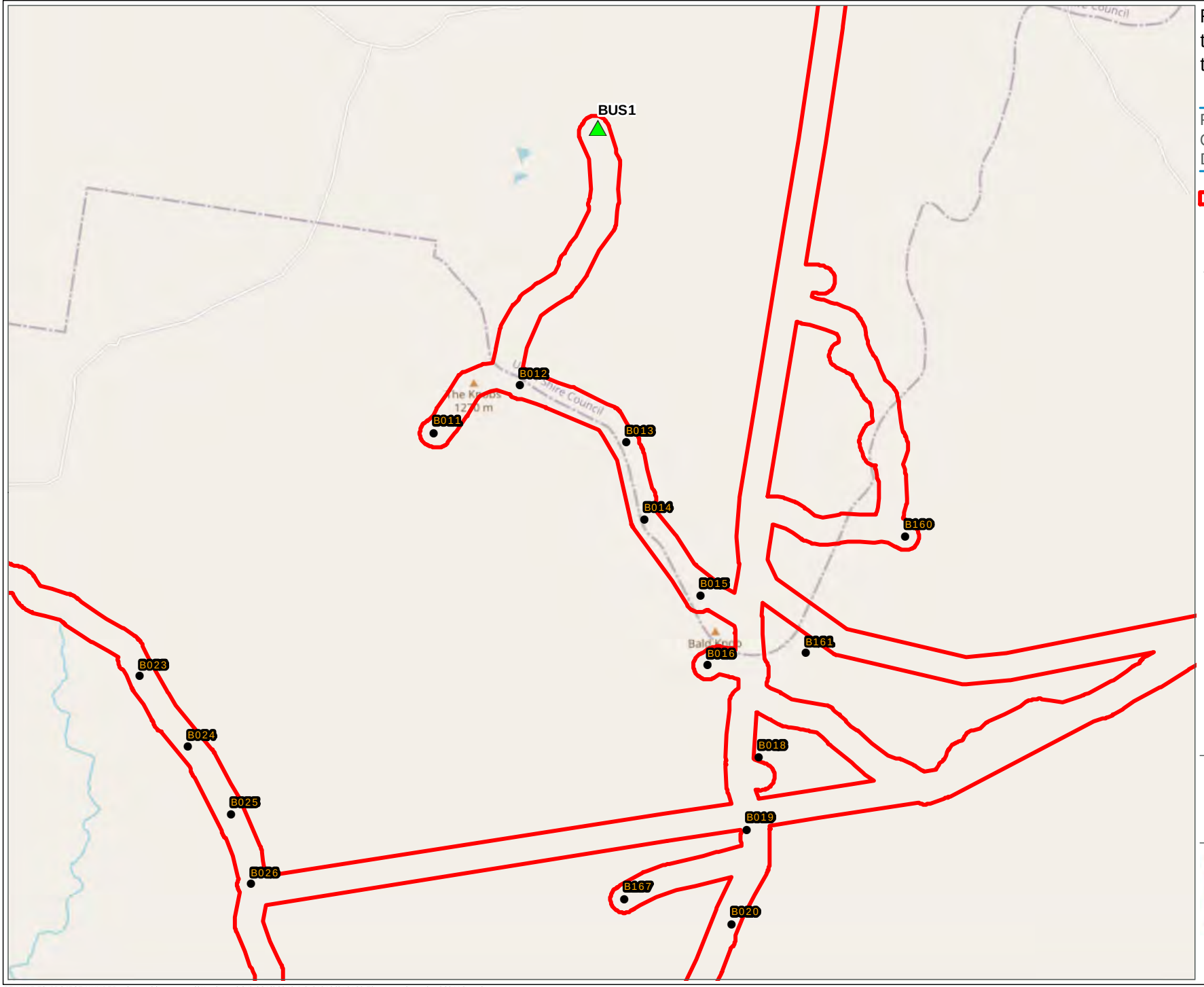

Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine

BUS points

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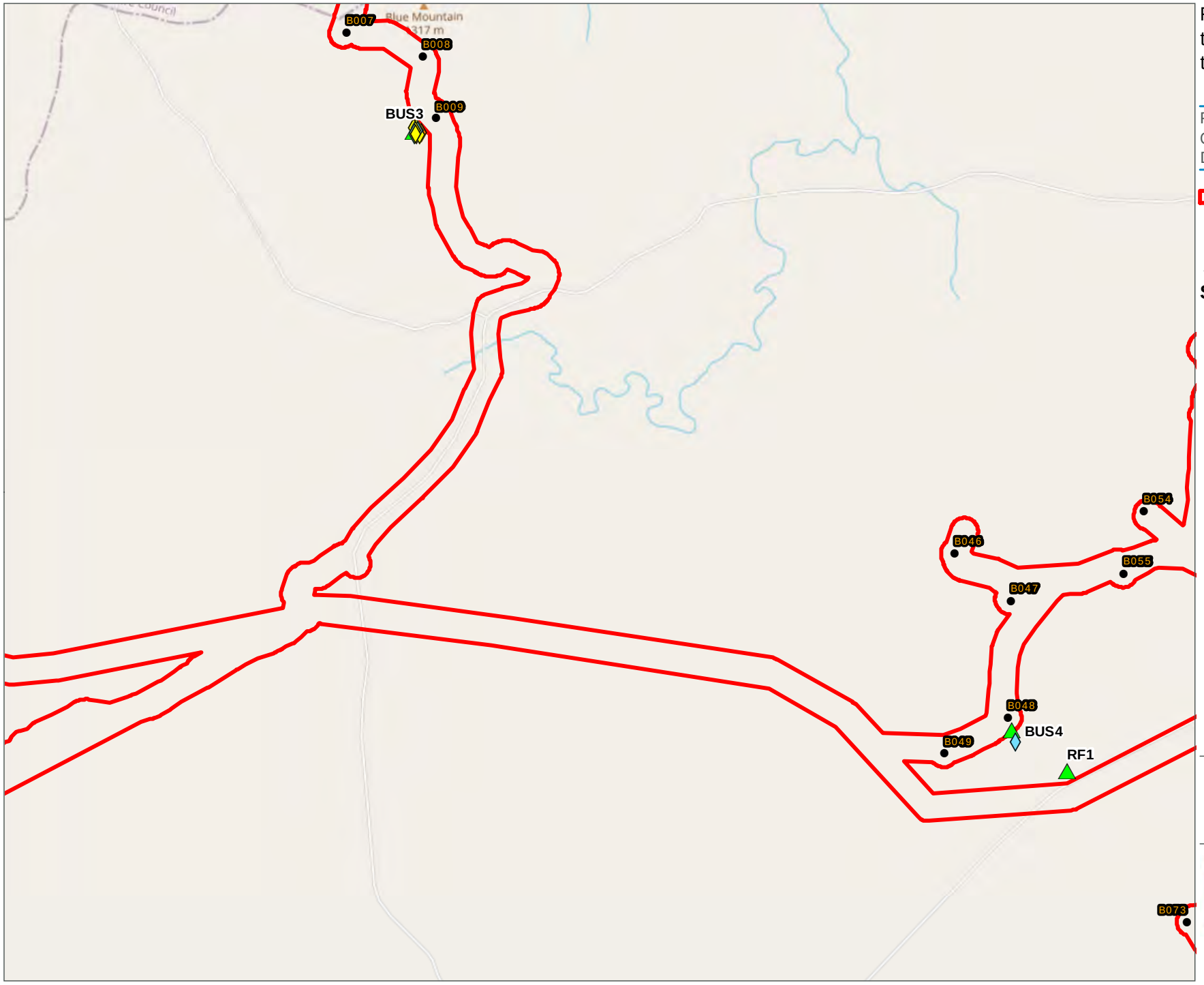

Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine

BUS points

Species name

Diamond Firetail

Dusky Woodswallow

Speckled Warbler

Varied Sitella

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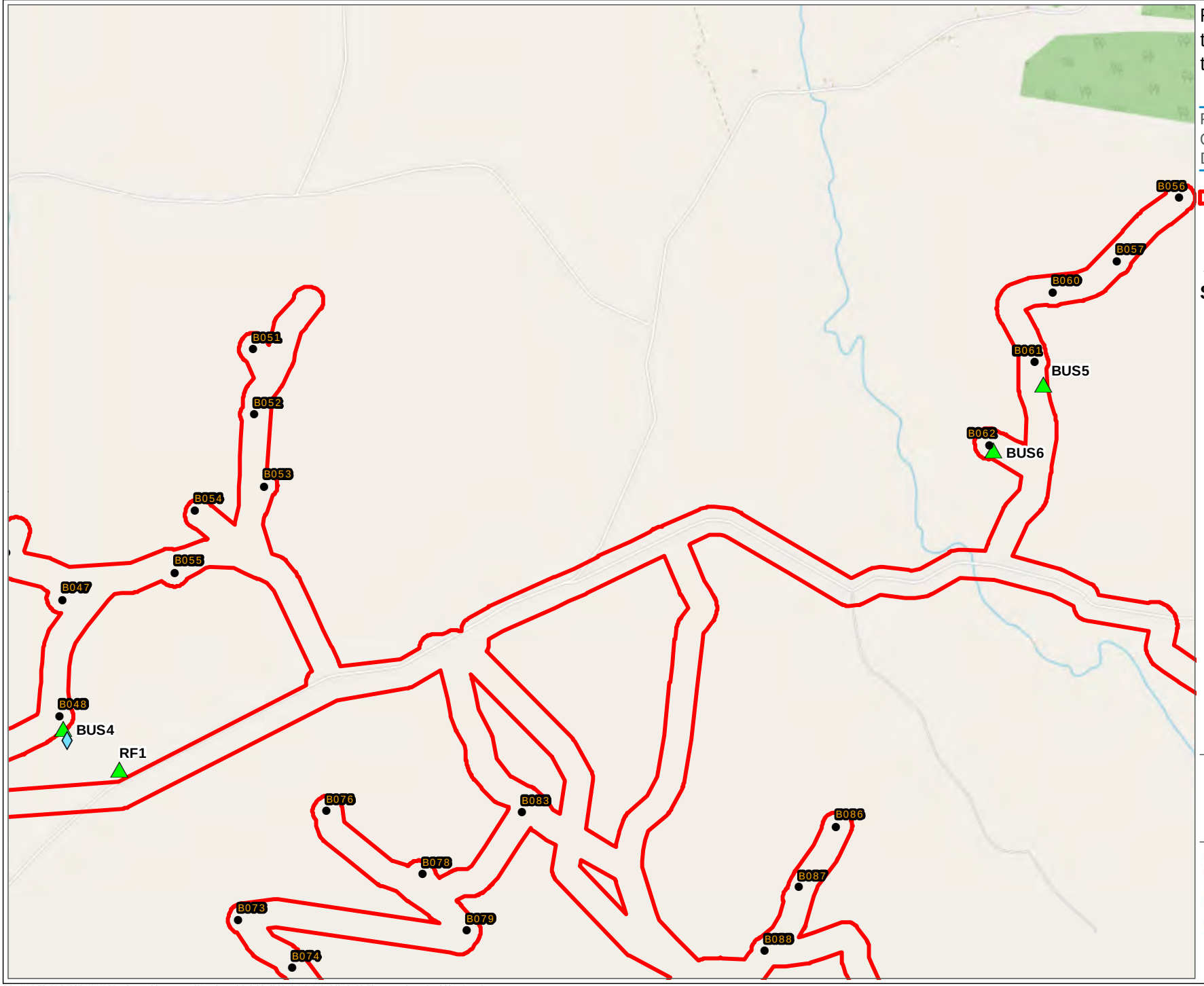


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

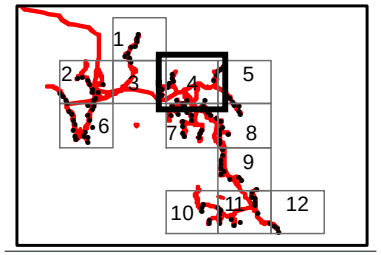
Winterbourne wind farm boundary

Proposed turbine

BUS points

Species name

Diamond Firetail



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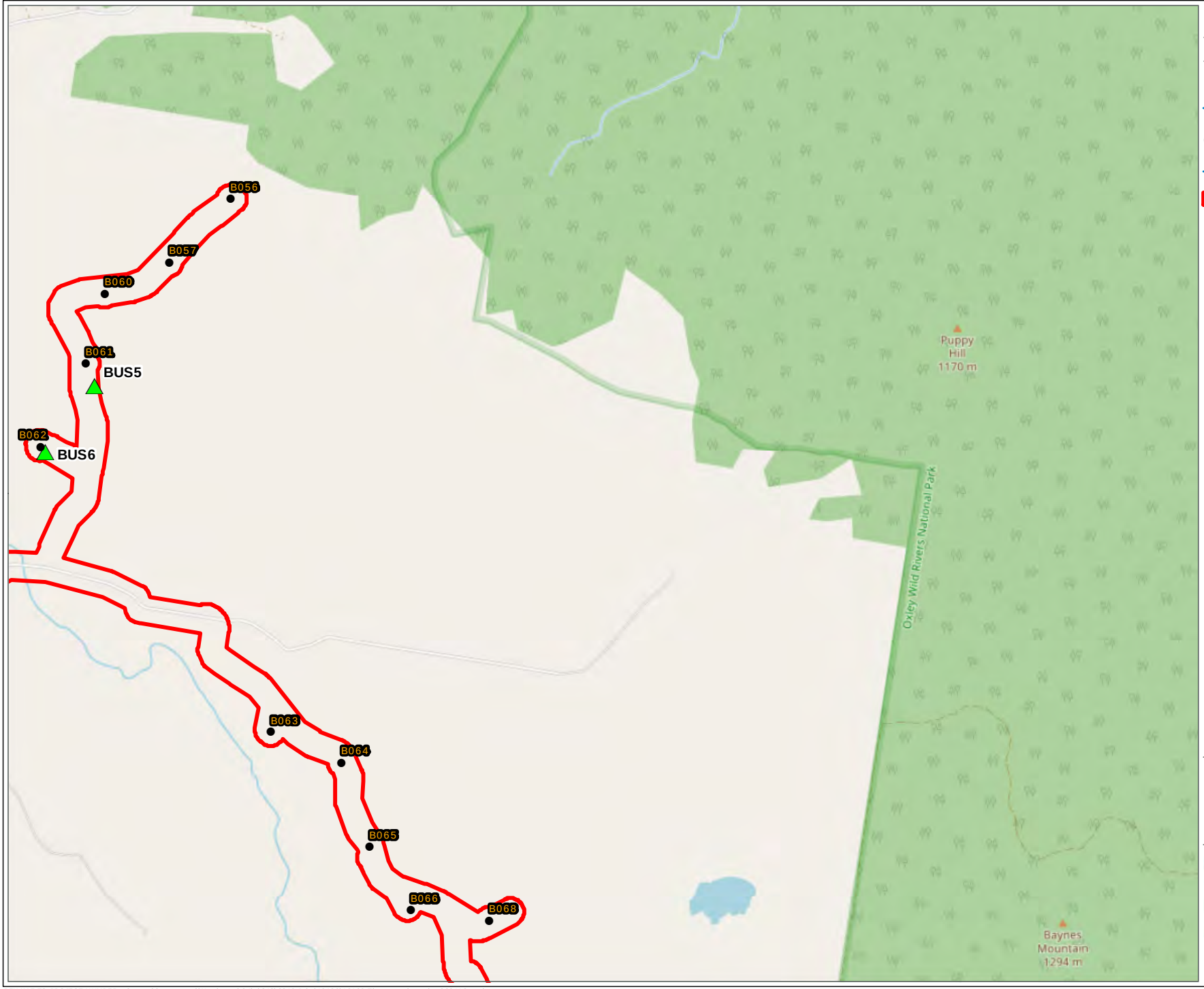
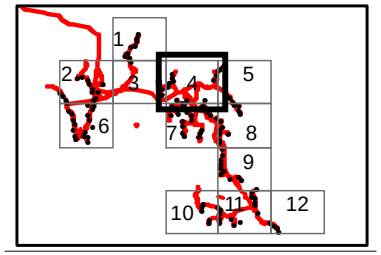


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

- Winterbourne wind farm boundary
- Proposed turbine
- BUS points



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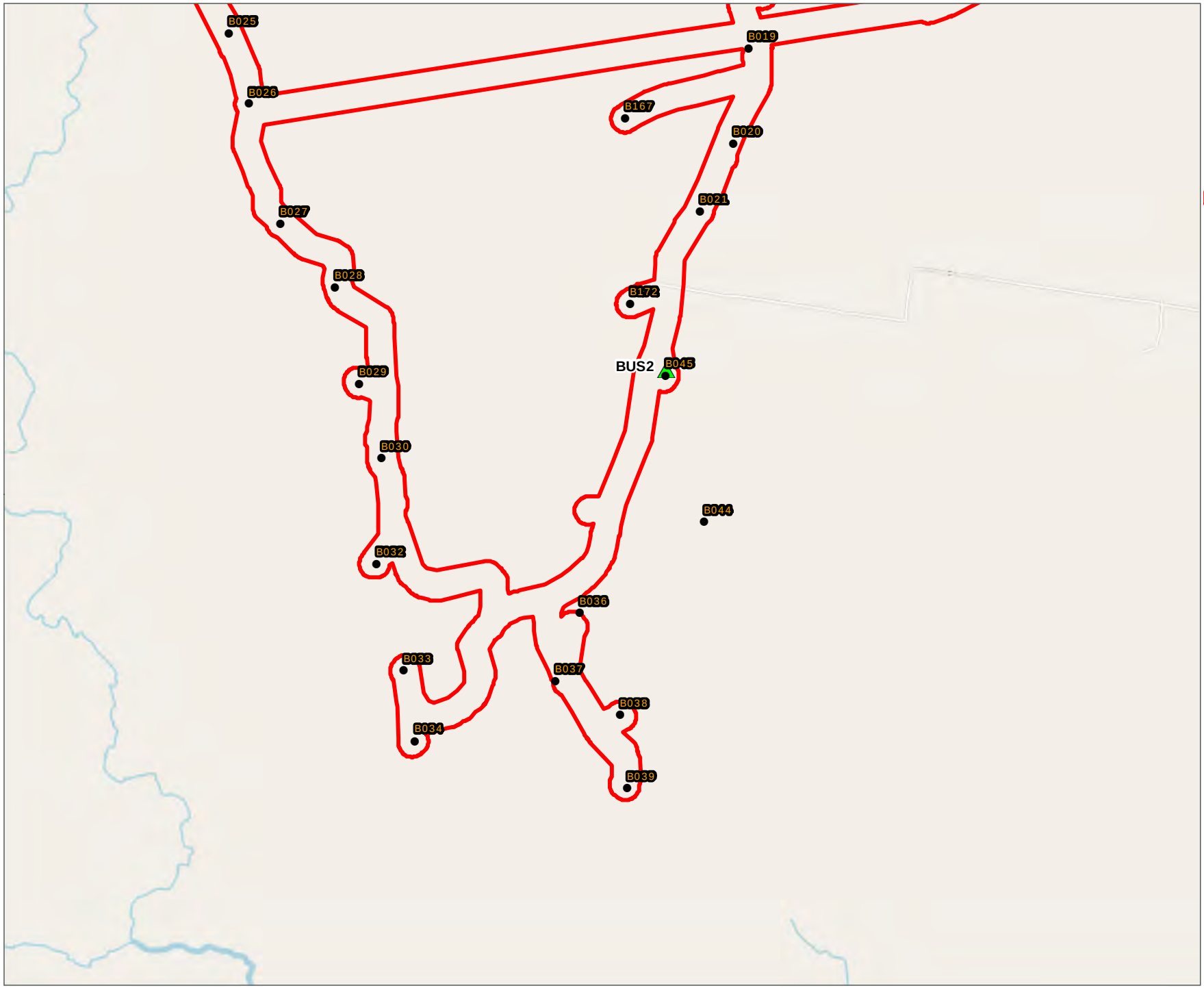


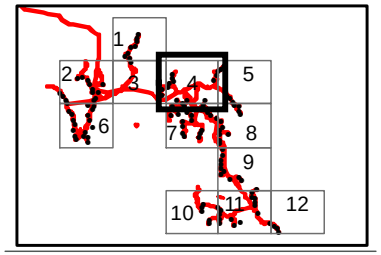
Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine

BUS points



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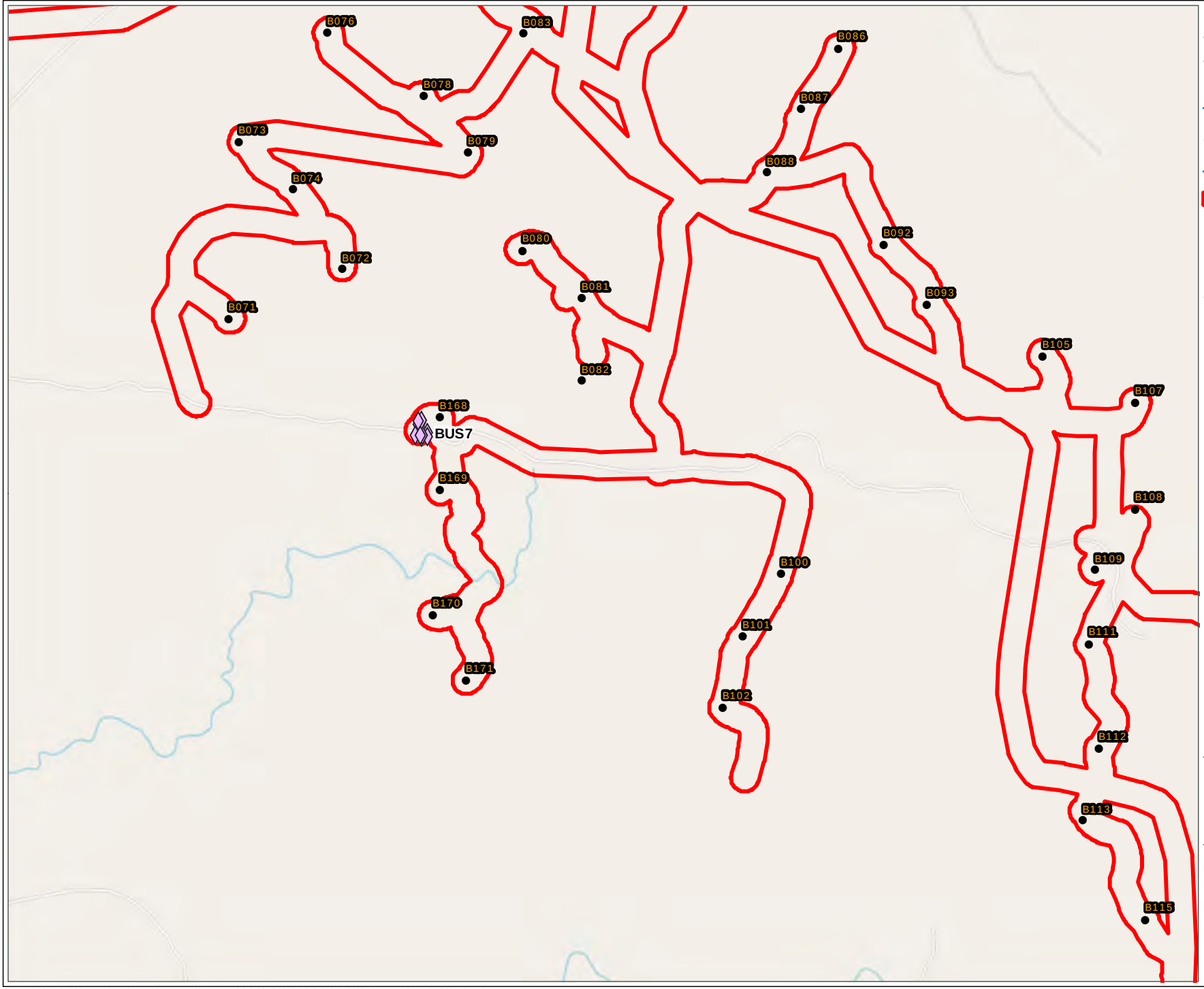


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

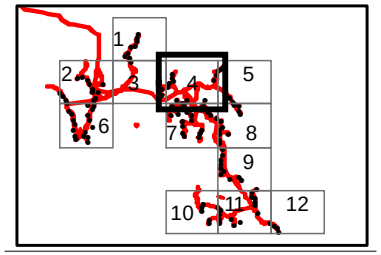
Proposed turbine

BUS points

Species name

Glossy Black Cockatoo

Varied Sitella



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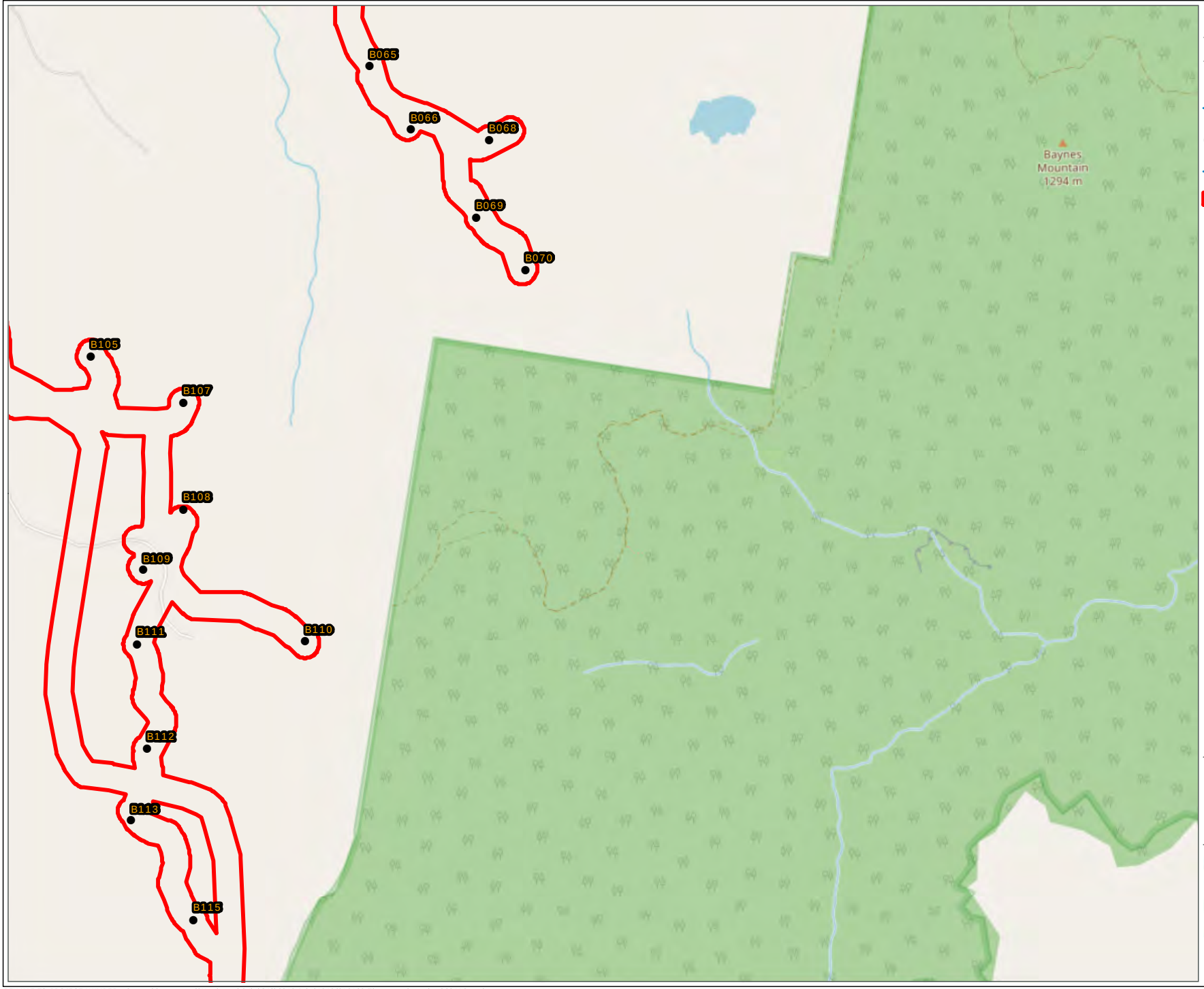
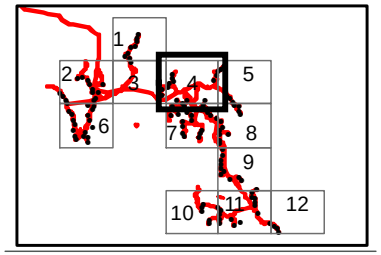


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine



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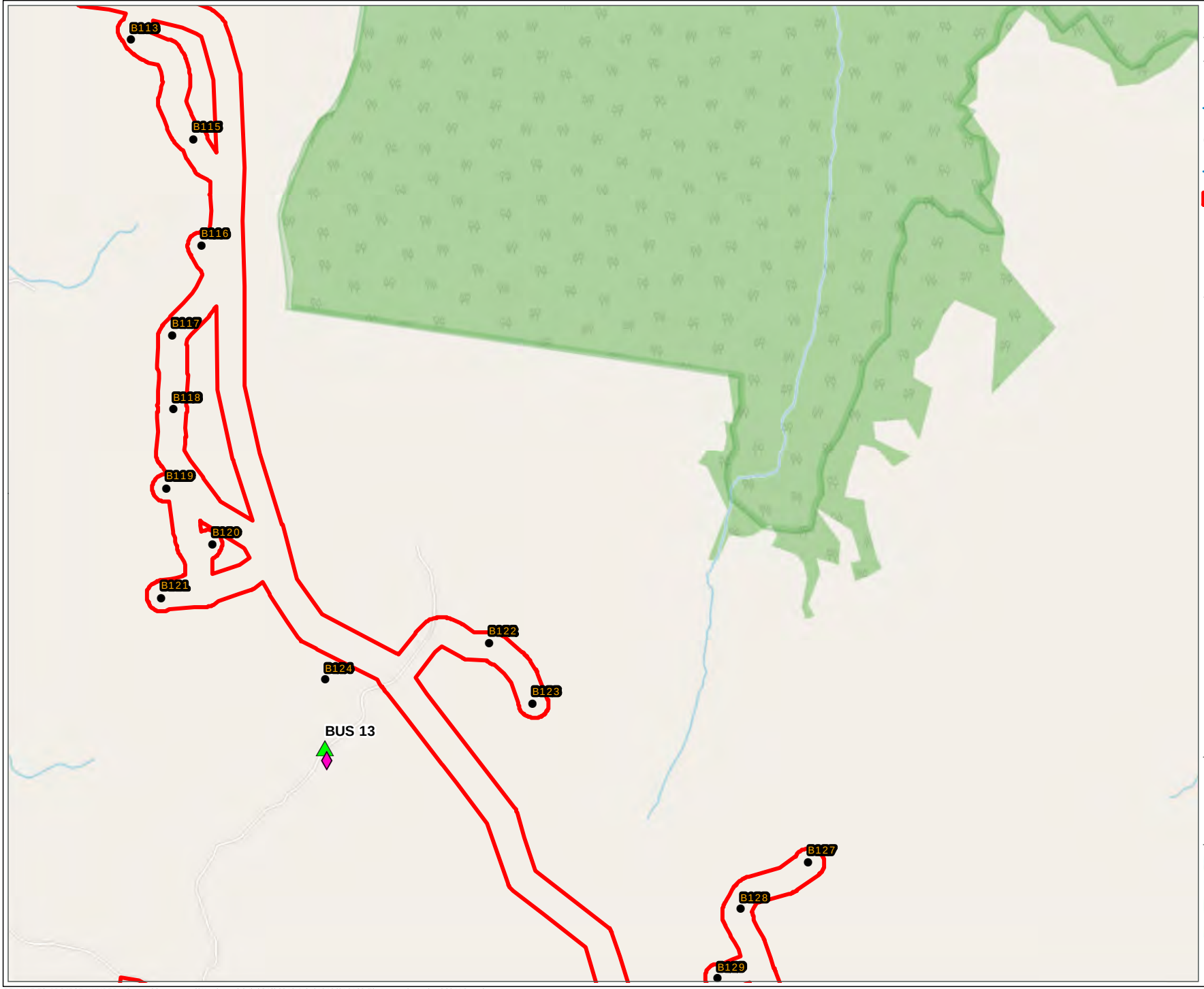


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

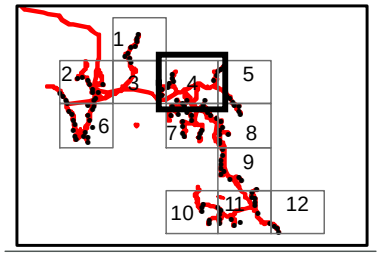
Winterbourne wind farm boundary

Proposed turbine

BUS points

Species name

Little Lorikeet



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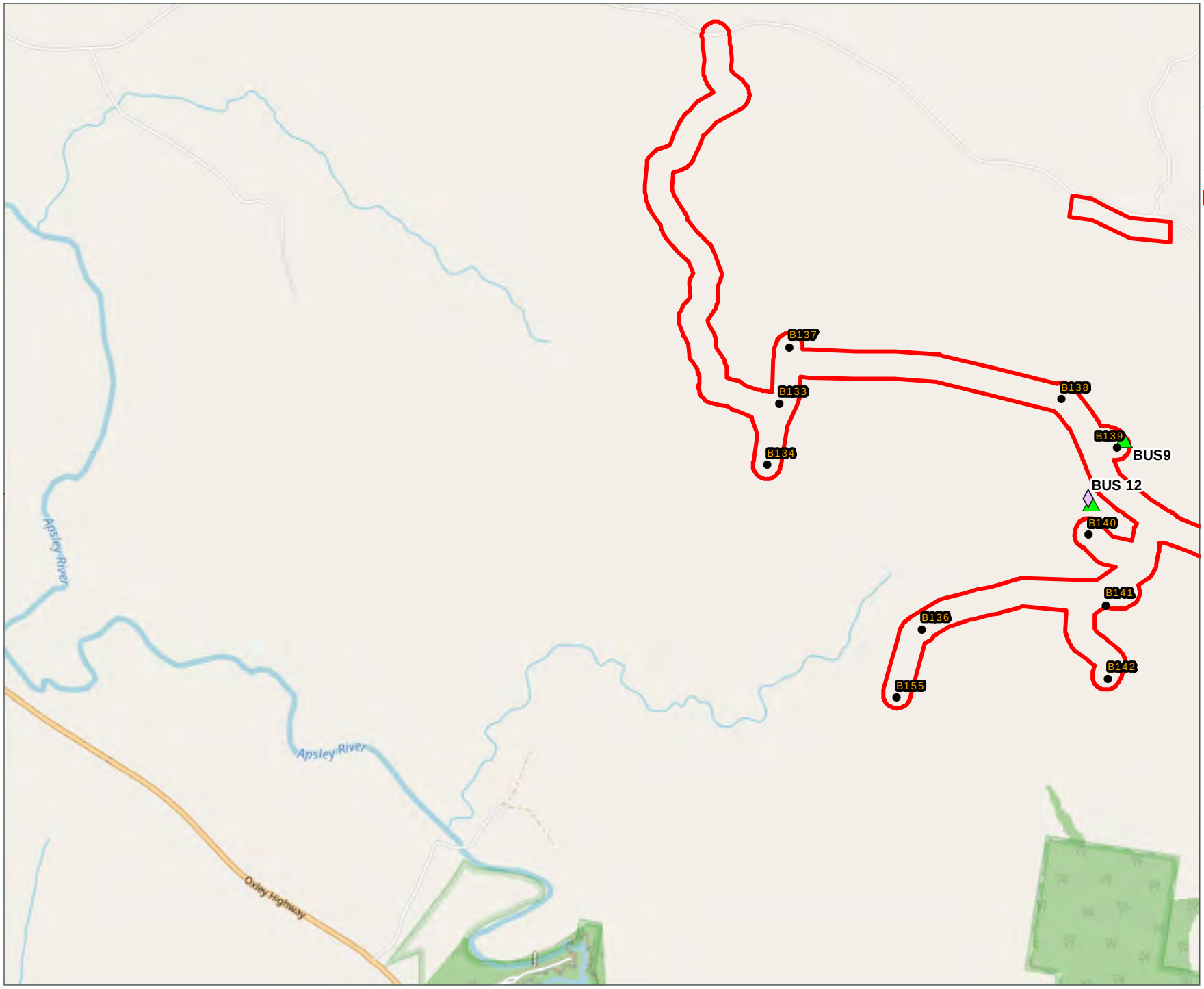


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

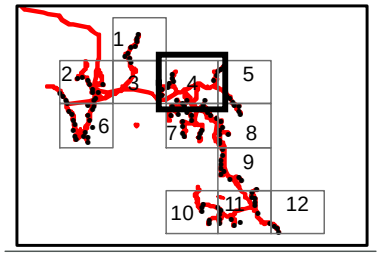
Winterbourne wind farm boundary

Proposed turbine

BUS points

Species name

Varied Sitella



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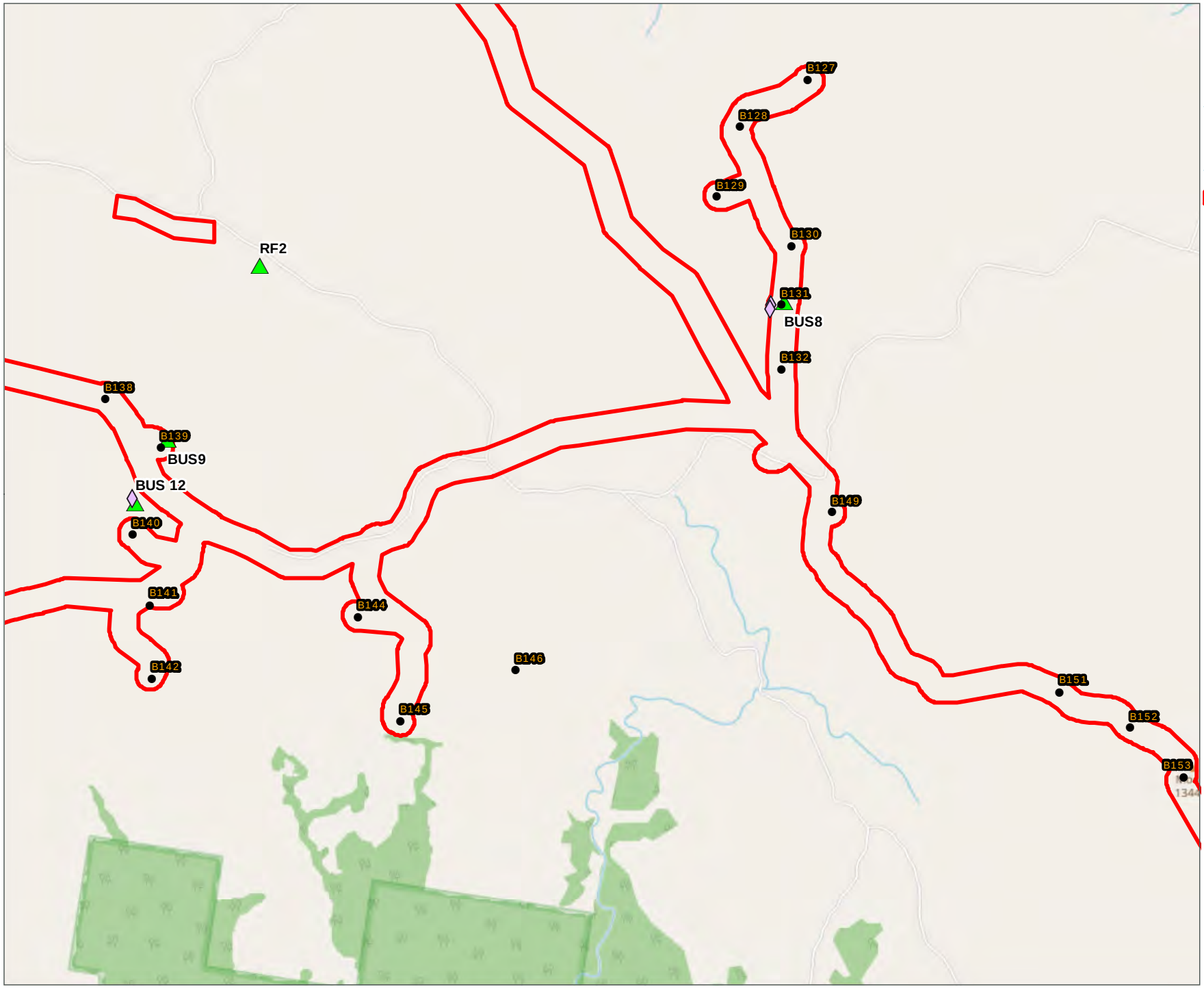


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

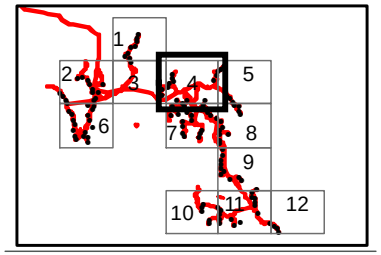
Winterbourne wind farm boundary

Proposed turbine

BUS points

Species name

Varied Sitella



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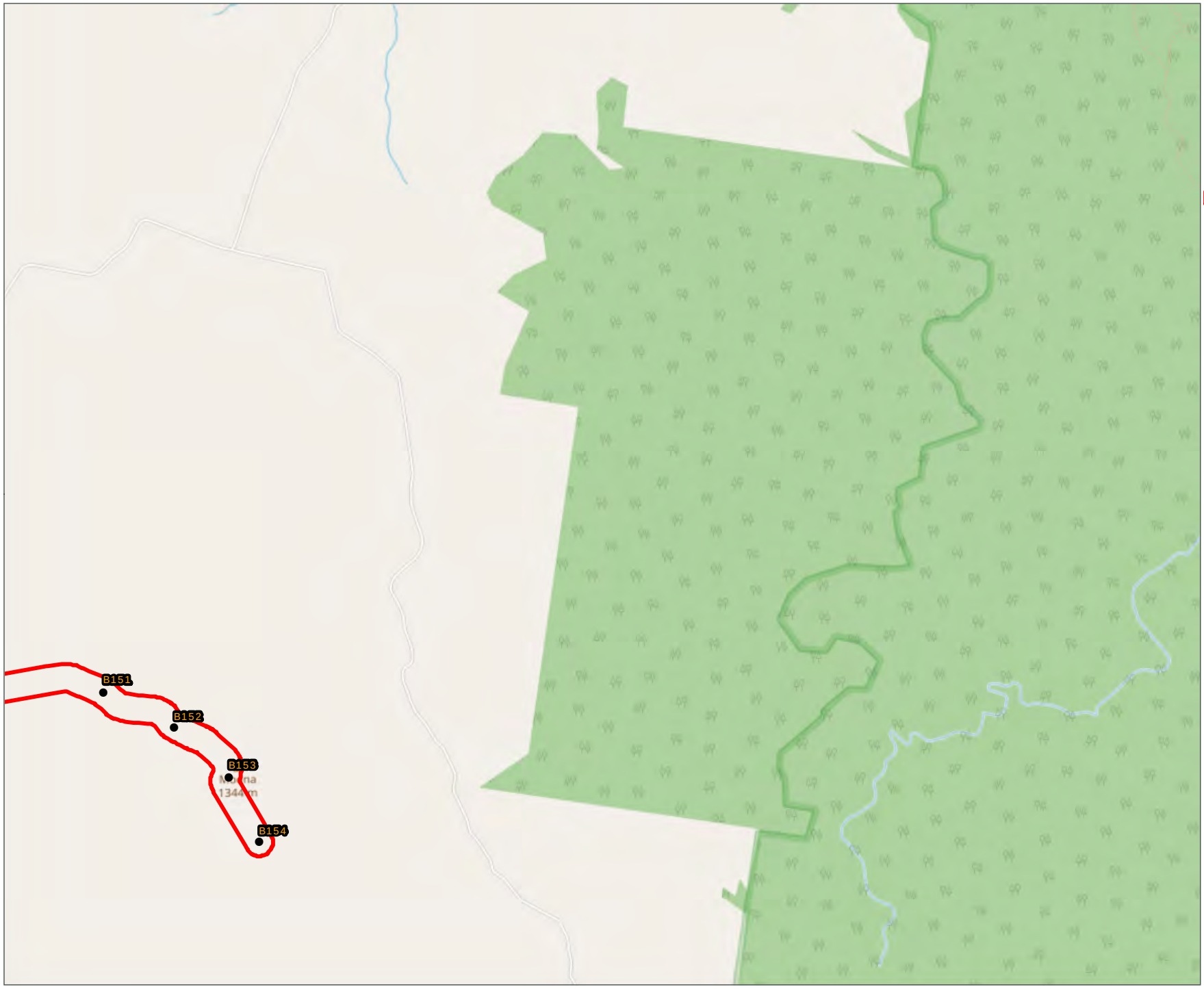
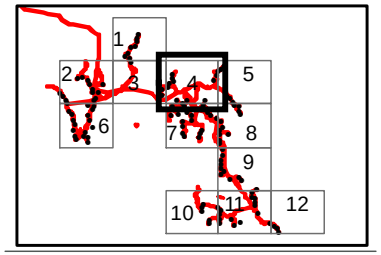


Figure 4: Locations of threatened birds recorded in the study area

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine



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3. Raptor Survey

3.1. Methods

While undertaking the BUS, White-throated Needletail targeted surveys and traversing across the study area incidental observations of raptors were recorded. When a raptor was observed the following data was documented.

- Species name
- Count of birds
- Time first observed
- Time the bird/s flew out of sight or landed
- Distance and bearing from observer
- The location of the bird (either Air, perched or ground)
- Height of the bird when first observed
- The height range of the bird (minimum and maximum heights)
- Elevation of the fixed point
- The landscape the bird was observed in (either valley, slope or ridge)
- Flight direction (either toward, away, parallel to ridge or circling), and
- Flight behaviour (either soaring, gliding, hovering, flapping, display, resting, mobbing or foraging).

All raw data recorded is presented in Appendix 6. All flight paths were marked onto flight path maps (see Figures 5-1 to 5-12).

3.2. Results

In total, 98 observations were recorded from five raptor species at the proposed Winterbourne Wind Farm during the surveys. The species recorded included the following:

- Brown Falcon
- Brown Goshawk
- Nankeen Kestrel
- Wedge-tailed Eagle.

The Wedge-tailed Eagle was the most abundant and active raptor species at the proposed wind farm site and was recorded throughout. The species accounted for 67% of all raptors observed at the proposed wind farm site (Figures 5-1 to 5-12). The species accounted for 24% of all raptor observations. This species is frequently observed both below and at RSA heights

The Brown Falcon seen very occasionally with only 6 observations recorded consisting of 6% of all observations (Figures 5-1 to 5-12). Two observations were of single birds and two observations were of pairs. The Brown Falcon was observed flying below and at RSA heights.

Very few observations of Brown Goshawk with only three observations recorded consisting of 3% of the total flights plotted. Only single birds reported and all were recorded below RSA heights putting these birds at minimal risk of collision with turbines.

It was difficult to estimate exactly how many Wedge-tailed eagle were utilising the wind farm site. No nesting sites were observed though courtship behaviour and stick carrying was observed which would

indicate that there are resident pairs that are nesting nearby. As reported in the BUS the Wedge-tailed was most active during autumn and was observed flying at RSA height regularly. The Nankeen Kestrel was the second most abundant raptor species recorded at the proposed wind farm site The species accounted for 24% of all raptor observations. This species is frequently observed both below and at RSA heights

The Brown Falcon seen very occasionally with only 6 observations recorded consisting of 6% of all observations. Two observations were of single birds and two observations were of pairs. The Brown Falcon was observed flying below and at RSA heights.

Very few observations of Brown Goshawk with only three observations recorded consisting of 3% of the total flights plotted. Only single birds reported and all were recorded below RSA heights putting these birds at minimal risk of collision with turbines.

No listed species of raptors have been recorded utilising the proposed Winterbourne Wind Farm site. The Little Eagle, listed as vulnerable under the BC Act, has been reported in the surrounding region.

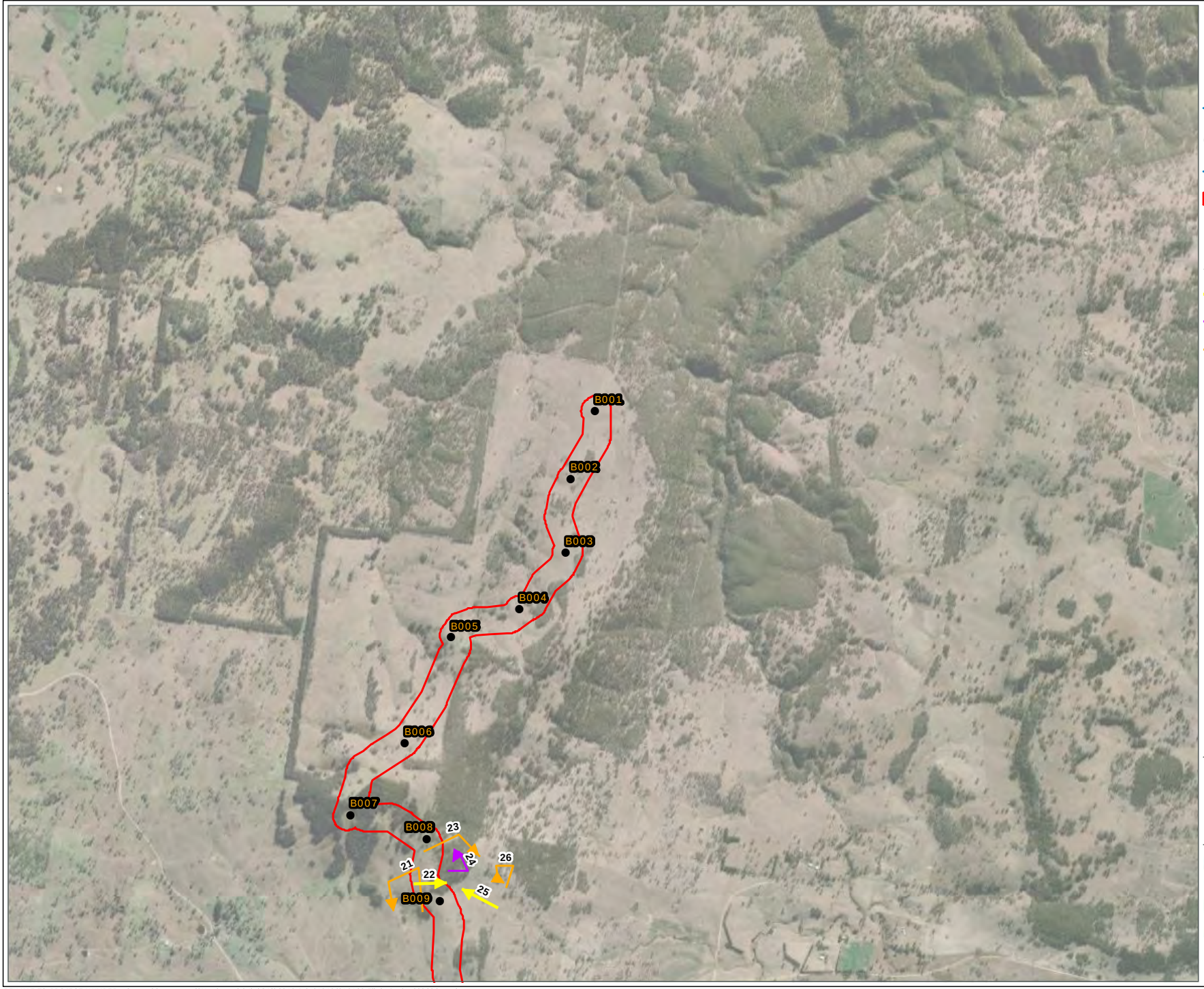


Figure 5-1: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

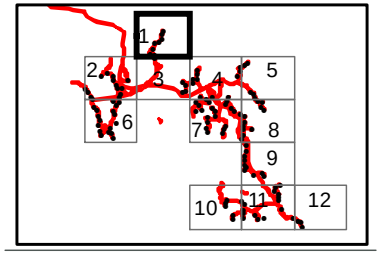
Proposed turbine

Species

Brown Falcon

Nankeen Kestrel

Wedge-tailed Eagle



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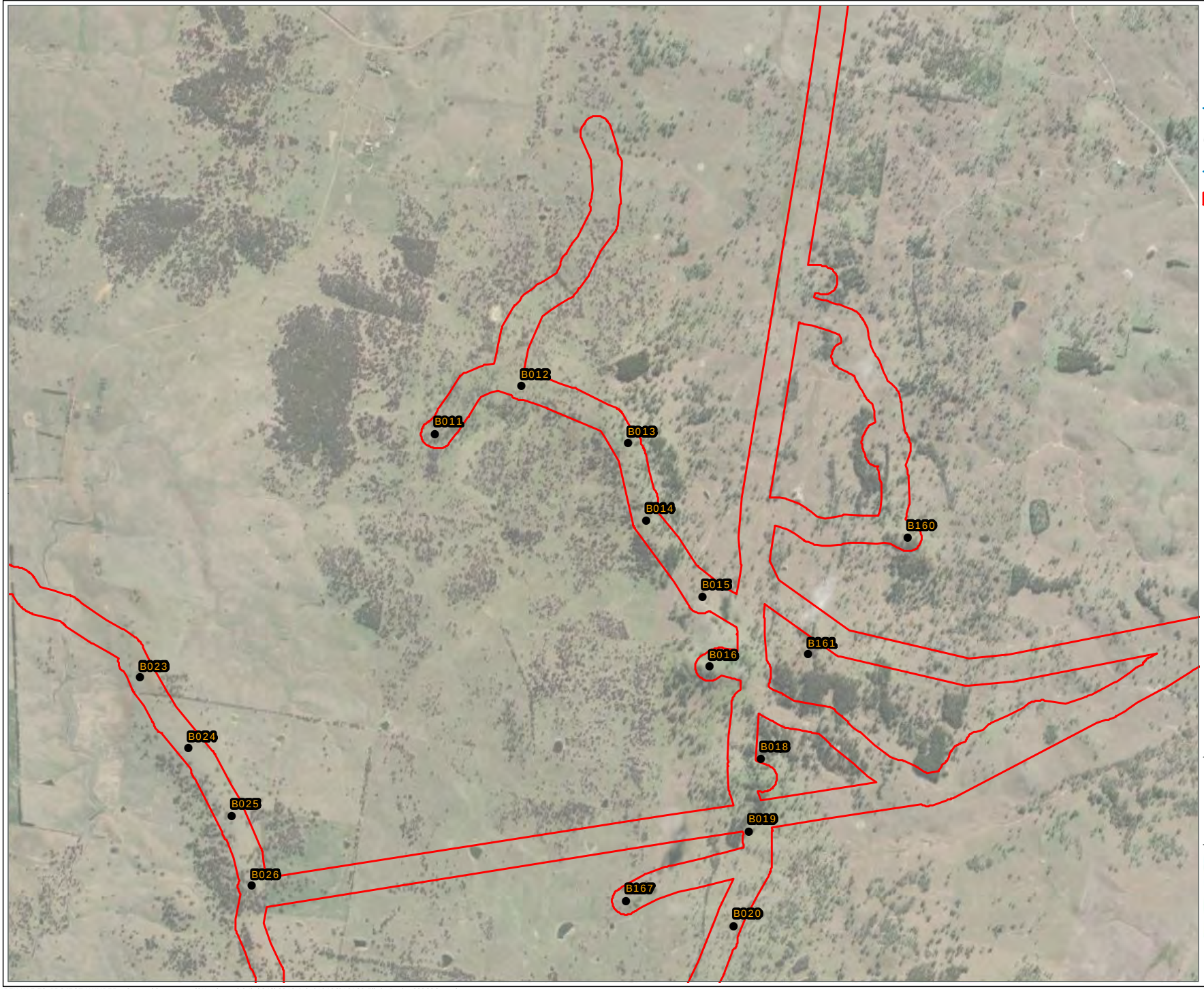
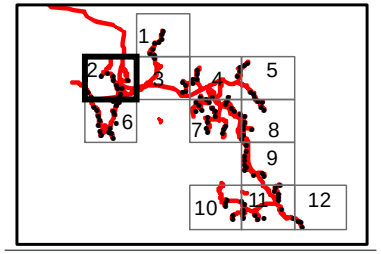


Figure 5-2: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine



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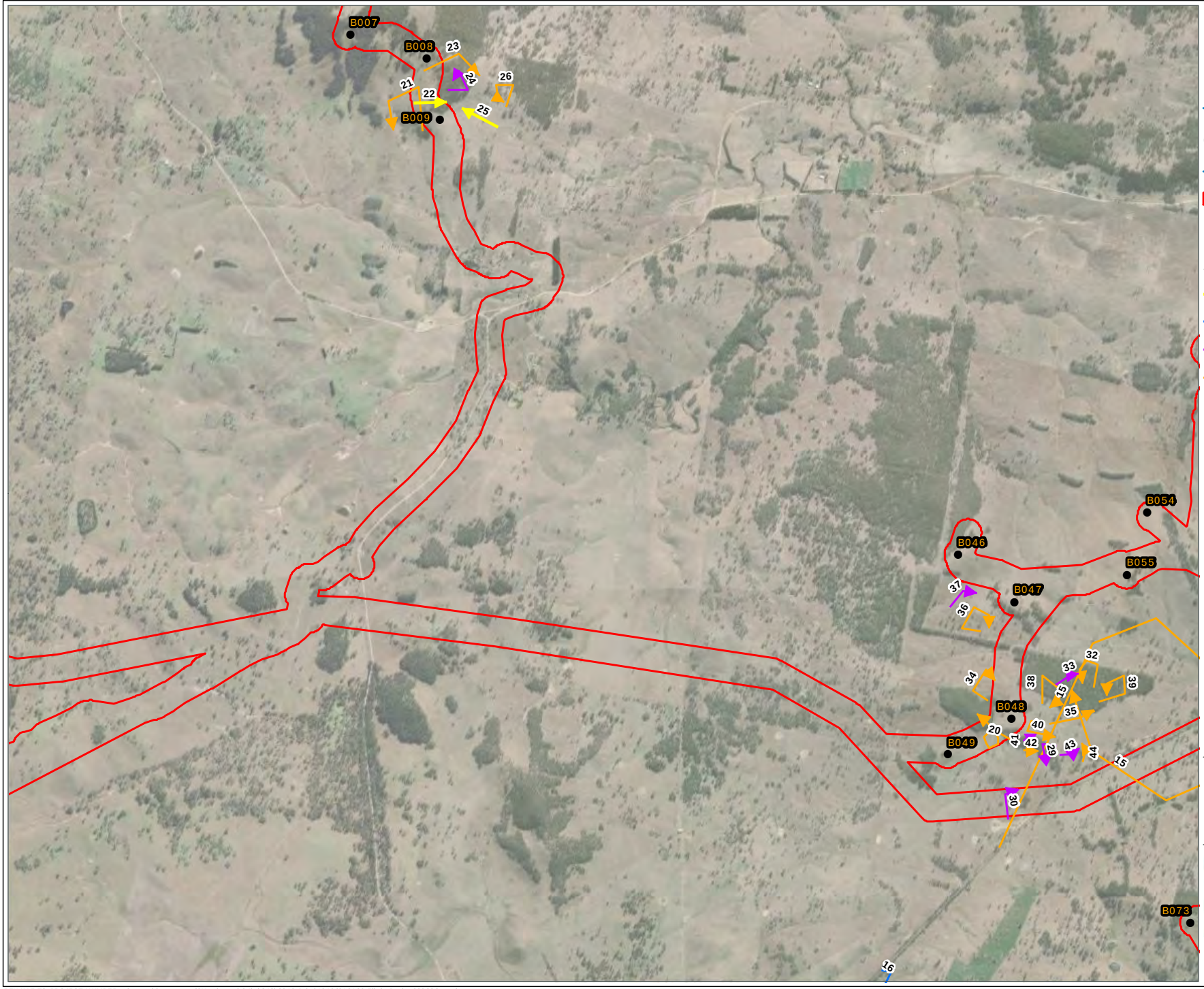


Figure 5-3: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine

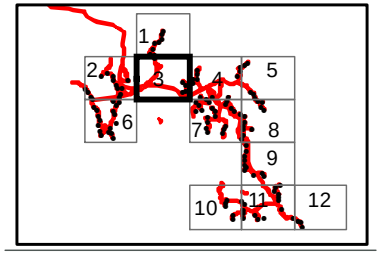
Species

Brown Falcon

Brown Goshawk

Nankeen Kestrel

Wedge-tailed Eagle



N

Metres

0 600

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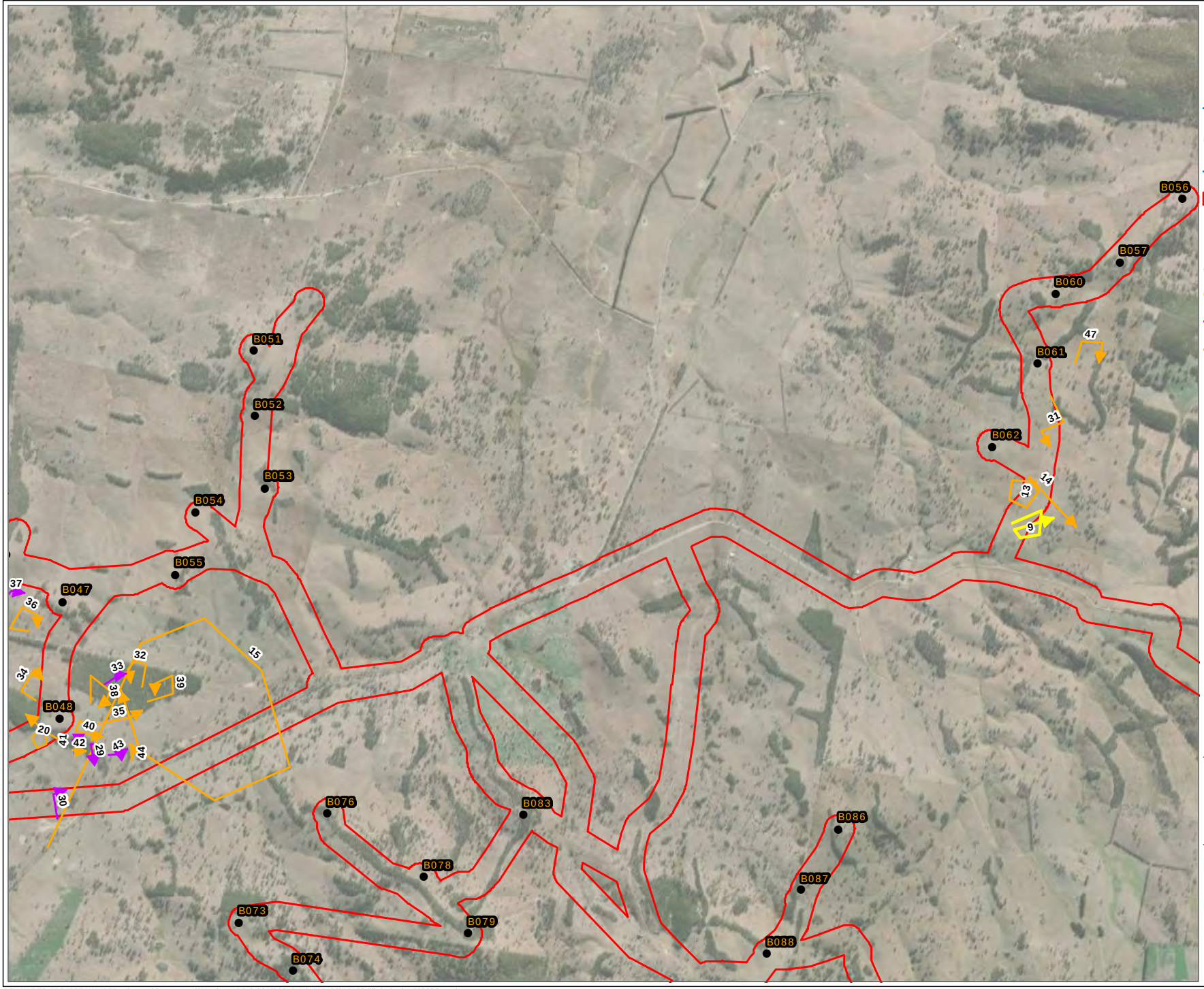


Figure 5-4: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

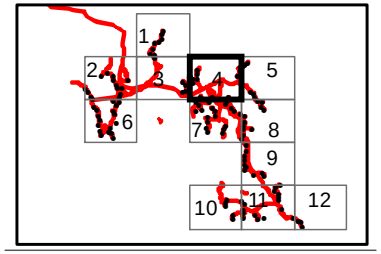
Proposed turbine

Species

Brown Falcon

Nankeen Kestrel

Wedge-tailed Eagle



N

Metres
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600

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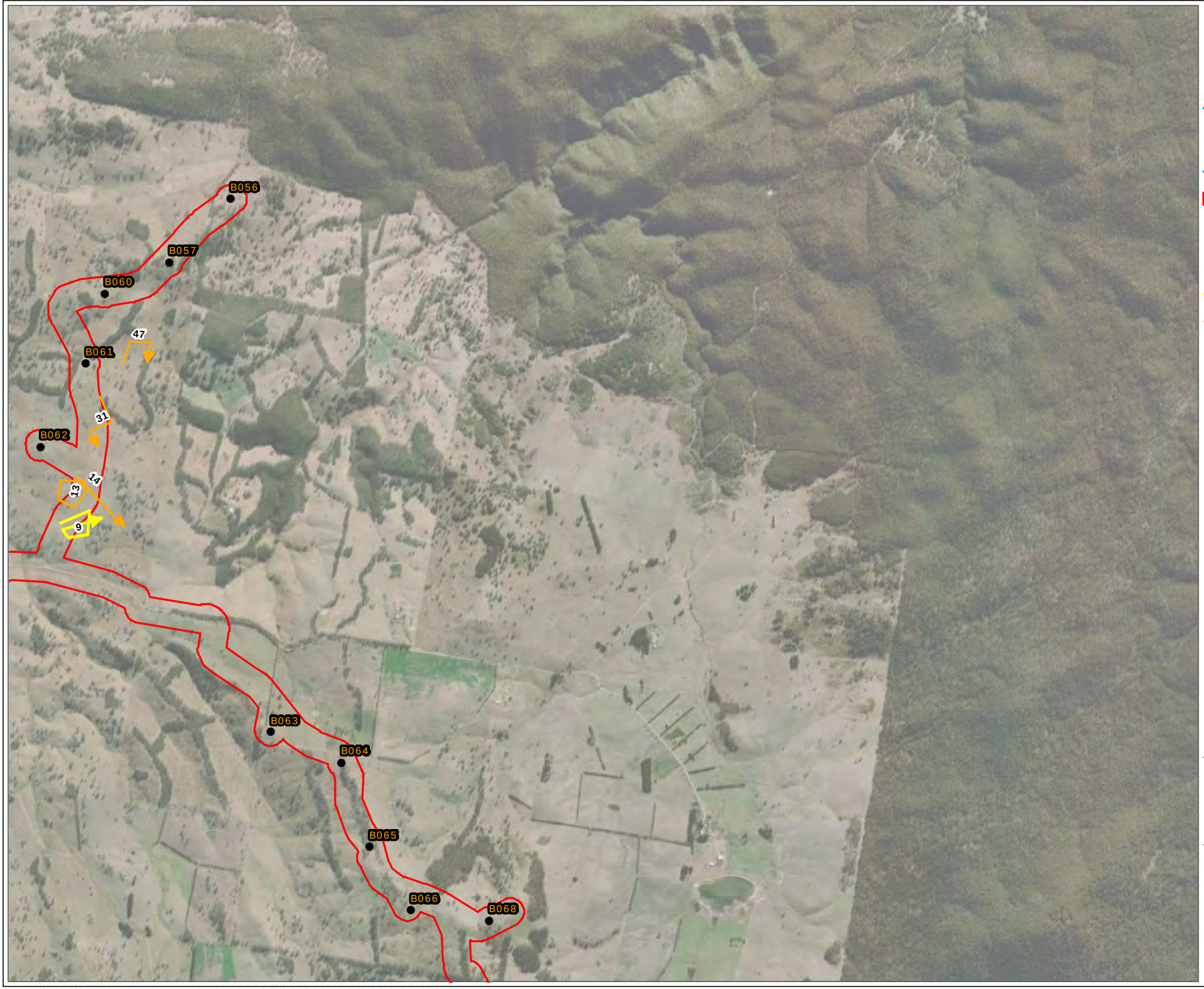


Figure 5-5: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

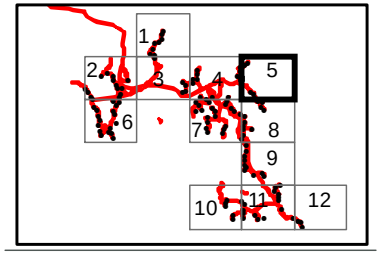
Winterbourne wind farm boundary

Proposed turbine

Species

Brown Falcon

Wedge-tailed Eagle



N

Metres
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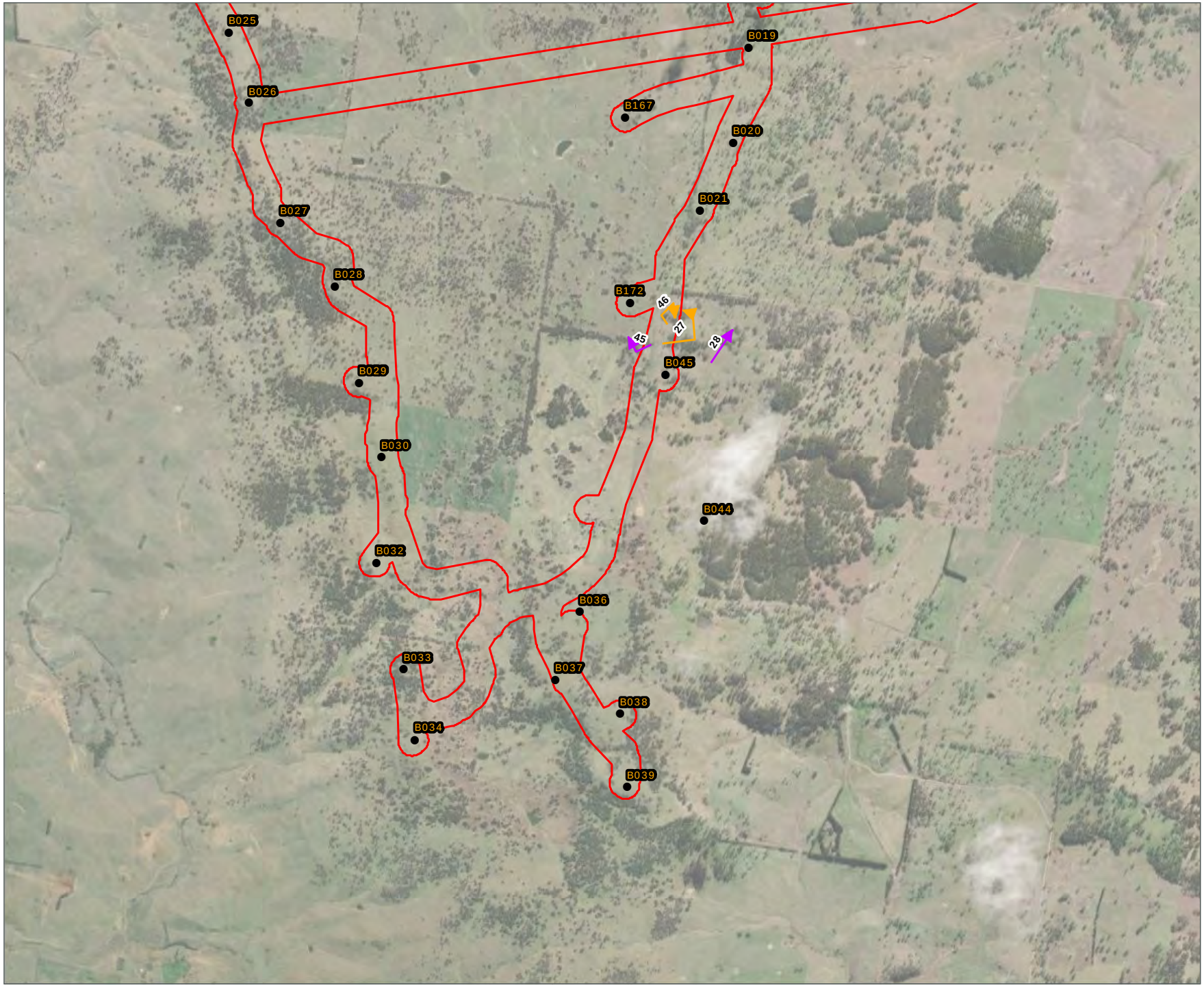


Figure 5-6: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

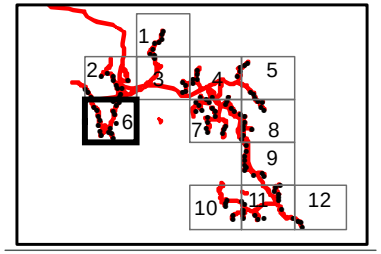
Winterbourne wind farm boundary

Proposed turbine

Species

Nankeen Kestrel

Wedge-tailed Eagle



N

Metres

0 600

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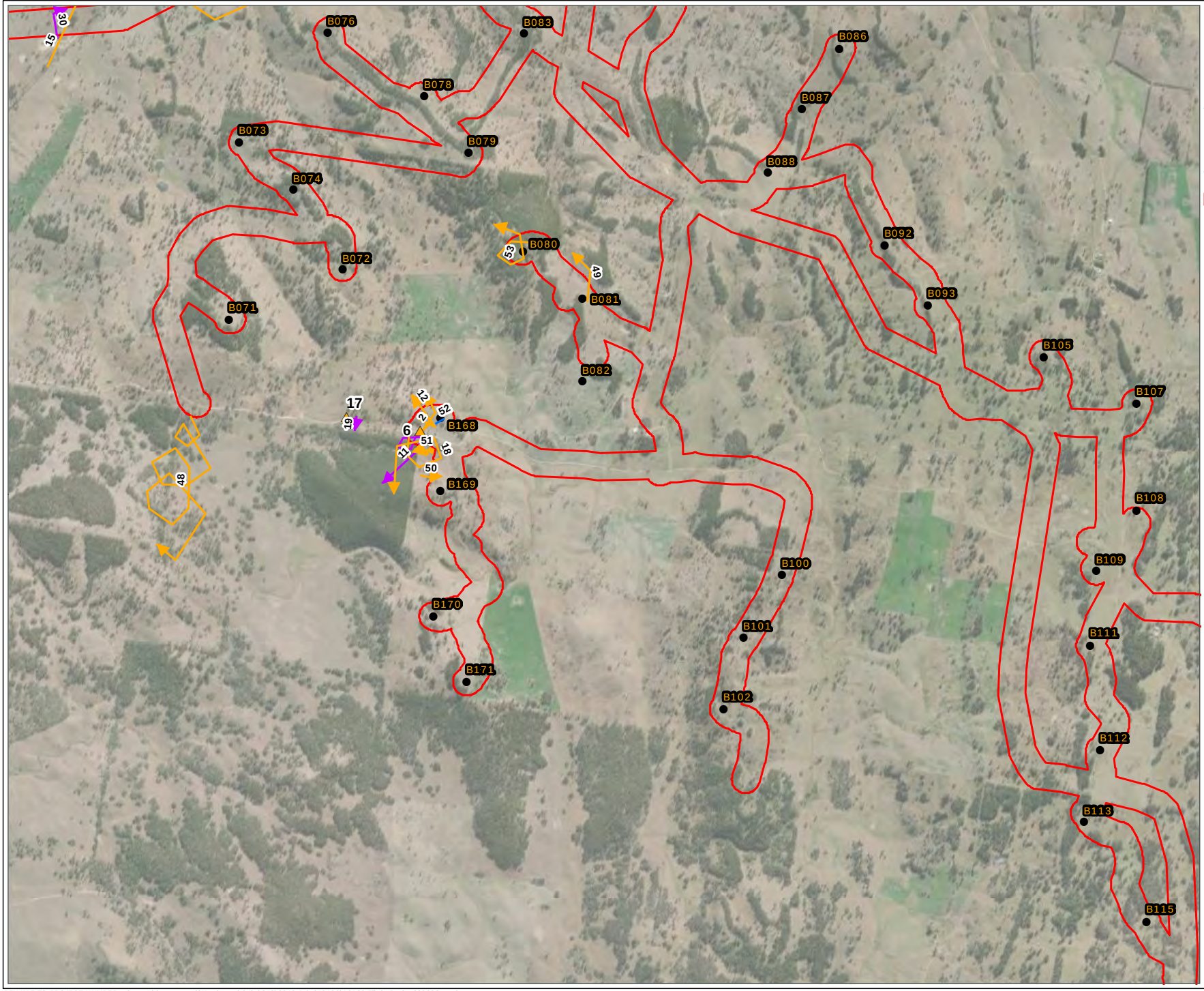


Figure 5-7: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine

Perched

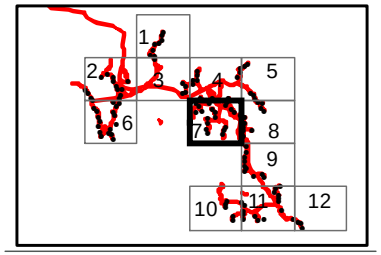
Wedge-tailed Eagle

Species

Brown Goshawk

Nankeen Kestrel

Wedge-tailed Eagle



N

Metres

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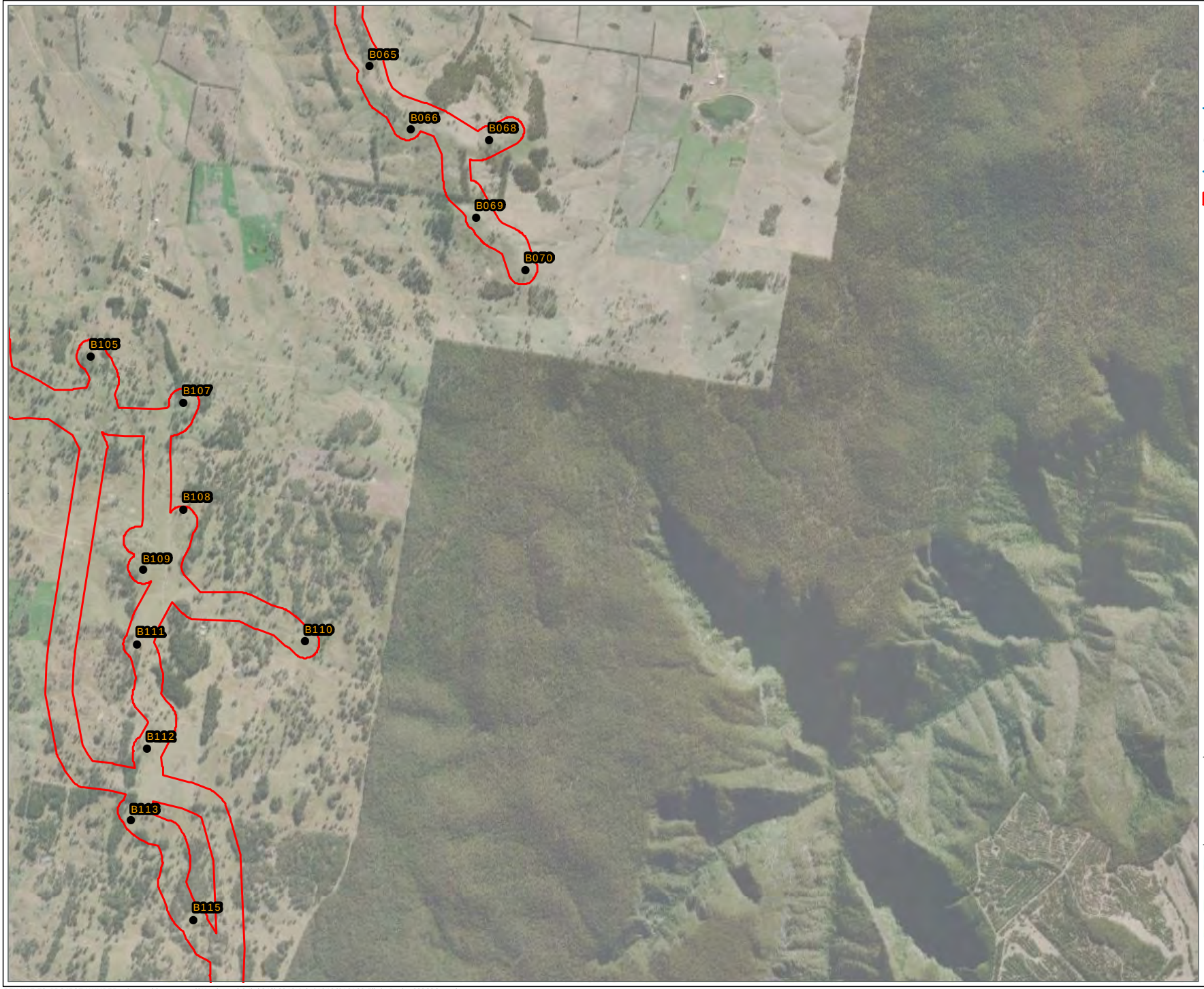
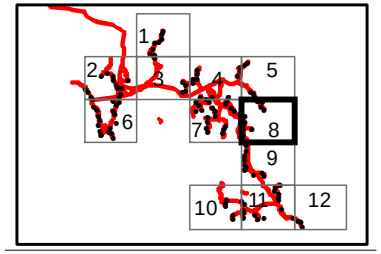


Figure 5-8: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine



N

Metres
0
600

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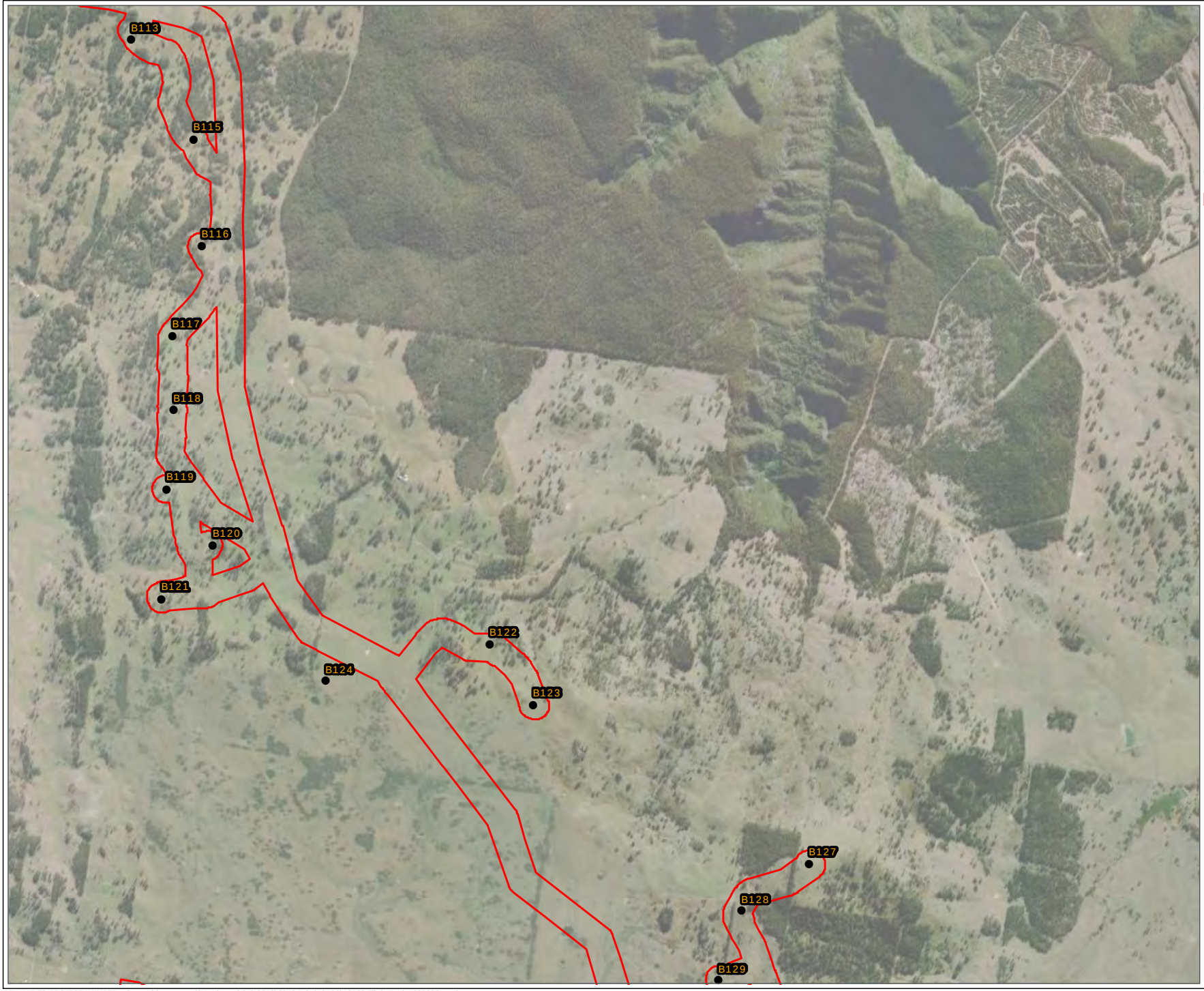
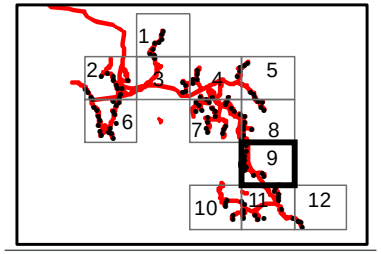


Figure 5-9: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine



N

Metres
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600

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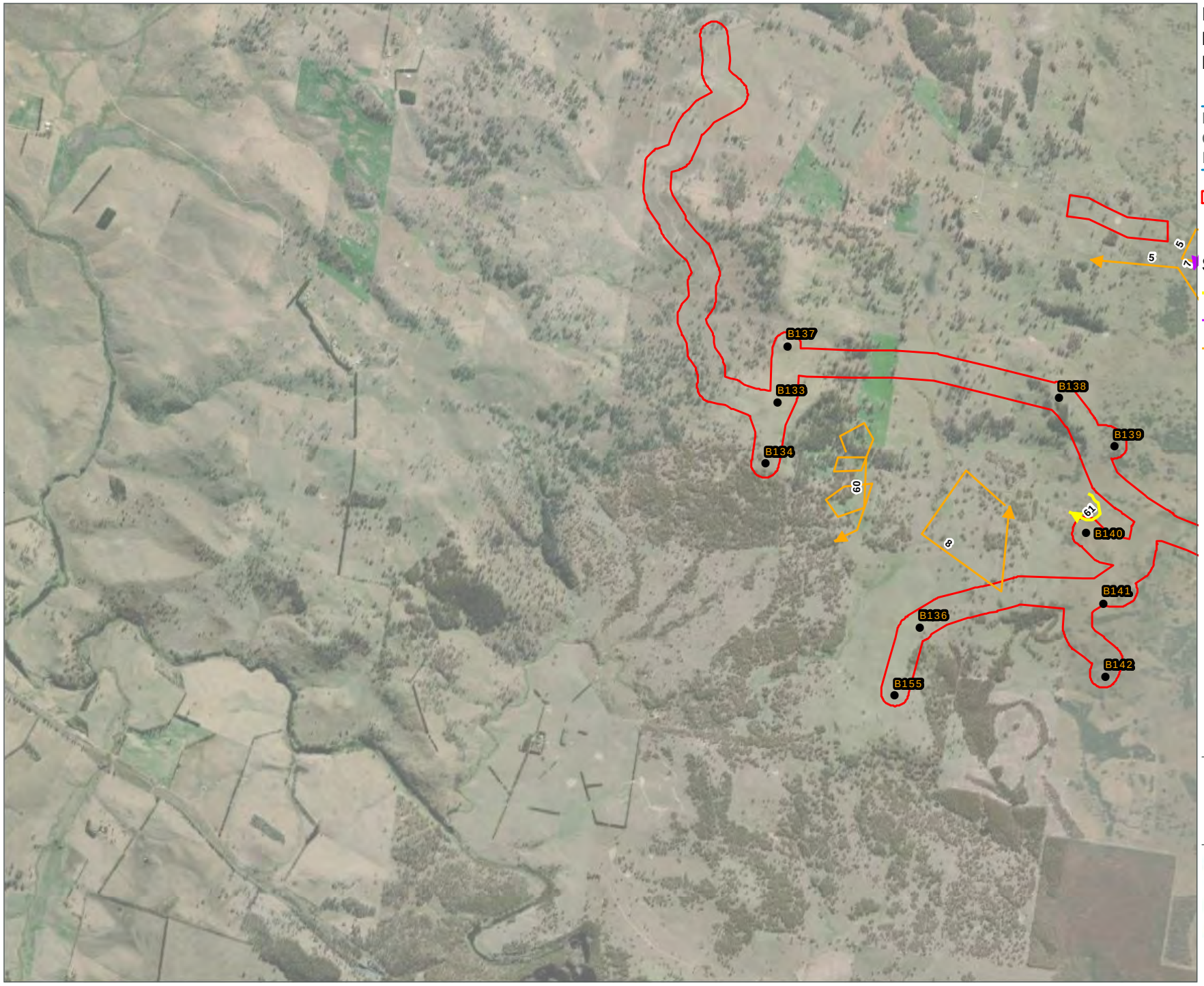


Figure 5-10: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

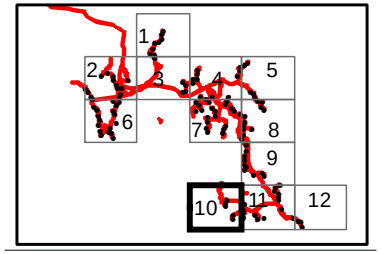
Proposed turbine

Species

Brown Falcon

Nankeen Kestrel

Wedge-tailed Eagle



N

Metres
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600

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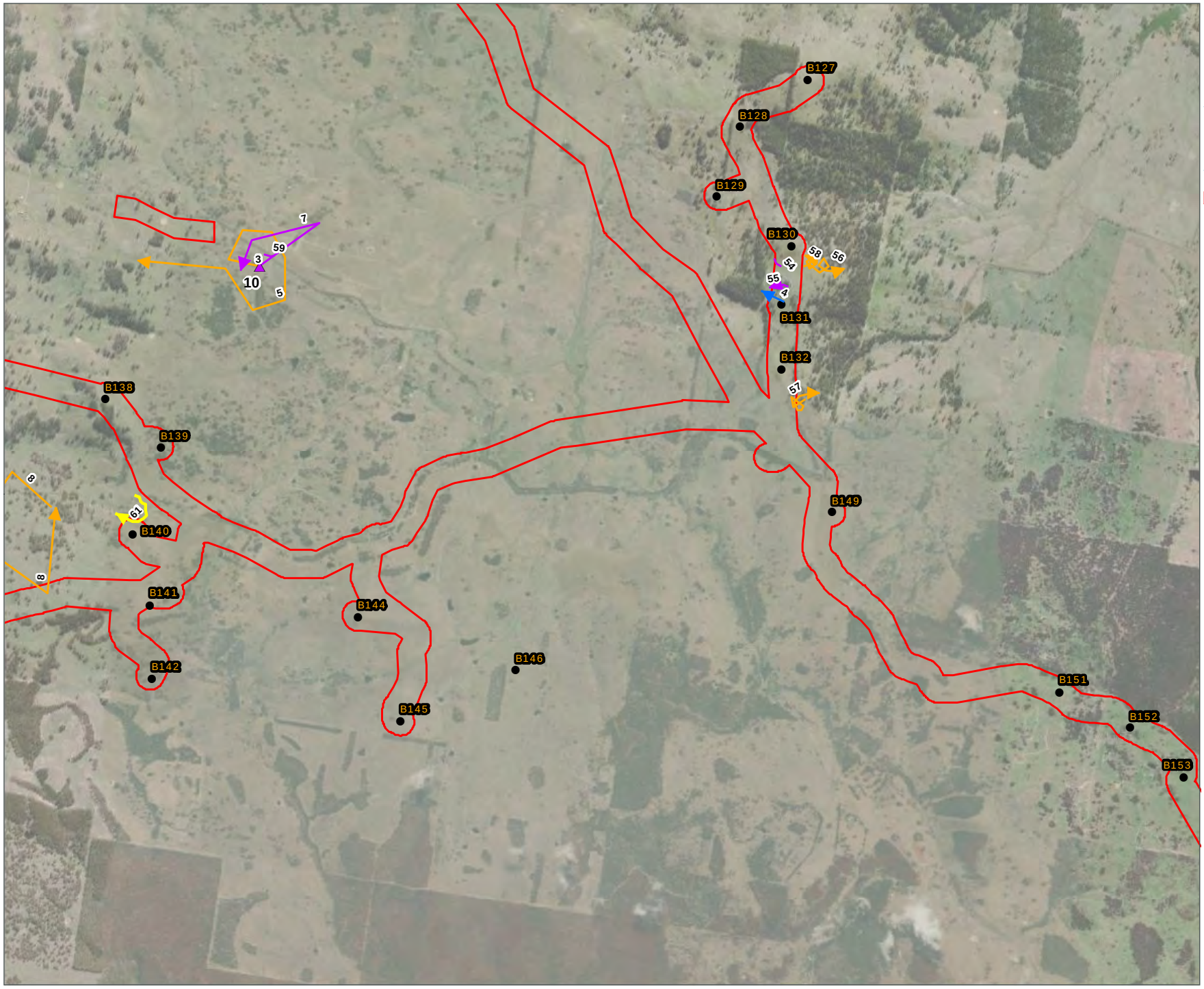


Figure 5-11: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine

Perched

Nankeen Kestrel

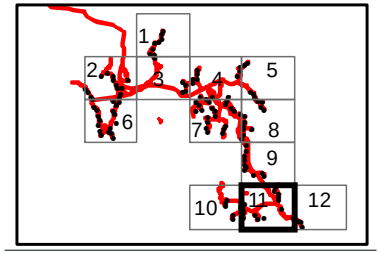
Species

Brown Falcon

Brown Goshawk

Nankeen Kestrel

Wedge-tailed Eagle



N

Metres
0
600

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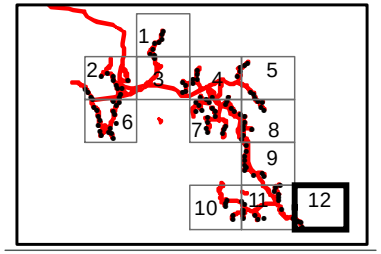
Figure 5-12: Raptor Flight Paths at Winterbourne Wind Farm

Project: Winterbourne Wind Farm
Client: NGH Consulting
Date: 24/02/2022

Winterbourne wind farm boundary

Proposed turbine



N

Metres
0
600

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4. Conclusions

The conclusions from the Spring 2020 and Autumn 2021 BUS at WWF are presented below.

- The proposed site is a mosaic of farmland and scattered woodland remnants, supporting predominantly farmland and woodland birds.
- During three seasonal BUS, a total of 4,656 individual birds were recorded, 2,609 of these from the impact points at WWF.
- Over 90 species of birds were recorded during the seasonal BUS, of which 65 species were recorded during spring and autumn, and 72 species during summer. At impact and reference points, 64 and 35, and 67 and 29 species were recorded during spring and autumn, and summer, respectively.
- Birds numbers were highest in spring (1,320 individuals), and lowest in summer (979), with autumn numbers (1,310) similar to spring.
- The five most common species (Percent of total birds recorded during the three seasons) at the impact points were; Australian Magpie (12.5%), Torresian Crow (8.9%), Yellow-rumped Thornbill (8,3%), Eastern Rosella (7.3%), and Superb Fairywren (5.8%). At reference points they were: Eastern Rosella (16.3%), Torresian Crow (14.5%), Noisy Miner (13,2%), Australian Magpie (10.5%), and Galah (8.8%). These five species comprised 42.5% of all birds recorded at the impact survey points and 63.3% at the reference survey points.
- A combined average of the distribution of bird flight heights revealed that a significant majority of 95.7% flew below, 3.4% at, and 0.9% over RSA heights. Three raptors, one raven and one cockatoo dominated bird species flying at RSA heights.
- Wedge-tailed Eagle was the most abundant raptor species at WWF during the three seasons of BUS. Numbers observed were high during autumn (64 Observations), lower in spring (41) and lowest in summer (28). Of the total number of eagles seen (133), 62.4% were observed flying at RSA heights. They made up 74.3% of all raptors.
- At the WWF, the number of Wedge-tailed Eagles were exceptionally high compared with other wind farms with similar settings. The utilisation rate of eagles was estimated as 0.66 eagles per hectare per hour, higher than the range (0.01 – 0.44) calculated for other wind farms in south-eastern Australia (Nature Advisory data).
- The Wedge-tailed Eagle and Nankeen Kestrel were both observed regularly flying at RSA height which will lead to interactions with turbines and may result in collisions.
- Waterbirds were found to be largely confined to some small farm dams and were mainly very common farmland species. One individual was seen flying at RSA during the three seasonal surveys.
- Four species of threated birds were recorded on the WWF site during BUS, namely Varied Sitella, Speckled Warbler, Diamond Firetail and Glossy Black-Cockatoo. None of these behave in a manner that puts them at risk of collision with operating wind turbines. One additional threatened species, Little Eagle, was identified incidentally flying over the wind farm site.
- Consideration should be given to mapping the habitat of the Glossy Black Cockatoo and assessing the availability of their favoured feed trees (i.e. *Allocasuarina and Casuarina*) and to identifying where Wedge-tailed Eagles are breeding to provide adequate (minimum 300m) buffers between nests and turbines.

5. References

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Crowley, G. M. & Garnett, S.T. (2001). Food value and tree selection by Glossy Black Cockatoos *Calyptorhynchus lathami*. *Austral Ecology* 26, 116-126.

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Appendix 1: Raw data for BUS spring 2020 survey impact points (BUS1-4) at WWF

Site	BUS1								BUS2												BUS3								BUS4									
Replicate	1	2	3	4	5		6	7	8	1		2	3		4		5		6		7		8	1	2	3	4		5	6	7	8	1		2	3	4	5	6	7		8
Species/height class	A	A	A	A	A	B	A	A	A	A	B	A	A	B	A	B	A	B	A	B	A	B	A	A	A	A	A	A	B	A	A	A	A	A	B	A	A	A	A	A	A	B	A
Australian Wood Duck																														4													
Australasian Darter																																											
Australian King Parrot			2														1											1				1									
Australian Magpie	2	4	2	1	5		3	1	1	1		6			2		2				2		1	2	4	2	2			1	1		5		1	2	3	2	1	2		1
Australian Raven														3										2					3												1
Black-chinned Honeyeater																																		3								
Black-faced Cuckoo-shrike				1						1			1		1				1		1										1			1	3	1		1	1		1
Black-shouldered Kite																															1											
Brown Falcon													1												1										1						
Brown Goshawk																																										
Crested Pigeon																									1																
Crimson Rosella					2								2												2																
Eastern Rosella	5	4	1	4	6			2				4											2	2			2			2			4			4	2		2			2
Eastern Yellow Robin																												1													
Fuscous Honeyeater																																		4		1						
Galah	2		6	5	3			3	3										1		1		3			2	2					1			2			1	1		
Grey Butcherbird	1			2			1			1		1			1						1				1						1			1				1	1		
Grey Shrike-thrush							1			1																								1					1			
Jacky Winter																																										
Laughing Kookaburra																																2										
Leaden Flycatcher		1																																								
Little Corella								2									3						2							2												
Little Friarbird																									1														1			
Magpie-lark			1																																							
Masked Lapwing																																										
Nankeen Kestrel	1					2		1	1	1		1											1					1			1						1				
Noisy Friarbird	3	1					1		2	1							2		1										1	1											
Noisy Miner	1	3	1		8		2	5	2	5		1			2		2		1				3	2		1	2				3					1					
Olive-backed Oriole																																										
Pied Butcherbird																																								2			
Pied Currawong				1	1								1		1									1			1											2			
Red Wattlebird																									1	3				1											
Red-rumped Parrot																																								1		
Restless Flycatcher																														3									1			
Rufous Songlark																														1	1											
Rufous Whistler																												1	1									1			3
Spotted Pardalote		1	1																																							
Straw-necked Ibis																																			10							
Striated Pardalote		1		4	1				1			1					1		2		2		2	3		1	1		2		2	2	1		1	3		1		2		2
Sulphur-crested Cockatoo								1	10														1																1			1
Superb Fairy-wren																			5		5			7					3	4		5			4		2	2	4	5		
Torresian Crow	3		2							3																2				4			4		1		1		5			
Tree Martin																									1											2						
Varied Sitella																																										
Wedge-tailed Eagle											2	3					2		3		2		2			1			1							2				2	
Weebill							3																			2															

Site	BUS1									BUS2														BUS3								BUS4								
Replicate	1	2	3	4	5		6	7	8	1		2	3		4		5		6		7		8	1	2	3	4		5	6	7	8	1		2	3	4	5	6	7		8
Species/height class	A	A	A	A	A	B	A	A	A	A	B	A	A	B	A	B	A	B	A	B	A	B	A	A	A	A	A	B	A	A	A	A	A	B	A	A	A	A	A	A	B	A
Welcome Swallow													1																													
Whistling Kite																																	1								
White-browed Scrubwren																								3	2	1	4			2		1				1					
White-throated Gerygone							1			1															2																
White-throated Treecreeper		2													1										1				1	1	1		1		1	1	1	1			
White-winged Chough													5																												
Willie Wagtail					1		1														1				1	1					1					1				
Yellow-rumped Thornbill		10	4				5	3							3		3		7		7		3						7	3	3	3			3		4	5	6	7		
Yellow-tailed Black Cockatoo																																									
Total	18	27	20	18	27	2	18	18	20	15	2	17	11	3	11	2	14	3	18	2	20	2	18	22	21	13	14	2	20	18	23	17	18	1	22	28	20	17	23	21	2	11

Notes: A = below RSA height, B = At RSA height.

Appendix 1 continued: Raw data for BUS spring 2020 survey impact points (BUS5-8) at WWF

Site	BUS5										BUS6													BUS7								BUS8									Total
Replicate	1	2	3	4	5		6		7	8	1		2	3	4		5		6		7	8		1	2	3	4	5	6	7	8	1	2	3	4		5	6	7	8	
Species/height class	A	A	A	A	A	A	B	A	A	B	A	B	A	A	A	B	A	B	A	B	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	
Australian Wood Duck																																									**4**
Australasian Darter										1																																**1**
Australian King Parrot						1																		1															2			**9**
Australian Magpie	2	4	2	7	1	2		3	1		1		4	3	1		1				1	2		6	4	2	1	5	1	3	2	2	4	1	1				3	2	**134**
Australian Raven																																									**9**
Black-chinned Honeyeater													2	2			2		1		2	4													3						**19**
Black-faced Cuckoo-shrike											1								1			1					1		1	1	1			1			1			**24**
Black-shouldered Kite																																									**1**
Brown Falcon																																									**3**
Brown Goshawk																									1																	**1**
Crested Pigeon													1																													**2**
Crimson Rosella													2											1	2	6		1		2				2								**22**
Eastern Rosella		2		3				2	2					2					2					4	4		7	2	2			2	4				2	2			**90**
Eastern Yellow Robin																																								1		**2**
Fuscous Honeyeater																																		3	4		2					**14**
Galah		6	2	10	2	2		4	3												1	1		2			2							1	2						**74**
Grey Butcherbird		1	1		1			1			1		1	1	1				1		1	1			1						1				1				1		**28**
Grey Shrike-thrush											1		1	1	1		1																								**8**
Jacky Winter	1																																								**1**
Laughing Kookaburra																								2			1	1							1						**7**
Leaden Flycatcher																																2	1	1				1	1	**7**
Little Corella						3			2																																**14**
Little Friarbird													1						1																						**4**
Magpie-lark		1	1	1	1									1																											**6**
Masked Lapwing								2	2																																**4**
Nankeen Kestrel									1					1																												**13**
Noisy Friarbird													1		1						1												2	1	2			1	1	1		**24**
Noisy Miner		1			1				3						2																2										**54**
Olive-backed Oriole																						1													1				2		**4**
Pied Butcherbird																																									**2**

Site	BUS5										BUS6												BUS7								BUS8								Total
Replicate	1	2	3	4	5	6		7	8		1		2	3	4		5		6		7	8		1	2	3	4	5	6	7	8	1	2	3	4		5	6	7	8	
Species/height class	A	A	A	A	A	A	B	A	A	B	A	B	A	A	A	B	A	B	A	B	A	A	B	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	
Pied Currawong											1													2	3		2	1		1	1	1		1						**21**
Red Wattlebird																																								**5**
Red-rumped Parrot		1											4		2																									**8**
Restless Flycatcher																												1												**5**
Rufous Songlark																																								**2**
Rufous Whistler																	1				1						1											1	1	1	**12**
Spotted Pardalote																																								**2**
Straw-necked Ibis		1			1			1						1																										**14**
Striated Pardalote	1	2	1	2	1	1		2	2				1						1		2	2		5	3	5	4	2	1	3	5	3	1	2	1		3	3	2	1	**98**
Sulphur-crested Cockatoo				1					1																															**16**
Superb Fairy-wren														4	7		4		3			5					4		3			7	6	7	4			6	5	4	**115**
Torresian Crow		2	2	1	5	2		2	5		3		7	7	11		4		5		5	2		4		5	2	2		2			4	1	1					**109**
Tree Martin								1					1																											**5**
Varied Sitella																																3								**3**
Wedge-tailed Eagle							1		1			4	1	1		4		2		2	1		2												2					**41**
Weebill	1										3		2		3											2														**16**
Welcome Swallow																													1											**2**
Whistling Kite																																								**1**
White-browed Scrubwren																																								**14**
White-throated Gerygone											1		1		1						1	1																		**9**
White-throated Treecreeper													1	1			1		1					1		1			1		1	2	1		1		1	2	1	1	**29**
White-winged Chough																																								**5**
Willie Wagtail			1								1		1	1	1		1		1		2	1																		**18**
Yellow-rumped Thornbill		3	3	3	5	3		2	3		8		3	4			3		6		4	7			3						3	5	4	4	3		2	4	7	5	**183**
Yellow-tailed Black Cockatoo																																		3							**3**
Total	5	24	13	28	18	14	1	20	26	1	21	4	35	30	31	4	18	2	23	2	22	28	2	28	21	21	25	14	10	13	16	29	26	29	23	2	12	21	25	15	**1321**

Notes: A = below RSA height, B = At RSA height.

Appendix 2: Raw data for BUS autumn 2021 survey impact points (BUS2-5) at WWF

Points	BUS2											BUS3												BUS4																BUS5															
Replicate	1		2	3		4	5	6		7	8	1	2	3		4		5		6	7	8		1		2	3	4		5		6		7	8					1	2		3		4	5		6	7		8	
Species/height class	A	B	A	A	B	A	A	A	B	A	A	A	A	A	B	A	B	A	B	A	A	A	B	A	B	A	A	A	B	A	B	A	B	A	A					A	A	B	A	B	A	A	B	A	A	B	A	B
Australian Wood Duck														4				1																								27						17	9			
Australian Magpie	5		1	4		2	5	2		9	5	3				4		2		4	4	2		5		6	3	3		12		10		4	9					2	5		1		3	1		3	5		5	
Australian Pipit			1															1				1																													
Black-faced Cuckoo-shrike											1	1																																							
Black-shouldered Kite																																																1		
Brown Falcon											1																						1														1			
Common Starling																																			2															
Crested Pigeon																										2																								
Crimson Rosella										5		2	4	1		1		2						1																		1									
Eastern Rosella	6						2	6		2	2	1	2											19		4		4		2		6		4		6			2		13			2					
Galah																											2				5		59			12								14				
Glossy Black Cockatoo																																																	
Grey Butcherbird	2			1		1							1																		1			1	1												
Grey Fantail																1																																	
Grey Shrike-thrush																																																
Laughing Kookaburra						1				1		1																																					
Masked Lapwing																														2														2		3		
Nankeen Kestrel						1	1																														1								1		
Noisy Friarbird																																																
Noisy Miner	7		5	6		5	2	2		2	7															8	3	5		4		2				2			2		2			1	3			
Olive-backed Oriole																										1																							
Peregrine Falcon							1																																										
Pied Currawong																1								1			1																						
Rainbow Lorikeet																																																
Red Wattlebird												1												1			1																						
Red-rumped Parrot																														2			9															
Red-winged Parrot																																																
Rufous Whistler																											2																						
Speckled Warbler														4																																			
Striated Pardalote																								2																									
Striated Thornbill																								4			5																						
Sulphur-crested Cockatoo																																																
Superb Fairy-wren												8	6	3		3								9																									
Torresian Crow	4			1			1			4	1	4	5			2				2	2				2	1	1	8		19		11		6	2	3	1		3		3			5	7		2	
Tree Martin											2																																						
Varied Sitella													12																																				
Wedge-tailed Eagle		1			1				2				3		2		3		3				1		1				8		5	3			1			8		1			2			5		2	
Welcome Swallow			2			1																																			1							
White-browed Scrubwren												2																																				
White-throated Gerygone																																																
White-throated Treecreeper																			1					1		1						1																	
White-winged Chough																														7																		
Willie Wagtail																								1				1						1														
Yellow-rumped Thornbill																					5													8								3							
Total	24	1	9	12	1	11	12	10	2	23	19	23	33	12	2	12	3	6	3	7	6	8	1	44	3	21	16	25	8	44	5	43	1	75	31	14	46	8	8	1	22	5	2	28	41	6	11	2

Appendix 2 continued: Raw data for BUS atumn 2021 survey impact points (BUS6-9) at WWF

Points	BUS6											BUS7									BUS8									BUS9									Total
Replicate	1	2		3		4	5	6	7	8		1		2	3	4	5		6	7	8	1	2	3	4	5		6	7	8	1	2	3	4	5		6		7	8	
Species/height class	A	A	B	A	B	A	A	A	A	A	B	A	B	A	A	A	A	B	A	A	A	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A	B	A	A	
Australian Wood Duck																																								58
Australian Magpie		1				2	2		5	1		2		6	2	2	3		3	4	6	4	2	1	1	3		1	1	2	5	5	1	5	2	6		3	3	213
Australian Pipit																																		1						4
Black-faced Cuckoo-shrike		1															1		1																					5
Black-shouldered Kite																																								1
Brown Falcon																																								3
Common Starling																																								2
Crested Pigeon																																								2
Crimson Rosella									5														1	3	1				4						5					36
Eastern Rosella						1	2		6			2										2												2		2		4	4	108
Galah		2							2																		3				5	2								106
Glossy Black Cockatoo														2																										2
Grey Butcherbird							1							1	2		1		1			1		1								1								17
Grey Fantail	1			2		1	1																																	6
Grey Shrike-thrush																						1																		1
Laughing Kookaburra				1				1	1													1						1	1			1				1				12
Masked Lapwing																																								7
Nankeen Kestrel													1								2																				7
Noisy Friarbird	1														1																										2
Noisy Miner				4					2													1										1	3	1		3	5		3	4	95
Olive-backed Oriole																																								1
Peregrine Falcon															1																										2
Pied Currawong														1	1					1				1	1				1		1							1			11
Rainbow Lorikeet																						13											2					2			17
Red Wattlebird																						1	1	3	1			14	1			1	1	1	1	1		1			30
Red-rumped Parrot		3		5																											2	4	3	11	13	2		6			60
Red-winged Parrot										2																															2
Rufous Whistler																																									2
Speckled Warbler																																									4
Striated Pardalote		2					2	2				2			2								3						1												16
Striated Thornbill																																									9
Sulphur-crested Cockatoo																			1														2								3
Superb Fairy-wren	3	6					5		5													4	5						2											59
Torresian Crow	5	1		2			1		3	4		3			18	11	5			3	5	3	2	9	4	5		1	7	8		2			2	1		2		207
Tree Martin				1																						1														4
Varied Sitella																						11																			23
Wedge-tailed Eagle			1		1		1		1		1			2		1		2														1					1			64
Welcome Swallow																																2								6
White-browed Scrubwren																																								2
White-throated Gerygone	1					1																																		2
White-throated Treecreeper		1					1	1	1			1		1					1			2	2	1		1		1	1				1		1				1		22
White-winged Chough				6																																				13
Willie Wagtail	1	5		1																															1					11
Yellow-rumped Thornbill	9	4																				7	7						3	7										53
Total	21	26	1	22	1	5	16	4	31	7	1	10	1	13	27	14	10	2	6	9	13	51	23	19	8	10	3	18	22	17	14	25	9	20	28	18	1	22	12	1310

Appendix 3: Raw data for BUS spring 2020 and autumn 2021 at reference points at WWF

Season	Autumn																					Spring																				
Reference points	RF1												RF2								Autumn Total	RF1								RF2									Spring Total
Replicate	1		2		3		4	5		6	7	8	1	2	3	4	5	6	7	8		1	2		3	4	5	6	7	8	1	2		3	4	5	6	7	8	
Species/height class	A	B	A	B	A	B	A	A	B	A	A	A	A	A	A	A	A	A	A	A		A	A	B	A	A	A	A	A	A	A	A	B	A	A	A	A	A	A	
Australian Magpie	3		4		2		5	6		2	6		7	5	2	5	2	4	4	1	**58**	2	2		1	1	3	1	1	2	2	2		3	2	2	2	1	5	**32**
Australian Pipit													1								**1**																			
Australian Wood Duck																												2												**2**
Black-faced Cuckoo-shrike													1			1					**2**	2			5	1														**8**
Common Starling																									1															**1**
Crimson Rosella	2		2										2				9	4		2	**21**			2	6														2	**10**
Eastern Rosella			21		6		6	3		4	4	3	11		2	4	2	6	9		**81**	5	7		3	5	3		2		6	8		2	4	4	2		6	**57**
Eastern Yellow Robin																						1																			**1**
Galah					2		23	22			16		4							1	**68**		1			2	5		8	1	1			1	3	1				**23**
Grey Butcherbird	1				1		1	1		1			2		1	1	1	2	1		**13**							1		1	1			1	1	1			1	**7**
Laughing Kookaburra																																					1				**1**
Little Corella																											2		2	5											**9**
Magpie-lark													1			1	1	1		1	**5**						1	1												**2**
Masked Lapwing																													3												**3**
Nankeen Kestrel										1					1						**2**											1			1		1	1	2	**6**
Noisy Friarbird																						2			5	1				2					1					**11**
Noisy Miner	3		5		7		6	4		2	1		2	4	1	3	1	4	2	3	**48**	1	3		2	2		1	4	2	3	3		3	2	3			9	**38**
Olive-backed Oriole																	1				**1**																			
Pacific Black Duck										2											**2**																			
Pied Currawong																							1		1							1	1				1		1	**6**
Red Wattlebird																1	1				**2**																			
Red-rumped Parrot			13		4		19	17		8	3	19									**83**																		
Straw-necked Ibis																												5			2			9		13		1		**30**
Striated Pardalote																	2	2	1	1	**6**		3					1	2		2	3		2	4	3	1	2	3	**26**
Sulphur-crested Cockatoo						2	1						1								**4**						5		1	4									**10**
Torresian Crow	1		1		3		5	6		2	5		9	7	8	13	1	8	5	18	**92**		1		2		1	5	5	2	3	9		4	6	8	4	7	7	**64**
Tree Martin																																					2		1		**3**
Wedge-tailed Eagle		1		3	1		1		1	2				1							**10**												2							**2**
Weebill					3																**3**																			
Welcome Swallow					2																**2**																			
White-throated Gerygone																																		1							**1**
White-throated Treecreeper							1														**1**																			
Willie Wagtail																		1			**1**									1									1	**2**
Yellow-rumped Thornbill																										2	3	2	3	7											**17**
Total	10	1	46	3	31	2	68	59	1	24	35	22	41	17	15	29	21	32	22	27	**506**	13	18	2	26	14	23	19	31	27	21	27	2	26	24	38	11	13	37	**372**

Notes: A = below RSA height, B = At RSA height.

Appendix 4: Raw data for BUS summer 2022 survey impact points (BUS2-5) at WWF

| Season | Summer | | |

| Season | Summer | | |

Appendix 4 continued: Raw data for BUS summer 2022 survey impact points (BUS 7-8, 12-13) at WWF

Season	Summer																																Total all surveys
Reference points	BUS7									BUS8								BUS12								BUS13								
Replicate	1	2	3	4		5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4		5	6	7	8		1	2	3	4	5	6	7	8	
Species/height class	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	B	A	A	A	A	A	A	A	A	
Australasian Pipit																																				7
Australian Ibis																																				2
Australian Magpie		8					1	1		2	1	1	2	1	1	1		1	1	4	1			1		1		1	10	2	2	1	3	3	1	102
Australian Raven																																				10
Australian Wood Duck																																				7
Black-faced Cuckoo-shrike				1									1	1		1		1													1					14
Brown Falcon																				1																5
Brown Goshawk								1																												1
Brown Honeyeater																																				4
Brown Quail								1																												1
Brown-headed Honeyeater			1			3	1	1												1	2		1	3	1	2										16
Buff-rumped Thornbill																																				13
Common Starling																																				80
Crested Pigeon																																				1
Crimson Rosella			1									2	1	2	2	3	1											1	1		1	1				22
Diamond Firetail																																				9
Dusky Woodswallow																																				21
Eastern Rosella							2																					1					1			55
Eastern Spinebill			1	1		1	1	1	1										1	1	2		1		1											12
Fairy Martin																												1		3						4
Fan-tailed Cuckoo																																				4
Forest Raven													1		2											3	1			1						11
Fuscous Honeyeater																																				1
Galah									2																											18
Grey Butcherbird	1																													1						10
Grey Fantail	1	2	2	1		1	1	1	1																											10
Laughing Kookaburra																												2			1		2			7
Little Corella																																				26
Little Lorikeet																																	1			1
Little Raven															2	4	1																			7
Magpie-lark																																				4
Masked Lapwing																																				2
Mistletoebird				1																																1
Musk Lorikeet			2																																	2
Nankeen Kestrel											1																									8
Noisy Friarbird						2																								1						6
Noisy Miner																												1				1			1	54
Pacific Black Duck																																				1
Pallid Cuckoo																																				3
Pied Butcherbird																																				6
Pied Currawong					1									2																						5

Season	Summer																																Total all surveys
Reference points	BUS7									BUS8								BUS12									BUS13								
Replicate	1	2	3	4		5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4		5	6	7	8		1	2	3	4	5	6	7	8	
Species/height class	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	B	A	A	A	A	A	A	A	A	
Rainbow Bee-eater																																				2
Raven/Crow sp.											2											1						1	1					1		6
Red Wattlebird																		2	2				1	1	2							1		2		16
Red-rumped Parrot																							2													8
Rufous Songlark																																				5
Rufous Whistler		1		1		2	1	1	1																											10
Striated Pardalote										2						1									2			1	2	1	2	1	1	1	1	32
Striated Thornbill						4																									2					15
Stubble Quail										1										1	1		1	1	2	1										8
Sulphur-crested Cockatoo																																				22
Superb Fairy-wren		1	1	1		1	1	1																				1	1	1	2	1	1			35
Torresian Crow																																				3
Tree Martin																																				5
Varied Sittella		3	3	2		2	2	2	2															1												17
Wedge-tailed Eagle																																				28
Welcome Swallow																																				20
White-browed Scrubwren																																				2
White-eared Honeyeater				1				1																												2
White-naped Honeyeater								1	1																											2
White-throated Treecreeper	1	1	1	1		1	1			1											1		1		1			1	1	1	1	1			1	27
White-winged Chough																																				30
Willie Wagtail		1	1			1	1		1											1	1	1		1		1	1									18
Yellow Thornbill																																				12
Yellow-faced Honeyeater	1	2	2	2		2	3	3	2																											17
Yellow-rumped Thornbill		4				1	1																		1											63
Total	4	23	15	12	1	21	16	15	11	6	4	3	5	6	7	10	2	4	5	9	8	1	7	7	10	10	1	11	16	9	14	8	8	7	4	979

Notes: A = below RSA height.

Appendix 5: Raw data for BUS summer 2022 at reference points at WWF

Season	Summer																Total
Reference site	REF1								REF2								
Replicate	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	
Species/height class	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Australian King Parrot								1									1
Australian Magpie					3	3	3			2	1	1	3	1	5	1	23
Australian Raven			1			1											2
Black-faced Cuckoo-shrike		2	1		1								3				7
Common Starling				5													5
Crested Pigeon				1													1
Crimson Rosella	2	3		2													7
Dollarbird							1										1
Eastern Rosella	5	3	4	1			3	3	2	5	2	2		1	3	3	37
Forest Raven															1		1
Galah			2	2													4
Grey Butcherbird						3											3
Grey Shrike-thrush					1												1
Little Corella								9									9
Little Raven												3		2			5
Nankeen Kestrel	1						2		1								4
Noisy Friarbird						2											2
Noisy Miner	2	3	3	10	5	6	2	8	3	2	3	1	2	1	3	2	56
Pied Butcherbird		2															2
Pied Currawong									2		1						3
Red Wattlebird											2						2
Red-rumped Parrot								3			1						4
Striated Pardalote	2								1					1			4
Sulphur-crested Cockatoo						3		2			1				1		7
Torresian Crow					1												1
Willie Wagtail					1	2											3
Yellow-rumped Thornbill			3														3
Grand Total	12	13	14	21	12	20	11	26	9	9	11	7	8	6	13	6	198

Appendix 6: Raw data for the raptor surveys

Label	Species	Species count	Date	Start time	End time	Observer Initials	Distance (m)	Bearing	Location	Height first observed (m)	Height range of bird (m)	Elevation (m)	Landscape	Direction	Comments	Behaviour
2	Wedge-tailed Eagle	4	13/10/2020	12:30:25 PM	12:36:42 PM	CL		NW	Air		40 to 80				Two pairs - both displaying before heading north-west over Ridge	Displaying
3	Nankeen Kestrel	1	13/10/2020	1:12:09 PM	1:14:17 PM	CL		SE	Air		Oct-20			Away	Kestrel perched on arrival, hovered in flight and moved to another perched 20m away	Foraging (hunting)
4	Brown Goshawk	1	13/10/2020	2:16:58 PM	2:16:09 PM	CL		SE	Air		20 to 40		Ridge	Away	Bird flew from one woodland patch to another	
5	Wedge-tailed eagle	2	13/10/2020	1:14:37 PM	1:20:45 PM	CL		W	Air		60 to 100		Slope	Circling		Soaring
6	wedge-tailed eagle	1	14/10/2020	8:47:06 AM	8:50:18 AM	CL		W	Perched		10 to 30		Slope	Away	Bird was perched and flushed on arrival to another tree. It was mobbed by 2 Torresian crows until it flew off low just above the canopy	Resting
7	Nankeen kestrel	1	14/10/2020	9:25:58 AM	9:28:05 AM	CL		NE	Air		10 to 40		Slope	Toward	Bird hovering then flew to perch in tall Stringybark	
8	Wedge-tailed Eagle	2	14/10/2020	10:02:32 AM	10:03:39 AM	CL		S	Air		70 to 90		Ridge	Circling	Two birds circling above	Soaring
9	Brown Falcon	1	14/10/2020	12:35:02 PM	12:37:08 PM	CL		SE	Air		20 to 30		Valley	Circling	Brown Falcon circled then flew to perch	Foraging (hunting)
10	Nankeen Kestrel	1	14/10/2020	2:20:22 PM	2:23:24 PM	CL		NW	Perched		15		Slope		Kestrel perched on dying stringybark 50m from BUS point	
11	Nankeen Kestrel	1	15/10/2020	8:48:31 AM	8:51:34 AM	CL		S	Air		20		Valley	Circling		Soaring
12	Wedge-tailed Eagle	1	15/10/2020	4:38:47 PM	4:42:50 PM	CL		NW	Air		30 to 40		Ridge	Circling	Circling over lambing paddock	Soaring
13	Wedge-tailed Eagle	1	16/10/2020	9:57:44 AM	10:03:52 AM	CL	200	E	Air		30 to 40		Valley	Circling	Bird circled for several minutes then flew east	Soaring
14	Wedge-tailed Eagle	1	16/10/2020	9:57:44 AM	10:03:52 AM	CL	200	E	Air		30 to 40		Valley	Circling	Bird circled for several minutes then flew east	Soaring
15	Wedge-tailed Eagle	2	16/10/2020	10:25:41 AM	10:28:45 AM	CL	500	NE	Air		40 to 70		Slope	Circling	Two birds circling	
16	Brown Goshawk	1	16/10/2020	9:40:09 AM	9:42:15 AM	CL					15 to 25		Valley	Away	Brown Goshawk flushed then moved to another perch in the paddock	Gliding
17	Wedge-tailed Eagle	2	16/10/2020	10:35:10 AM	10:37:18 AM	CL		S	Perched		20			Away	Birds perched. flushed as I drove past. mobbed by several magpies and 2 kestrels	Gliding
18	Wedge-tailed Eagle	2	16/10/2020	10:46:24 AM	10:50:30 AM	CL		SE	Air		60 to 100			Circling	Two birds circling, headed back over woodland	Soaring
19	Nankeen Kestrel	2	16/10/2020	10:35:26 AM	10:37:31 AM	CL					20				Kestrels mobbed 1 Wedge-tailed Eagle then flew into woodland	
20	Wedge-tailed Eagle	1	8/03/2021	12:42:03 PM	12:44:13 PM	CL					40 to 70		Valley	Circling		Soaring
21	Wedge-tailed Eagle	2	4/01/2022	9:08:52 AM	9:12:11 AM	AB	200		Air		200 to 300		Slope	Circling		Soaring
22	Brown Falcon	2	4/01/2022	9:11:58 AM	9:16:11 AM	AB	200	E	Air		100 to 200		Slope	Away		Powered (flapping) flight
23	Wedge-tailed Eagle	2	4/01/2022	10:15:05 AM	10:16:17 AM	AB	600		Air		200 to 300		Slope	Away		Soaring
24	Nankeen Kestrel	2	4/01/2022	4:18:32 PM	4:20:43 PM	AB	200		Air		100 to 150		Slope	Circling		Hovering
25	Brown Falcon	2	5/01/2022	12:21:08 PM	12:23:18 PM	AB	50	W	Air		50 to 70		Slope	Away		Powered (flapping) flight
26	Wedge-tailed Eagle	1	7/01/2022	2:24:01 PM	2:26:16 PM	AB	400	NE			150 to 200		Slope	Circling		Soaring
27	Wedge-tailed Eagle	2	4/01/2022	3:26:47 PM	3:30:02 PM	AB	400		Air		300 to 400		Valley			Soaring
28	Nankeen Kestrel	2	5/01/2022	1:10:17 PM	1:15:31 PM	AB	200	E	Air		100 to 150		Valley			Hovering
29	Nankeen Kestrel	1	3/01/2022	1:01:51 PM	1:06:11 PM	AB	70	NE			50 to 70		Valley	Circling		Hovering
30	Nankeen Kestrel	2	5/01/2022	4:20:37 PM	4:27:57 PM	AB	80	W	Air		20 to 40		Valley			Hovering
31	Wedge-tailed Eagle	1	4/01/2022	1:35:35 PM	1:37:53 PM	AB	300	S			200 to 300		Slope	Toward		Soaring
32	Wedge-tailed Eagle	2	4/01/2022	11:51:43 AM	11:54:57 AM	AB	300	W	Air		200 to 300		Slope	Circling		Soaring
33	Nankeen Kestrel	2	5/01/2022	9:21:53 AM	9:28:06 AM	AB	200		Air		100 to 150		Slope	Away		Powered (flapping) flight
34	Wedge-tailed Eagle	2	5/01/2022	9:21:33 PM	9:25:49 PM	AB	400	E	Air		300 to 400		Slope			Soaring
35	Wedge-tailed Eagle	4	5/01/2022	3:41:41 AM	3:44:00 AM	AB	300	N	Air		200 to 300		Slope	Toward		Soaring

Label	Species	Species count	Date	Start time	End time	Observer Initials	Distance (m)	Bearing	Location	Height first observed (m)	Height range of bird (m)	Elevation (m)	Landscape	Direction	Comments	Behaviour
36	Wedge-tailed Eagle	2	6/01/2022	8:36:16 PM	8:38:27 PM	AB	300	E	Air		200 to 300		Slope	Circling		Soaring
37	Nankeen Kestrel	1	7/01/2022	11:00:02 PM	11:03:18 PM	AB	50	NE	Air		30 to 50		Slope	Away		Powered (flapping) flight
38	Wedge-tailed Eagle	3	8/01/2022	5:06:24 PM	5:13:37 PM	AB	400	N	Air		200 to 300		Slope	Circling		Soaring
39	Wedge-tailed Eagle	4	3/01/2022	3:00:22 PM	3:03:50 PM	AB	300	E	Air		100 to 300		Valley	Circling		Soaring
40	Wedge-tailed Eagle	2	6/01/2022	8:35:45 AM	8:38:01 AM	AB	400	S	Air		300 to 400		Slope	Circling		Soaring
41	Nankeen Kestrel	2	7/01/2022	11:06:27 AM	11:11:40 AM	AB	200	N	Air		100 to 150		Slope	Circling		Hovering
42	Wedge-tailed Eagle	1	7/01/2022	5:17:04 PM	5:19:46 PM	AB	400	N	Air		300 to 400		Slope	Circling		Soaring
43	Nankeen Kestrel	1	5/01/2022	10:27:13 AM	10:30:39 PM	AB	200	W	Air		50 to 100		Valley	Toward		Hovering
44	Wedge-tailed Eagle	1	5/01/2022	4:40:09 PM	4:43:39 PM	AB	200	N	Air		100 to 150		Valley	Circling		Gliding
45	Nankeen Kestrel	1	3/01/2022	11:25:23 AM	11:28:40 AM	AB	70	W	Air		30 to 50		Valley	Away		Powered (flapping) flight
46	Wedge-tailed Eagle	2	7/01/2022	1:48:19 PM	1:51:47 PM	AB	400	S	Air		200 to 300		Valley	Circling		Soaring
47	Wedge-tailed Eagle	2	5/01/2022	11:20:30 PM	11:22:44 AM	AB	400	NE	Air		300 to 400		Slope	Circling		Soaring
48	Wedge-tailed Eagle	1	4/01/2022	10:44:45 AM	10:45:02 AM	PSL	2000	W	Air	100	80,100	1170	Slope	Parallel to ridge		Soaring
49	Wedge-tailed Eagle	1	7/01/2022	2:24:06 PM	2:24:06 PM	PSL	2500	NE	Air	50	50 to 60	1170	Ridge	Parallel to ridge		Soaring
50	Wedge-tailed Eagle	1	5/01/2022	11:47:32 AM	11:47:49 AM	PSL	300	S	Air	40	40 to 40	1170	Ridge	Parallel to ridge	Adult male	Gliding
51	Wedge-tailed Eagle	1	5/01/2022	11:48:42 AM	11:49:53 AM	PSL	100	SE	Air	150	150,200	1170	Ridge	Parallel to ridge	Adult female	Soaring
52	Brown Goshawk	1	7/01/2022	9:21:22 AM	9:21:36 AM	PSL	100	NE	Air	10	10 to 15	1170	Slope	Away		Powered (flapping) flight
53	Wedge-tailed Eagle	1	7/01/2022	9:48:25 AM	9:49:36 AM	PSL	1500	NE	Air	30	30 to 60	1170	Ridge	Parallel to ridge		Gliding
54	Nankeen Kestrel	1	3/01/2022	10:54:16 AM	10:54:29 AM	PSL	300	NW	Air	40	30 to 40	1290	Ridge	Toward		Gliding
55	Nankeen Kestrel	1	4/01/2022	1:50:25 PM	1:50:39 PM	PSL	100	N	Air	35	15 to 35	1290	Ridge	Parallel to ridge		Gliding
56	Wedge-tailed Eagle	1	5/01/2022	10:41:21 AM	10:42:19 PM	PSL	300	NE	Air	30	30 to 60	1290	Ridge	Away	Adult male	Soaring
57	Wedge-tailed Eagle	2	7/01/2022	12:38:28 PM	12:41:48 PM	PSL	800	S	Air	60	60 to 200	1310	Valley	Away	Adult pair	Soaring
58	Wedge-tailed Eagle	2	7/01/2022	12:49:34 PM	12:50:49 PM	PSL	300	NE	Air	60	60 to 200	1310	Ridge	Parallel to ridge	Adult pair, probably same as seen @12:38 (11 minutes previously)	Soaring
59	Nankeen Kestrel	1	3/01/2022	2:49:13 PM	2:49:34 PM	PSL	100	NE	Air	30	20 to 30	1250	Slope	Away		Hovering
60	Wedge-tailed Eagle	3	3/01/2022	4:12:42 PM	4:13:57 PM	PSL	2000	W	Air	40	30 to 50	1210	Slope	Parallel to ridge	Three together over hill slope to west, probably family group	Soaring
61	Brown Falcon	1	4/01/2022	3:58:31 PM	4:02:24 PM	PSL	15	NW	Air	15	0 to 15	1210	Ridge	Away	Bird flew in, hovered close by, landed on ground then flew away around hillside - foraging	Powered (flapping) flight

APPENDIX I BIODIVERSITY CREDIT REPORT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00022013/BAAS17034/21/00030009

Proposal Name
21-570 WInterbourne Wind Farm - Walcha Plateau

BAM data last updated *
28/10/2024

Assessor Name

Assessor Number
BAAS17034

BAM Data version *
Legacy Classification (pre-ENSW) (80)

Proponent Names

Report Created
18/06/2025

BAM Case Status
Finalised

Assessment Revision
9

Assessment Type
Major Projects

Date Finalised
18/06/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	Critically Endangered Ecological Community	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	Critically Endangered Ecological Community	533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	Critically Endangered Ecological Community	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

Species
Vespadelus troughtoni / Eastern Cave Bat

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	30.6	343	51	394
533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	0.7	3	8	11
534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	51.1	221	263	484
565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	Not a TEC	17.2	209	0	209
567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Not a TEC	46.6	482	343	825
568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Not a TEC	143.2	695	572	1267
571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	Not a TEC	42.2	0	474	474
766-Carex sedgeland of the slopes and tablelands	Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	1.6	0	51	51

965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	Not a TEC	42.4	208	0	208
501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	Not a TEC	9.0	92	0	92
1512-Fuzzy Box open forest of the New England Tableland Bioregion	Not a TEC	0.7	0	19	19
970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	Not a TEC	55.9	373	0	373
1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	22.1	46	165	211
1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	0.9	33	0	33

501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	New England Grassy Woodlands This includes PCT's: 489, 501, 510, 533, 539, 571, 704, 734, 853, 1118, 1332, 3351, 3352, 3358, 3359, 3363	New England Grassy Woodlands >=70% and <90%	501_VZ32_DC_woodland	Yes	92	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Grassy Woodlands This includes PCT's: 489, 501, 510, 533, 539, 571, 704, 734, 853, 1118, 1332, 3351, 3352, 3358, 3359, 3363	New England Grassy Woodlands >=70% and <90%	501_VZ42_low_grassland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
White Box - Yellow Box -	-	510_VZ1_DC_w	Yes	106	Walcha Plateau, Armidale Plateau,

	Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324,		oodland			Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437,	-	510_VZ2_DC_openwoodland	No	8	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	-	510_VZ3_DC_grassland	Yes	188	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box -	-	510_VZ4_RC_gr	No	43	Walcha Plateau, Armidale Plateau,

	Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324,		assland			Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437,	-	510_VZ5_low_grassland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	-	510_VZ6_RC_woodland	Yes	49	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 516, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					

533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	533_VZ7_DC_openwoodland	Yes	3	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	533_VZ8_DC_grassland	No	8	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	534_VZ9_DC_woodland	Yes	73	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	534_VZ10_DC_openwoodland	No	15	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	534_VZ11_mod_grassland	No	248	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	534_VZ12_low_grassland	Yes	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion This includes PCT's: 533, 534, 704, 734, 965, 970, 1332, 1551, 3339, 3344, 3345, 4164	-	534_VZ13_RC_woodland	Yes	148	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	New England Dry Sclerophyll Forests This includes PCT's: 493, 495, 530, 540, 541, 542, 550, 559, 565, 568, 572, 575, 611, 965, 970, 1394, 1396, 1553, 3500, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3508	New England Dry Sclerophyll Forests <50%	565_VZ14_DC_woodland	Yes	121	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Dry Sclerophyll Forests This includes PCT's: 493, 495, 530, 540, 541, 542, 550, 559, 565, 568, 572, 575, 611, 965, 970, 1394, 1396, 1553, 3500, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3508	New England Dry Sclerophyll Forests <50%	565_VZ15_DC_ openwoodland	Yes	1	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Dry Sclerophyll Forests This includes PCT's: 493, 495, 530, 540, 541, 542, 550, 559, 565, 568, 572, 575, 611, 965, 970, 1394, 1396, 1553, 3500, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3508	New England Dry Sclerophyll Forests <50%	565_VZ16_DC_ grassland	Yes	87	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	New England Grassy Woodlands This includes PCT's: 488, 489, 496, 501, 510, 533, 539, 567, 571, 704, 734, 853, 1118, 1171, 1332, 3351, 3352, 3353, 3354, 3357, 3358, 3359, 3361, 3363	New England Grassy Woodlands >=50% and <70%	567_VZ17_DC_woodland	Yes	482	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Grassy Woodlands This includes PCT's: 488, 489, 496, 501, 510, 533, 539, 567, 571, 704, 734, 853, 1118, 1171, 1332, 3351, 3352, 3353, 3354, 3357, 3358, 3359, 3361, 3363	New England Grassy Woodlands >=50% and <70%	567_VZ18_mod_grassland	No	334	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Grassy Woodlands This includes PCT's: 488, 489, 496, 501, 510, 533, 539, 567, 571, 704, 734, 853, 1118, 1171, 1332, 3351, 3352, 3353, 3354, 3357, 3358, 3359, 3361, 3363	New England Grassy Woodlands >=50% and <70%	567_VZ19_RC_ woodland	No	9	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	568_VZ20_DC_ openforest	No	125	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	568_VZ21_DC_ woodland	Yes	695	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	568_VZ22_DC_ openwoodland	Yes	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	568_VZ23_DC_grassland	No	447	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	568_VZ43_low_grassland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
New England Grassy Woodlands This includes PCT's: 489, 501, 510, 533, 539, 571, 704, 734, 853, 1118, 1332, 3351, 3352, 3358, 3359, 3363	New England Grassy Woodlands >=70% and <90%	571_VZ24_DC_openforest	No	426	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
New England Grassy Woodlands This includes PCT's: 489, 501, 510, 533, 539, 571, 704, 734, 853, 1118, 1332, 3351, 3352, 3358, 3359, 3363	New England Grassy Woodlands >=70% and <90%	571_VZ25_RC_woodland	No	48	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Grassy Woodlands This includes PCT's: 489, 501, 510, 533, 539, 571, 704, 734, 853, 1118, 1332, 3351, 3352, 3358, 3359, 3363	New England Grassy Woodlands >=70% and <90%	571_VZ44_low_grassland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

766-Carex sedgeland of the slopes and tablelands	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions This includes PCT's: 361, 582, 766, 1270, 3944	-	766_VZ26_DC_sedgeland	No	45	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions This includes PCT's: 361, 582, 766, 1270, 3944	-	766_VZ27_RC_sedgeland	No	6	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	New England Dry Sclerophyll Forests This includes PCT's: 559, 965	New England Dry Sclerophyll Forests >=70% and <90%	965_VZ28_openforest	Yes	66	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

New England Dry Sclerophyll Forests This includes PCT's: 559, 965	New England Dry Sclerophyll Forests >=70% and <90%	965_VZ29_woodland	Yes	142	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
New England Dry Sclerophyll Forests This includes PCT's: 559, 965	New England Dry Sclerophyll Forests >=70% and <90%	965_VZ30_DC_shrubland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Dry Sclerophyll Forests This includes PCT's: 559, 965	New England Dry Sclerophyll Forests >=70% and <90%	965_VZ31_low_grassland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	970_VZ34_DC_openforest	Yes	150	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	970_VZ35_DC_ woodland	Yes	219	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	970_VZ36_DC_ grassland	No	0	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	New England Dry Sclerophyll Forests This includes PCT's: 540, 541, 542, 559, 568, 965, 970, 1394, 1396, 3501, 3502, 3503, 3506, 3507	New England Dry Sclerophyll Forests >=50% and <70%	970_VZ37_RC_woodland	Yes	4	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion This includes PCT's: 540, 554, 606, 965, 1551, 1555, 1559, 3339, 3344	-	1192_VZ38_RC_grassland	No	20	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion This includes PCT's: 540, 554, 606, 965, 1551, 1555, 1559, 3339, 3344	-	1192_VZ39_DC_grassland	No	145	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion This includes PCT's: 540, 554, 606, 965, 1551, 1555, 1559, 3339, 3344	-	1192_VZ40_DC_woodland	Yes	46	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion This includes PCT's: 540, 554, 606, 965, 1551, 1555, 1559, 3339, 3344	-	1194_VZ41_DC_woodland	Yes	33	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1512-Fuzzy Box open forest of the New England Tableland Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	New England Grassy Woodlands This includes PCT's: 489, 501, 510, 533, 539, 571, 704, 734, 853, 1118, 1332, 3351, 3352, 3358, 3359, 3363	New England Grassy Woodlands >=70% and <90%	1512_VZ33_DC_woodland	No	19	Walcha Plateau, Armidale Plateau, Comboyne Plateau, Eastern Nandewars, Macleay Gorges, Mummel Escarpment, Peel, Tomalla and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo	**510_VZ1_DC_woodland, 534_VZ9_DC_woodland, 567_VZ17_DC_woodland, 568_VZ20_DC_openforest, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland , 571_VZ24_DC_openforest, 965_VZ29_woodland, 501_VZ32_DC_woodland, 970_VZ34_DC_openforest, 970_VZ35_DC_woodland**	7.5	242.00
Cryptostylis hunteriana / Leafless Tongue Orchid	**533_VZ7_DC_openwoodland, 533_VZ8_DC_grassland, 1194_VZ41_DC_woodland**	1.6	31.00
Dichanthium setosum / Bluegrass	**965_VZ29_woodland, 965_VZ31_low_grassland**	4.2	34.00
Eucalyptus nicholii / Narrow-leaved Black Peppermint	**510_VZ6_RC_woodland, 533_VZ7_DC_openwoodland, 534_VZ13_RC_woodland, 565_VZ14_DC_woodland, 567_VZ19_RC_woodland, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland**	136.0	272.00

Myotis macropus / Southern Myotis	**510_VZ1_DC_woodland, 510_VZ2_DC_openwoodland, 510_VZ6_RC_woodland, 534_VZ9_DC_woodland, 534_VZ10_DC_openwoodland , 534_VZ13_RC_woodland, 565_VZ14_DC_woodland, 567_VZ17_DC_woodland, 567_VZ19_RC_woodland, 568_VZ20_DC_openforest, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland , 571_VZ24_DC_openforest, 571_VZ25_RC_woodland, 965_VZ28_openforest, 965_VZ29_woodland, 970_VZ34_DC_openforest, 970_VZ35_DC_woodland, 970_VZ37_RC_woodland, 1192_VZ40_DC_woodland**	11.9	343.00
Ninox connivens / Barking Owl	**970_VZ34_DC_openforest, 970_VZ35_DC_woodland**	1.2	42.00

Petauroides volans / Southern Greater Glider	**510_VZ1_DC_woodland, 510_VZ2_DC_openwoodland, 510_VZ6_RC_woodland, 565_VZ14_DC_woodland, 565_VZ15_DC_openwoodland , 567_VZ17_DC_woodland, 567_VZ19_RC_woodland, 568_VZ20_DC_openforest, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland , 965_VZ28_openforest, 965_VZ29_woodland, 1512_VZ33_DC_woodland, 970_VZ34_DC_openforest, 970_VZ35_DC_woodland, 970_VZ37_RC_woodland**	91.0	2566.00

Petaurus norfolcensis / Squirrel Glider	**510_VZ1_DC_woodland, 510_VZ2_DC_openwoodland, 510_VZ6_RC_woodland, 533_VZ7_DC_openwoodland, 534_VZ9_DC_woodland, 534_VZ10_DC_openwoodland , 534_VZ13_RC_woodland, 565_VZ14_DC_woodland, 565_VZ15_DC_openwoodland , 567_VZ17_DC_woodland, 567_VZ19_RC_woodland, 568_VZ20_DC_openforest, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland , 571_VZ24_DC_openforest, 571_VZ25_RC_woodland, 965_VZ28_openforest, 965_VZ29_woodland, 501_VZ32_DC_woodland, 1512_VZ33_DC_woodland, 970_VZ34_DC_openforest, 970_VZ35_DC_woodland, 970_VZ37_RC_woodland, 1192_VZ40_DC_woodland, 1194_VZ41_DC_woodland**	119.2	3417.00

Phascolarctos cinereus / Koala	**510_VZ1_DC_woodland, 510_VZ2_DC_openwoodland, 510_VZ6_RC_woodland, 533_VZ7_DC_openwoodland, 534_VZ9_DC_woodland, 534_VZ10_DC_openwoodland , 534_VZ13_RC_woodland, 565_VZ14_DC_woodland, 565_VZ15_DC_openwoodland , 567_VZ17_DC_woodland, 567_VZ19_RC_woodland, 568_VZ20_DC_openforest, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland , 571_VZ24_DC_openforest, 571_VZ25_RC_woodland, 965_VZ28_openforest, 965_VZ29_woodland, 501_VZ32_DC_woodland, 1512_VZ33_DC_woodland, 970_VZ34_DC_openforest, 970_VZ35_DC_woodland, 970_VZ37_RC_woodland, 1192_VZ40_DC_woodland, 1194_VZ41_DC_woodland**	119.3	3422.00
Thesium australe / Austral Toadflax	**510_VZ4_RC_grassland**	0.1	1.00

Vespadelus troughtoni / Eastern Cave Bat	**534_VZ10_DC_openwoodland, 567_VZ17_DC_woodland, 568_VZ20_DC_openforest, 568_VZ21_DC_woodland, 568_VZ22_DC_openwoodland, 965_VZ28_openforest, 965_VZ29_woodland, 970_VZ34_DC_openforest, 970_VZ35_DC_woodland, 1194_VZ41_DC_woodland**	9.4	431.00

Credit Retirement Options

Like-for-like credit retirement options

Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo	Spp	IBRA subregion
	Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo	Any in NSW
Cryptostylis hunteriana / Leafless Tongue Orchid	Spp	IBRA subregion
	Cryptostylis hunteriana / Leafless Tongue Orchid	Any in NSW
Dichanthium setosum / Bluegrass	Spp	IBRA subregion
	Dichanthium setosum / Bluegrass	Any in NSW

Eucalyptus nicholii / Narrow-leaved Black Peppermint	Spp	IBRA subregion
	Eucalyptus nicholii / Narrow-leaved Black Peppermint	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Ninox connivens / Barking Owl	Spp	IBRA subregion
	Ninox connivens / Barking Owl	Any in NSW
Petauroides volans / Southern Greater Glider	Spp	IBRA subregion
	Petauroides volans / Southern Greater Glider	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Thesium australe / Austral Toadflax	Spp	IBRA subregion

	Thesium australe / Austral Toadflax	Any in NSW
Vespadelus troughtoni / Eastern Cave Bat	Spp	IBRA subregion
	Vespadelus troughtoni / Eastern Cave Bat	Any in NSW

BAM Candidate Species Report

Proposal Details

Assessment Id 00022013/BAAS17034/21/00030009	Proposal Name 21-570 WInterbourne Wind Farm - Walcha Plateau	BAM data last updated * 28/10/2024
Assessor Name	Report Created 18/06/2025	BAM Data version * Legacy Classification (pre-ENSW) (80)
Assessor Number BAAS17034	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 9		Date Finalised 18/06/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Adelotus brevis - endangered population Tusked Frog population in the Nandewar and New England Tableland Bioregions	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Aepyprymnus rufescens Rufous Bettong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Callitris oblonga subsp. parva Callitris oblonga subsp. parva	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	No (expert report)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chiloglottis anaticeps Bird Orchid	No (surveyed)	☑ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Cryptostylis hunteriana Leafless Tongue Orchid	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Dichanthium setosum Bluegrass	Yes (surveyed)	☑ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Diuris eborensis Diuris eborensis	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris pedunculata Small Snake Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus magnificata Northern Blue Box	No (surveyed)	☑ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Eucalyptus nicholii Narrow-leaved Black Peppermint	Yes (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☑ Jun ☑ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Eucalyptus oresbia Small-fruited Mountain Gum	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☑ Jun ☑ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Euphrasia arguta Euphrasia arguta	No (surveyed)	☑ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Euphrasia ciliolata Polblue Eyebright	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haloragis exalata subsp. velutina Tall Velvet Sea-berry	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Litoria booroolongensis Booroolong Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Litoria daviesae Davies' Tree Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Litoria subglandulosa Glandular Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Ninox strenua Powerful Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petauroides volans Southern Greater Glider	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Potorous tridactylus Long-nosed Potoroo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prostanthera cineolifera Singleton Mint Bush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Pterostylis elegans Elegant Greenhood	No (surveyed)	☐ Jan ☑ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhodamnia rubescens Scrub Turpentine	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tasmannia purpurascens Broad-leaved Pepperbush	No (surveyed)	☑ Jan ☑ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Thesium australe Austral Toadflax	Yes (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Tyto tenebricosa Sooty Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

Common Name	Scientific Name
Eastern Cave Bat	Vespadelus troughtoni

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Phascogale	Phascogale tapoatafa	Refer to BAR
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Narrow-leaved Bertya	Bertya ingramii	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id
00022013/BAAS17034/21/00030009

Proposal Name
21-570 WInterbourne Wind Farm - Walcha Plateau

BAM data last updated *
28/10/2024

Assessor Name

Report Created
18/06/2025

BAM Data version *
Legacy Classification (pre-ENSW) (80)

Assessor Number
BAAS17034

BAM Case Status
Finalised

Date Finalised
18/06/2025

Assessment Revision
9

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion												
32	501_VZ32_DC_woodland	Not a TEC	69.5	69.5	2.6	PCT Cleared - 83%	High Sensitivity to Gain			2.00		92

42	501_VZ42_low_grassland	Not a TEC	15.3	15.3	6.4	PCT Cleared - 83%	High Sensitivity to Gain			2.00		0
											Subtotal	**92**
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion												
1	510_VZ1_DC_woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	58	43.1	3.9	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	106

2	510_VZ2_DC_openwoodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	34.6	34.6	0.38	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	8

3	510_VZ3_DC_grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	34.5	34.5	8.7	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	188

4	510_VZ4_RC_grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	28.8	28.8	2.4	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	43

5	510_VZ5_low_grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	12.1	12.1	14.2	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

6	510_VZ6_RC_woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	81.2	81.2	0.96	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	49
											Subtotal	**394**
Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion												
17	567_VZ17_DC_woodland	Not a TEC	66.4	66.4	16.6	PCT Cleared - 62%	High Sensitivity to Gain			1.75		482
18	567_VZ18_mod_grassland	Not a TEC	25.8	25.8	29.6	PCT Cleared - 62%	High Sensitivity to Gain			1.75		334
19	567_VZ19_RC_woodland	Not a TEC	63	63.0	0.34	PCT Cleared - 62%	High Sensitivity to Gain			1.75		9

											Subtotal	**825**
Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion												
20	568_VZ20_DC_openforest	Not a TEC	63.9	63.9	4.5	PCT Cleared - 59%	High Sensitivity to Gain			1.75		125
21	568_VZ21_DC_woodland	Not a TEC	59.1	55.8	28.5	PCT Cleared - 59%	High Sensitivity to Gain			1.75		695
22	568_VZ22_DC_openwoodland	Not a TEC	11.3	11.3	1.3	PCT Cleared - 59%	High Sensitivity to Gain			1.75		0
23	568_VZ23_DC_grassland	Not a TEC	20.3	20.3	50.3	PCT Cleared - 59%	High Sensitivity to Gain			1.75		447
43	568_VZ43_low_grassland	Not a TEC	11.7	11.7	58.7	PCT Cleared - 59%	High Sensitivity to Gain			1.75		0
											Subtotal	**1267**

Carex sedgeland of the slopes and tablelands												
26	766_VZ26_DC_sedgeland	Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	76	76.0	1.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		45
27	766_VZ27_RC_sedgeland	Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions	28.5	28.5	0.4	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		6
											Subtotal	**51**
Fuzzy Box open forest of the New England Tableland Bioregion												
33	1512_VZ33_DC_woodland	Not a TEC	58.6	58.6	0.66	PCT Cleared - 80%	High Sensitivity to Gain			2.00		19
											Subtotal	**19**

Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion												
28	965_VZ28_openforest	Not a TEC	54	42.7	3.1	PCT Cleared - 75%	High Sensitivity to Gain			2.00		66
29	965_VZ29_woodland	Not a TEC	23.2	23.2	12.2	PCT Cleared - 75%	High Sensitivity to Gain			2.00		142
30	965_VZ30_DC_shrubland	Not a TEC	9.3	9.3	0.95	PCT Cleared - 75%	High Sensitivity to Gain			2.00		0
31	965_VZ31_low_grassland	Not a TEC	11.6	11.6	26.1	PCT Cleared - 75%	High Sensitivity to Gain			2.00		0
											Subtotal	**208**
Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion												
34	970_VZ34_DC_openforest	Not a TEC	74.6	74.6	4.6	PCT Cleared - 56%	High Sensitivity to Gain			1.75		150
35	970_VZ35_DC_woodland	Not a TEC	63	59.4	8.4	PCT Cleared - 56%	High Sensitivity to Gain			1.75		219
36	970_VZ36_DC_grassland	Not a TEC	13.7	13.7	42.7	PCT Cleared - 56%	High Sensitivity to Gain			1.75		0
37	970_VZ37_RC_woodland	Not a TEC	40.2	40.2	0.23	PCT Cleared - 56%	High Sensitivity to Gain			1.75		4

											Subtotal	**373**
New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion												
7	533_VZ7_DC_openwoodland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	47.2	34.2	0.14	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	3
8	533_VZ8_DC_grassland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	23.8	23.8	0.52	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	8
											Subtotal	**11**

New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion												
9	534_VZ9_DC_woodland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	62.3	47.1	2.5	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	73
10	534_VZ10_DC_openwoodland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	41.8	41.8	0.58	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	15

11	534_VZ11_mod_grassland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	30.9	30.9	12.9	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	248
12	534_VZ12_low_grassland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	12.7	12.7	31.9	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
13	534_VZ13_RC_woodland	New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion	72.5	72.5	3.3	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	148

										Subtotal	**484**
Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion											
24	571_VZ24_DC_openforest	Not a TEC	60.4	60.4	14.1	PCT Cleared - 78%	High Sensitivity to Gain			2.00	426
25	571_VZ25_RC_woodland	Not a TEC	70.8	70.8	1.4	PCT Cleared - 78%	High Sensitivity to Gain			2.00	48
44	571_VZ44_low_grassland	Not a TEC	15	15.0	26.7	PCT Cleared - 78%	High Sensitivity to Gain			2.00	0
										Subtotal	**474**
Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion											
14	565_VZ14_DC_woodland	Not a TEC	64.1	62.9	5.1	PCT Cleared - 44%	High Sensitivity to Gain			1.50	121
15	565_VZ15_DC_openwoodland	Not a TEC	19.3	19.3	0.17	PCT Cleared - 44%	High Sensitivity to Gain			1.50	1
16	565_VZ16_DC_grassland	Not a TEC	19.4	19.4	11.9	PCT Cleared - 44%	High Sensitivity to Gain			1.50	87
										Subtotal	**209**

Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion												
38	1192_VZ38_RC_grassland	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	32.7	32.7	1.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		20
39	1192_VZ39_DC_grassland	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	16.1	16.1	18	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		145
40	1192_VZ40_DC_woodland	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	32.7	32.7	2.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		46
											Subtotal	**211**

Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion												
41	1194_VZ41_DC_woodland	Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	70.3	70.3	0.93	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		33
											Subtotal	**33**
											Total	**4651**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo (Fauna)									
510_VZ1_DC_woodland	58.0	58.0	0.03			Vulnerable	Vulnerable	False	1
534_VZ9_DC_woodland	62.3	62.3	0.06			Vulnerable	Vulnerable	False	2
567_VZ17_DC_woodland	66.4	66.4	1.5			Vulnerable	Vulnerable	False	48

568_VZ20_DC_openforest	63.9	63.9	0.07			Vulnerable	Vulnerable	False	2
568_VZ21_DC_woodland	59.1	59.1	1.6			Vulnerable	Vulnerable	False	49
568_VZ22_DC_openwoodland	11.3	11.3	0.08			Vulnerable	Vulnerable	False	1
571_VZ24_DC_openforest	60.4	60.4	1.3			Vulnerable	Vulnerable	False	39
965_VZ29_woodland	23.2	23.2	0.01			Vulnerable	Vulnerable	False	1
501_VZ32_DC_woodland	69.5	69.5	1.1			Vulnerable	Vulnerable	False	38
970_VZ34_DC_openforest	74.6	74.6	1.2			Vulnerable	Vulnerable	False	44
970_VZ35_DC_woodland	63.0	63.0	0.54			Vulnerable	Vulnerable	False	17
								Subtotal	**242**
Cryptostylis hunteriana / Leafless Tongue Orchid (Flora)									
533_VZ7_DC_openwoodland	47.2	47.2	0.14	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2
533_VZ8_DC_grassland	23.8	23.8	0.52	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	5

1194_VZ41_DC_woodland	70.3	70.3	0.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	24
								Subtotal	**31**
Dichanthium setosum / Bluegrass (Flora)									
965_VZ29_woodland	23.2	23.2	1.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Vulnerable	False	19
965_VZ31_low_grassland	11.6	11.6	2.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Vulnerable	False	15
								Subtotal	**34**
Eucalyptus nicholii / Narrow-leaved Black Peppermint (Flora)									
510_VZ6_RC_woodland	N/A	N/A	16			Vulnerable	Vulnerable	False	32
533_VZ7_DC_openwoodland	N/A	N/A	13			Vulnerable	Vulnerable	False	26
534_VZ13_RC_woodland	N/A	N/A	13			Vulnerable	Vulnerable	False	26
565_VZ14_DC_woodland	N/A	N/A	8			Vulnerable	Vulnerable	False	16

567_VZ19_RC_woodland	N/A	N/A	20			Vulnerable	Vulnerable	False	40
568_VZ21_DC_woodland	N/A	N/A	64			Vulnerable	Vulnerable	False	128
568_VZ22_DC_openwoodland	N/A	N/A	2			Vulnerable	Vulnerable	False	4
								Subtotal	**272**
Myotis macropus / Southern Myotis (Fauna)									
510_VZ1_DC_woodland	58.0	58.0	1.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	39
510_VZ2_DC_openwoodland	34.6	34.6	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2
510_VZ6_RC_woodland	81.2	81.2	0.08	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3
534_VZ9_DC_woodland	62.3	62.3	0.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	19
534_VZ10_DC_openwoodland	41.8	41.8	0.14	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3

534_VZ13_RC_woodland	72.5	72.5	0.76	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	28
565_VZ14_DC_woodland	64.1	64.1	0.18	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	6
567_VZ17_DC_woodland	66.4	66.4	0.52	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	17
567_VZ19_RC_woodland	63.0	63.0	0.07	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2
568_VZ20_DC_openforest	63.9	63.9	0.75	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	24
568_VZ21_DC_woodland	59.1	59.1	1.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	51
568_VZ22_DC_openwoodland	11.3	11.3	0.07	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1

571_VZ24_DC_openforest	60.4	60.4	1.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	50
571_VZ25_RC_woodland	70.8	70.8	0.64	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	23
965_VZ28_open forest	54.0	54.0	0.78	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	21
965_VZ29_woodland	23.2	23.2	0.52	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	6
970_VZ34_DC_openforest	74.6	74.6	0.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	11
970_VZ35_DC_woodland	59.4	59.4	0.71	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	21
970_VZ37_RC_woodland	40.2	40.2	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2

1192_VZ40_DC_woodland	32.7	32.7	0.86	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	14
								Subtotal	**343**
Ninox connivens / Barking Owl (Fauna)									
970_VZ34_DC_openforest	74.6	74.6	0.57			Vulnerable	Not Listed	False	21
970_VZ35_DC_woodland	63.0	63.0	0.67			Vulnerable	Not Listed	False	21
								Subtotal	**42**
Petauroides volans / Southern Greater Glider (Fauna)									
510_VZ1_DC_woodland	58.0	58.0	3.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	114
510_VZ2_DC_openwoodland	34.6	34.6	0.38	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	7
510_VZ6_RC_woodland	81.2	81.2	0.95	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	39

565_VZ14_DC_woodland	64.1	64.1	5.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	164
565_VZ15_DC_openwoodland	19.3	19.3	0.17	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	2
567_VZ17_DC_woodland	66.4	66.4	16.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	550
567_VZ19_RC_woodland	63.0	63.0	0.34	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	11
568_VZ20_DC_openforest	63.9	63.9	4.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	143
568_VZ21_DC_woodland	59.1	59.1	28.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	842
568_VZ22_DC_openwoodland	11.3	11.3	1.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	7

965_VZ28_open forest	54.0	54.0	3.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	83
965_VZ29_wood land	23.2	23.2	12.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	142
1512_VZ33_DC_ woodland	58.6	58.6	0.66	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	19
970_VZ34_DC_o penforest	74.6	74.6	4.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	172
970_VZ35_DC_w oodland	63.0	63.0	8.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	266
970_VZ37_RC_w oodland	40.2	40.2	0.23	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	5
								Subtotal	**2566**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
510_VZ1_DC_wo odland	58.0	58.0	3.9			Vulnerable	Not Listed	False	114

510_VZ2_DC_openwoodland	34.6	34.6	0.36			Vulnerable	Not Listed	False	6
510_VZ6_RC_woodland	81.2	81.2	0.95			Vulnerable	Not Listed	False	39
533_VZ7_DC_openwoodland	47.2	47.2	0.14			Vulnerable	Not Listed	False	3
534_VZ9_DC_woodland	62.3	62.3	2.5			Vulnerable	Not Listed	False	78
534_VZ10_DC_openwoodland	41.8	41.8	0.48			Vulnerable	Not Listed	False	10
534_VZ13_RC_woodland	72.5	72.5	3.2			Vulnerable	Not Listed	False	116
565_VZ14_DC_woodland	64.1	64.1	5.1			Vulnerable	Not Listed	False	164
565_VZ15_DC_openwoodland	19.3	19.3	0.17			Vulnerable	Not Listed	False	2
567_VZ17_DC_woodland	66.4	66.4	16.6			Vulnerable	Not Listed	False	550
567_VZ19_RC_woodland	63.0	63.0	0.34			Vulnerable	Not Listed	False	11
568_VZ20_DC_openforest	63.9	63.9	4.5			Vulnerable	Not Listed	False	143
568_VZ21_DC_woodland	59.1	59.1	28.5			Vulnerable	Not Listed	False	842
568_VZ22_DC_openwoodland	11.3	11.3	1.3			Vulnerable	Not Listed	False	7

571_VZ24_DC_openforest	60.4	60.4	14.1			Vulnerable	Not Listed	False	426
571_VZ25_RC_woodland	70.8	70.8	1.4			Vulnerable	Not Listed	False	48
965_VZ28_open forest	54.0	54.0	3.1			Vulnerable	Not Listed	False	83
965_VZ29_woodland	23.2	23.2	12.2			Vulnerable	Not Listed	False	142
501_VZ32_DC_woodland	69.5	69.5	2.6			Vulnerable	Not Listed	False	92
1512_VZ33_DC_woodland	58.6	58.6	0.66			Vulnerable	Not Listed	False	19
970_VZ34_DC_openforest	74.6	74.6	4.6			Vulnerable	Not Listed	False	172
970_VZ35_DC_woodland	63.0	63.0	8.4			Vulnerable	Not Listed	False	266
970_VZ37_RC_woodland	40.2	40.2	0.23			Vulnerable	Not Listed	False	5
1192_VZ40_DC_woodland	32.7	32.7	2.8			Vulnerable	Not Listed	False	46
1194_VZ41_DC_woodland	70.3	70.3	0.93			Vulnerable	Not Listed	False	33
								Subtotal	**3417**
Phascolarctos cinereus / Koala (Fauna)									
510_VZ1_DC_woodland	58.0	58.0	3.9			Endangered	Endangered	False	114

510_VZ2_DC_openwoodland	34.6	34.6	0.38			Endangered	Endangered	False	7
510_VZ6_RC_woodland	81.2	81.2	0.96			Endangered	Endangered	False	39
533_VZ7_DC_openwoodland	47.2	47.2	0.14			Endangered	Endangered	False	3
534_VZ9_DC_woodland	62.3	62.3	2.5			Endangered	Endangered	False	78
534_VZ10_DC_openwoodland	41.8	41.8	0.58			Endangered	Endangered	False	12
534_VZ13_RC_woodland	72.5	72.5	3.3			Endangered	Endangered	False	118
565_VZ14_DC_woodland	64.1	64.1	5.1			Endangered	Endangered	False	164
565_VZ15_DC_openwoodland	19.3	19.3	0.17			Endangered	Endangered	False	2
567_VZ17_DC_woodland	66.4	66.4	16.6			Endangered	Endangered	False	550
567_VZ19_RC_woodland	63.0	63.0	0.34			Endangered	Endangered	False	11
568_VZ20_DC_openforest	63.9	63.9	4.5			Endangered	Endangered	False	143
568_VZ21_DC_woodland	59.1	59.1	28.5			Endangered	Endangered	False	842
568_VZ22_DC_openwoodland	11.3	11.3	1.3			Endangered	Endangered	False	7

571_VZ24_DC_openforest	60.4	60.4	14.1			Endangered	Endangered	False	426
571_VZ25_RC_woodland	70.8	70.8	1.4			Endangered	Endangered	False	48
965_VZ28_open forest	54.0	54.0	3.1			Endangered	Endangered	False	83
965_VZ29_woodland	23.2	23.2	12.2			Endangered	Endangered	False	142
501_VZ32_DC_woodland	69.5	69.5	2.6			Endangered	Endangered	False	92
1512_VZ33_DC_woodland	58.6	58.6	0.66			Endangered	Endangered	False	19
970_VZ34_DC_openforest	74.6	74.6	4.6			Endangered	Endangered	False	172
970_VZ35_DC_woodland	63.0	63.0	8.4			Endangered	Endangered	False	266
970_VZ37_RC_woodland	40.2	40.2	0.23			Endangered	Endangered	False	5
1192_VZ40_DC_woodland	32.7	32.7	2.8			Endangered	Endangered	False	46
1194_VZ41_DC_woodland	70.3	70.3	0.93			Endangered	Endangered	False	33
								Subtotal	**3422**
Thesium australe / Austral Toadflax (Flora)									
510_VZ4_RC_grassland	28.8	28.8	0.06			Vulnerable	Vulnerable	False	1
								Subtotal	**1**

Vespadelus troughtoni / Eastern Cave Bat (Fauna)									
534_VZ10_DC_openwoodland	41.8	41.8	0.02	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	1
567_VZ17_DC_woodland	66.4	66.4	0.19	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	9
568_VZ20_DC_openforest	63.9	63.9	2.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	138
568_VZ21_DC_woodland	55.8	55.8	2.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	122
568_VZ22_DC_openwoodland	11.3	11.3	0.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	3
965_VZ28_open forest	54.0	54.0	0.11	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	4
965_VZ29_woodland	23.2	23.2	0.04	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	1

970_VZ34_DC_openforest	74.6	74.6	1.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	95
970_VZ35_DC_woodland	59.4	59.4	0.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	9
1194_VZ41_DC_woodland	70.3	70.3	0.93	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	49
								Subtotal	**431**

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00022013/BAAS17034/21/00030009	21-570 WInterbourne Wind Farm - Walcha Plateau	28/10/2024
Assessor Name	**Report Created**	**BAM Data version ***
	18/06/2025	Legacy Classification (pre-ENSW) (80)
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17034	Major Projects	Finalised
Assessment Revision		**Date Finalised**
9		18/06/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black-necked Stork	Ephippiorhynchus asiaticus	766-Carex sedgeland of the slopes and tablelands
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Diamond Firetail	Stagonopleura guttata	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion

Dusky Woodswallow	Artamus cyanopterus cyanopterus	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		766-Carex sedgeland of the slopes and tablelands
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Eastern False Pipistrelle	Falsistrellus tasmaniensis	568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Flame Robin	Petroica phoenicea	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion

Greater Broad-nosed Bat	Scoteanax rueppellii	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Grey-headed Flying-fox	Pteropus poliocephalus	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Hastings River Mouse	Pseudomys oralis	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion

Large Bent-winged Bat	Miniopterus orianae oceanensis	1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Little Eagle	Hieraaetus morphnoides	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		766-Carex sedgeland of the slopes and tablelands
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Little Lorikeet	Glossopsitta pusilla	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Little Lorikeet	Glossopsitta pusilla	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
New Holland Mouse	Pseudomys novaehollandiae	533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Olive Whistler	Pachycephala olivacea	1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Painted Honeyeater	Grantiella picta	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Painted Honeyeater	Grantiella picta	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Regent Honeyeater	Anthochaera phrygia	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
Scarlet Robin	Petroica boodang	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		766-Carex sedgeland of the slopes and tablelands

Scarlet Robin	Petroica boodang	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
South-eastern Hooded Robin	Melanodryas cucullata cucullata	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

South-eastern Hooded Robin	Melanodryas cucullata cucullata	533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Speckled Warbler	Chthonicola sagittata	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion

Speckled Warbler	Chthonicola sagittata	1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Spotted Harrier	Circus assimilis	533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		766-Carex sedgeland of the slopes and tablelands
Spotted-tailed Quoll	Dasyurus maculatus	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion

Square-tailed Kite	Lophoictinia isura	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Swift Parrot	Lathamus discolor	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Swift Parrot	Lathamus discolor	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Varied Sittella	Daphoenositta chrysoptera	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion

Varied Sittella	Daphoenositta chrysoptera	1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
White-throated Needletail	Hirundapus caudacutus	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

White-throated Needletail	Hirundapus caudacutus	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
		766-Carex sedgeland of the slopes and tablelands
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Yellow-bellied Glider	Petaurus australis	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion

Yellow-bellied Glider	Petaurus australis	1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion
		534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion
		565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
		568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
		766-Carex sedgeland of the slopes and tablelands
		965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion
		1512-Fuzzy Box open forest of the New England Tableland Bioregion
		970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion
		1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion
		1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00022013/BAAS17034/21/00030009

Assessment name
21-570 WInterbourne Wind Farm - Walcha Plateau

BAM data last updated *
28/10/2024

Assessor Name

Report Created
18/06/2025

BAM Data version *
Legacy Classification (pre-ENSW) (80)

Assessor Number
BAAS17034

Assessment Type
Major Projects

BAM Case Status
Finalised

Assessment Revision
9

Date Finalised
18/06/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	510_VZ1_DC_woodland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	VZ1_DC_woodland	3.94	2	total (2.55 ha) Partial (1.39 ha)

2	510_VZ2_DC_open woodland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	VZ2_DC_openwoodland	0.38	1	
3	510_VZ3_DC_grassland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	VZ3_DC_grassland	8.72	3	
4	510_VZ4_RC_grassland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	VZ4_RC_grassland	2.4	2	
5	510_VZ5_low_grassland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	VZ5_low_grassland	14.23	3	
6	510_VZ6_RC_woodland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	VZ6_RC_woodland	0.96	1	
7	533_VZ7_DC_open woodland	533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	VZ7_DC_openwoodland	0.14	1	total (0.06 ha) Partial (0.08 ha)
8	533_VZ8_DC_grassland	533-New England Peppermint grassy woodland on granitic substrates of the New England Tableland Bioregion	VZ8_DC_grassland	0.52	1	
9	534_VZ9_DC_woodland	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	VZ9_DC_woodland	2.49	2	total (1.4 ha) Partial (1.09 ha)

10	534_VZ10_DC_openwoodland	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	VZ10_DC_openwoodland	0.58	1	
11	534_VZ11_mod_grassland	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	VZ11_mod_grassland	12.88	3	
12	534_VZ12_low_grassland	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	VZ12_low_grassland	31.88	4	
13	534_VZ13_RC_woodland	534-New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	VZ13_RC_woodland	3.26	2	
14	565_VZ14_DC_woodland	565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	VZ14_DC_woodland	5.13	3	total (4.96 ha) Partial (0.17 ha)
15	565_VZ15_DC_openwoodland	565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	VZ15_DC_openwoodland	0.17	1	
16	565_VZ16_DC_grassland	565-Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion	VZ16_DC_grassland	11.94	3	

17	567_VZ17_DC_woodland	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	VZ17_DC_woodland	16.58	3	total (15.51 ha) Partial (1.07 ha)
18	567_VZ18_mod_grassland	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	VZ18_mod_grassland	29.63	4	
19	567_VZ19_RC_woodland	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	VZ19_RC_woodland	0.34	1	
20	568_VZ20_DC_openforest	568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	VZ20_DC_openforest	4.48	2	
21	568_VZ21_DC_woodland	568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	VZ21_DC_woodland	28.47	4	total (25.72 ha) Partial (2.75 ha)
22	568_VZ22_DC_openwoodland	568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	VZ22_DC_openwoodland	1.3	1	
23	568_VZ23_DC_grassland	568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	VZ23_DC_grassland	50.29	4	
24	571_VZ24_DC_openforest	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	VZ24_DC_openforest	14.12	3	

25	571_VZ25_RC_woodland	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	VZ25_RC_woodland	1.36	1	
26	766_VZ26_DC_sedgeland	766-Carex sedgeland of the slopes and tablelands	VZ26_DC_sedgeland	1.18	1	
27	766_VZ27_RC_sedgeland	766-Carex sedgeland of the slopes and tablelands	VZ27_RC_sedgeland	0.4	1	
28	965_VZ28_openforest	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	VZ28_openforest	3.09	2	total (1.98 ha) Partial (1.11 ha)
29	965_VZ29_woodland	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	VZ29_woodland	12.21	3	
30	965_VZ30_DC_shrubland	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	VZ30_DC_shrubland	0.95	1	
31	965_VZ31_low_grassland	965-Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tableland Bioregion	VZ31_low_grassland	26.13	4	

32	501_VZ32_DC_woodland	501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	VZ32_DC_woodland	2.65	2	
33	1512_VZ33_DC_woodland	1512-Fuzzy Box open forest of the New England Tableland Bioregion	VZ33_DC_woodland	0.66	1	
34	970_VZ34_DC_openforest	970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	VZ34_DC_openforest	4.6	2	
35	970_VZ35_DC_woodland	970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	VZ35_DC_woodland	8.44	3	total (7.5 ha) Partial (0.94 ha)
36	970_VZ36_DC_grassland	970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	VZ36_DC_grassland	42.67	4	
37	970_VZ37_RC_woodland	970-Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion	VZ37_RC_woodland	0.23	1	
38	1192_VZ38_RC_grassland	1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	VZ38_RC_grassland	1.22	1	
39	1192_VZ39_DC_grassland	1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	VZ39_DC_grassland	18.02	3	

40	1192_VZ40_DC_woodland	1192-Snow Gum - Mountain Gum - Mountain Ribbon Gum grassy open forest of the New England Tableland Bioregion	VZ40_DC_woodland	2.82	2	
41	1194_VZ41_DC_woodland	1194-Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	VZ41_DC_woodland	0.93	1	
42	501_VZ42_low_grassland	501-Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion	VZ42_low_grassland	6.35	3	
43	568_VZ43_low_grassland	568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	VZ43_low_grassland	58.68	5	
44	571_VZ44_low_grassland	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	VZ44_low_grassland	26.71	4	

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