Flora and Fauna Impact Assessment

Residential Subdivision at

292 Rosemont Road

Boxers Creek

NSW 2580

Report prepared for M. Taylor

30 March 2022

Report:	Flora and Fauna Impact Assessment Residential Subdivision at 292 Rosemont Road Boxers Creek NSW 2580
Prepared for:	M.Taylor
Prepared by:	Land Eco Consulting Pty Ltd
Date:	30 March 2022
Version:	Final 1.0

Land Eco Consulting Pty Ltd
www.landeco.com.au
ABN 48 636 918 404

Report Certification

Name	Company/Position	Role
Semonn Oleksyn	Land Eco Consulting Ecologist	Field survey Report compilation
Kurtis Lindsay	Land Eco Consulting Principal Ecologist	Field survey Report review

Document Control

Revision	Document Name	Issue Date
DRAFT 1.0	Flora and Fauna Impact Assessment Residential Subdivision at 292 Rosemont Road Boxers Creek NSW 2580	01/03/2022
DRAFT 2.0	Flora and Fauna Impact Assessment Residential Subdivision at 292 Rosemont Road Boxers Creek NSW 2580	07/03/2022
Final 1.0	Flora and Fauna Impact Assessment Residential Subdivision at 292 Rosemont Road Boxers Creek NSW 2580	30/03/2022

Executive Summary

Land Eco Consulting Pty Ltd (Land Eco) was commissioned by M. Taylor ('the proponent') to prepare this Flora and Fauna Impact Assessment Report for proposed Planning Proposal and Development Application (DA) at 292 Rosemont Road Boxers Creek, NSW 2580 (hereafter referred to as 'the subject land'). The Planning Proposal is to rezone the land from RU6 to R5 Large Lot Residential and C2 Environmental Conservation (100m buffers from Riparian land) with a minimum lot size of 2 Hectares (R5) and 100 Hectare (C2). The DA is for a subdivision of the subject land into five large residential lots.

The proposed development site has been chosen is in a key position on the fringe of Goulburn township and provides an optimal setting for 'life-style' residential blocks which are in increasing demand but low supply. The subject land is an optimal location for development for the benefit of the town and community of Goulburn.

The subject land has been historically cleared and managed for agricultural purposes for over 100 years. Most of the subject land consists of non-native (exotic) pasture-improved and regularly grazed grassland. Small areas of the subject land contain native grassy woodland, however, it is severely weed-infested. No native vegetation will be directly impacted for the proposed subdivision.

The native grassy woodland vegetation belongs to one distinct plant community type (PCT):

- PCT 1330: Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.

The area of PCT 1330 within the subject land comprises an occurrence of '*White Box Yellow Box Blakeley's Red Gum Woodland*' which is listed as a Critically Endangered Ecological Community (CEEC) under the NSW *Biodiversity Conservation Act 2016*. The condition of this vegetation is poor. It is historically disturbed, isolated and weed infested.

No native vegetation belonging to this CEEC or any other identified native PCT will be removed for the proposed development. Approximately 4.19 ha of exotic dominated grassland, approximately 20 mature exotic shrubs and two large, dead trees (stags) will be removed for the proposed development. These dead trees contain small hollows that could provide shelter habitat for threatened fauna.

Upon completion of a Test of Significance, Land Eco Consulting are satisfied that the proposed development will not incur significant effects to a local occurrence of 'White Box Yellow Box Blakeley's Red Gum Woodland' nor any potentially occurring threatened species or ecological community as listed under the NSW *Biodiversity Conservation Act 2016*.

Recommendations have been put forward to reduce impacts of the proposed development upon biodiversity:

- Ensure all contractors employed to work within the subject land are suitably qualified, experienced and informed of the sensitive ecological features and potentially occurring threatened species;
- Assign a Project Ecologist to conduct and oversee all ecological compliance requirements associated with conducting a proposed development in line with all relevant state and commonwealth legislation and guidelines;
- Implement all relevant biological hygiene protocols and requirements as per NSW Government guidelines to reduce the spread of priority weeds.
- Ensure ongoing management of priority weeds according to statutory requirements.
- Ensure all trees that occur outside of the development footprint are protected from harm during earthworks and construction.

During occupation of the subdivision there is potential for the proposal to indirectly impact surrounding vegetation and habitat values through:

- Introduction of weed propagules by vehicle and increased edge effects.
- Erosion and sedimentation because of runoff from hard stand areas.

These issues will be actively managed through designated plans that will be prepared to manage open space proposed as part of the development.

State Environmental Planning Policy (Koala Habitat Protection) has been assessed, and the subject land does not contain 'Potential' or 'Core' Koala Habitat.

The proposed development will be of no significant consequence to biodiversity in the locality, region or bioregion. Subject to the proponent implementing the mitigation measures proposed in this report, Land Eco Consulting hold the opinion that the proposed development is suitable to the location and recommend this development for approval.

Contents

Figures

Tables

Glossary

Acronym/ Term	Definition
BAM	The NSW Biodiversity Assessment Method
BAMC	The NSW Biodiversity Assessment Method Calculator
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of development.
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
BOS	NSW Biodiversity Offset Scheme
DA	Development Application
DCP	Development Control Plan
DPIE	NSW Department of Planning, Infrastructure and Environment
Ecosystem credit	A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered Ecological Community
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FFA	Flora and Fauna Report
Ha	Hectare
HTW	High Threat Weed
Km	Kilometre
LEP	Goulburn Local Environmental Plan 2009
LGA	Local Government Area
Locality	The area within a 10km radius of the subject land. The same meaning when describing a local population of a species or local occurrence of an ecological community.
M	metres
MNES	Matters of National Environmental Significance
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.
NSW	The State of New South Wales
OEH	NSW Office of Environment and Heritage (now known as Department of Planning, Infrastructure and Environment)
PCT	NSW Plant Community Type
Priority weed	Priority weed in the South East bioregion as per the *Biosecurity Act 2015*
Proposal	The development, activity or action proposed.
SAII	Serious and Irreversible Impacts
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
SEPP	State Environmental Planning Policy
Species Credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require Species Credits are listed in the Threatened Biodiversity Data Collection.
Study Area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the proposal.
subject land	The location of the proposed activity (development footprint); the subject of this report.
Subject Property	Lots 117 & 118/-/DP126140 at 292 Rosemount Road Boxers Creek NSW 2580
The proponent	The developer of the property .
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 and '*threatened species, population or ecological community*' means a species, population or ecological community specified in any of those Schedules.
VIS Plot	Vegetation Integrity Survey Plot. A 50m x 20m area within which a botanist collects data on the prevailing vegetation.

1. Introduction

Land Eco Consulting Pty Ltd (Land Eco) was commissioned by Peter Taylor ('the proponent') to prepare this Flora and Fauna Report for the proposed rezoning and residential subdivision of privately-owned land at 292 Rosemont Road Boxers Creek, NSW 2580 (Lots 117 & 118/-/DP126140) (hereafter referred to as 'the subject property') (**Figure 1; Figure 2**).

1.1 Site Description

The subject property is located within the Goulburn Mulwaree Council Local Government Area (LGA). The entirety of the property is zoned 'RU6: Transition'. The proposed development is subject to the planning provisions of the Goulburn Mulwaree Council LGA, including the Goulburn Mulwaree Council Local Environment Plan 2009 (LEP), Development Control Plan 2009 (DCP) and associated plans, policies and guidelines. The minimum lot size of this property is currently 20 hectares. The proposed subdivision would result in lot sizes ranging from 3.8 ha to 12.3 ha.

Land Eco have produced this report to assess any potential impacts to terrestrial biodiversity associated with the proposed rezoning and subdivision and recommend appropriate measures to mitigate any potential impacts to terrestrial biodiversity in line with the requirements of the Goulburn Mulwaree Council, specifically those relating to the NSW *Biodiversity Conservation Act 2016*.

The development does not trigger the NSW Biodiversity Offset Scheme (BOS) and therefore does not need to be accompanied by a Biodiversity Development Assessment Report (BDAR). The proposal is not impacting upon any native vegetation mapped on the NSW Biodiversity Values (BV) Map, any mapped Coastal Wetland/Littoral Rainforest or any Area of Outstanding Biodiversity Value (AOBV). The clearing threshold for the property is outlined in the Biodiversity Assessment Method (BAM) as >0.5 hectares (**Table 1**). Native vegetation clearing thresholds are determined based on the minimum lot size, or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP), of the property in which the development is situated.

Table 1. Area Clearing Threshold as per Biodiversity Offsets Scheme entry requirements (OEH 2018)

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	**0.5 ha or more**
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

1.2 The Proposed Development

This report addresses the terrestrial biodiversity impacts of the proposed Planning Proposal to rezone the land from RU6 to R5 Large Lot Residential and C2 Environmental Conservation (100m buffers from Riparian land) with a minimum lot size of 2 Hectares (R5) and 100 Hectare (C2).

The report also addresses the impacts from the future subdivision of the subject land into five large residential lots. The subdivision which includes 5 low-density residential lots, driveways and landscaping at 292 Rosemont Road Boxers Creek, NSW 2580 (Lots 17 & 18/-/DP126140) hereafter referred to as the 'subject land' (**Figure 1**).

The proposed development footprint will not directly impact any native vegetation and will remain below the BOS threshold of 0.5 ha. The BOS is not triggered for this DA, therefore, the extent of biodiversity impact can be assessed under section 7.3 of the BC Act, which requires a 'Test of Significance' of impact from the development upon any threatened species, population or ecological community considered likely to be present on the subject property.

1.3 Avoid and minimise impacts (location and design)

The proposed development is a new residential subdivision. It contributes to the housing demands for the growing population of Goulburn which includes commuters who work in the Australian Capital Territory.

The proponent has designed the subdivision to minimise clearing of native vegetation. All native vegetation communities will be retained. The subject property is dominated by exotic grassland with a low density of native species. While 4.19 ha of exotic grassland, including exotic shrubs, will be removed, these hold little biodiversity value.

1.4 Aim and Approach

This report has been prepared to:

- Describe the biodiversity values present within the subject land and surrounding area, including the extent of native vegetation, vegetation integrity and the presence of threatened ecological communities (TECs);
- Determine the habitat suitability within the subject land for candidate threatened species.
- Prepare an impact assessment to assess potential impacts of the proposed development on biodiversity values in accordance with relevant state and/or Commonwealth legislation.
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values.

1.5 Sources of Information Used

A thorough literature review was undertaken to gain an understanding of the ecology within the locality and the Goulburn-Mulwaree LGA. Relevant data and literature reviewed in preparation of this report are detailed in the **References** section at the end of this document.

Online databases and literature reviews were utilised to gain an understanding of the natural environment and ecology of the subject land and its surrounds. Searches utilising NSW Wildlife Atlas (BioNet) (DPIE 2019c) and the Commonwealth Protected Matters Search Tool (DEE 2020) were conducted to identify threatened flora and fauna, including any migratory fauna, records within a 10km^2 search area centred on the subject land. The data was used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent to the subject land and help inform our Ecologists on what to look for during the site assessment.

1.6 IBRA Bioregions and Subregions

The subject land occurs within the 'South-Eastern Highlands' Interim Biogeographic Regionalisation (v7) for Australia (IBRA) bioregion and the 'Bungonia' IBRA (v7) subregion (Commonwealth of Australia 2016; **Figure 3**).

1.7 Mitchell Landscapes

NSW Landscapes Mapping: Background and Methodology (Mitchell 2002) groups ecosystems into meso-ecosystems representing larger natural entities based on topography and geology. The naming of ecosystems and meso-ecosystems was standardised so that each name provided location information and a meaningful descriptive landscape term. The subject land is within the '*Gundary Plains*' Mitchell Landscape Ecosystem (**Figure 4**).

1.7.1 Landscape Ecosystem – Gundary Plains

Wide open valleys with abandoned terraces and Quaternary lakebeds on lower Devonian siltstone, sandstone, andesite and quartz felspar porphyry. General elevation 75m, local relief <30m. Yellow, hard setting texture-contrast soils with distinct bleached A2 horizons. Grasslands of spear grass (*Austrostipa sp.*) and kangaroo grass (*Themeda triandra*) with small clumps of sparse snow gum (*Eucalyptus pauciflora*) on rounded rocky hills and sandy lunettes of former lakes. (Mitchell 2002).

1.8 Landscape features

This section details the landscape features and associated habitat values in and around the subject land. A table is provided which details the important landscape features that are present / absent from the subject land (**Table 2**).

1.8.1 Topography, geology and soils

The subject land is situated predominantly on rolling slopes and flats descending to a divided waterway sprawling through the centre of the property. Elevation across the subject land occurs at approximately 652 – 678 m above mean sea level (AMSL).

The Subject is situated on a 'Bullamalita Soil Landscape'. Bullamalita is associated with Upper Silurian and Lower Devonian sediments wherever they occur in conjunction with footslopes and valley floors or on landform patterns with slope gradients generally <10%. Commonly acid to neutral yellow duplex soils, usually with bleached A2 horizons that set very hard on drying, occur on lower sideslopes, footslopes and drainage lines. These soils are similar to Soloths (Dy3.41, Dy3.42). However, they are more fertile than similar soils found in the Blakney Creek soil landscape. Red Podzolic Soils (Db1.21) are found on upper slopes whilst Yellow Solodic Soils (Dy3.42) and Alluvial Soils occur in some drainage lines.

Table 2. Landscape features identified within and around the subject property

Landscape Feature	Identification of Landscape Feature on Site
Rivers and Streams (classified according to stream order)	A watercourse dissects the centre of the Subject Property and splits into two tributaries (**Figure 1**). This watercourse is a tributary of Gundary Creek.
Wetlands (within, adjacent to and downstream of site)	The subject property and the surrounding area do not contain any wetlands of national/international significance or areas of native vegetation identified as 'Coastal Wetlands' as per the State Environmental Planning Policy (Coastal Management) 2018.
Connectivity features	There is no woody vegetation connectivity into the Subject Land. Few remnant trees, stags and shrubs remain scattered across the subject property, providing low quality 'habitat stepping stones' for fauna. These habitat features will remain in the Subject Land post subdivision.
Areas of geological significance and soil hazard features	No areas of geological significance (karsts, caves, crevices or cliffs) were identified within the subject property. This was determined as a result of a comprehensive site-based assessment.

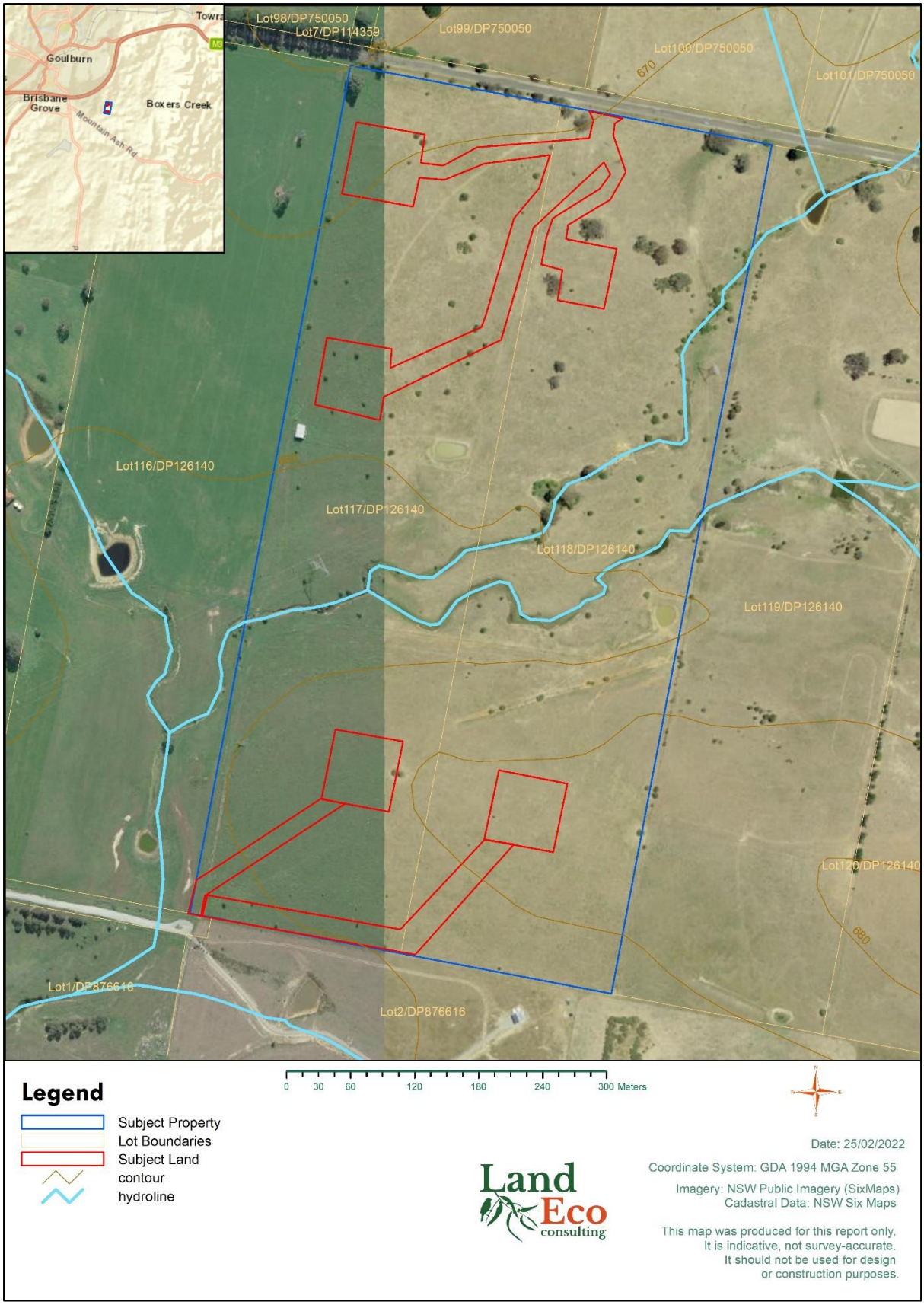


Figure 1. The location of the subject property and subject land

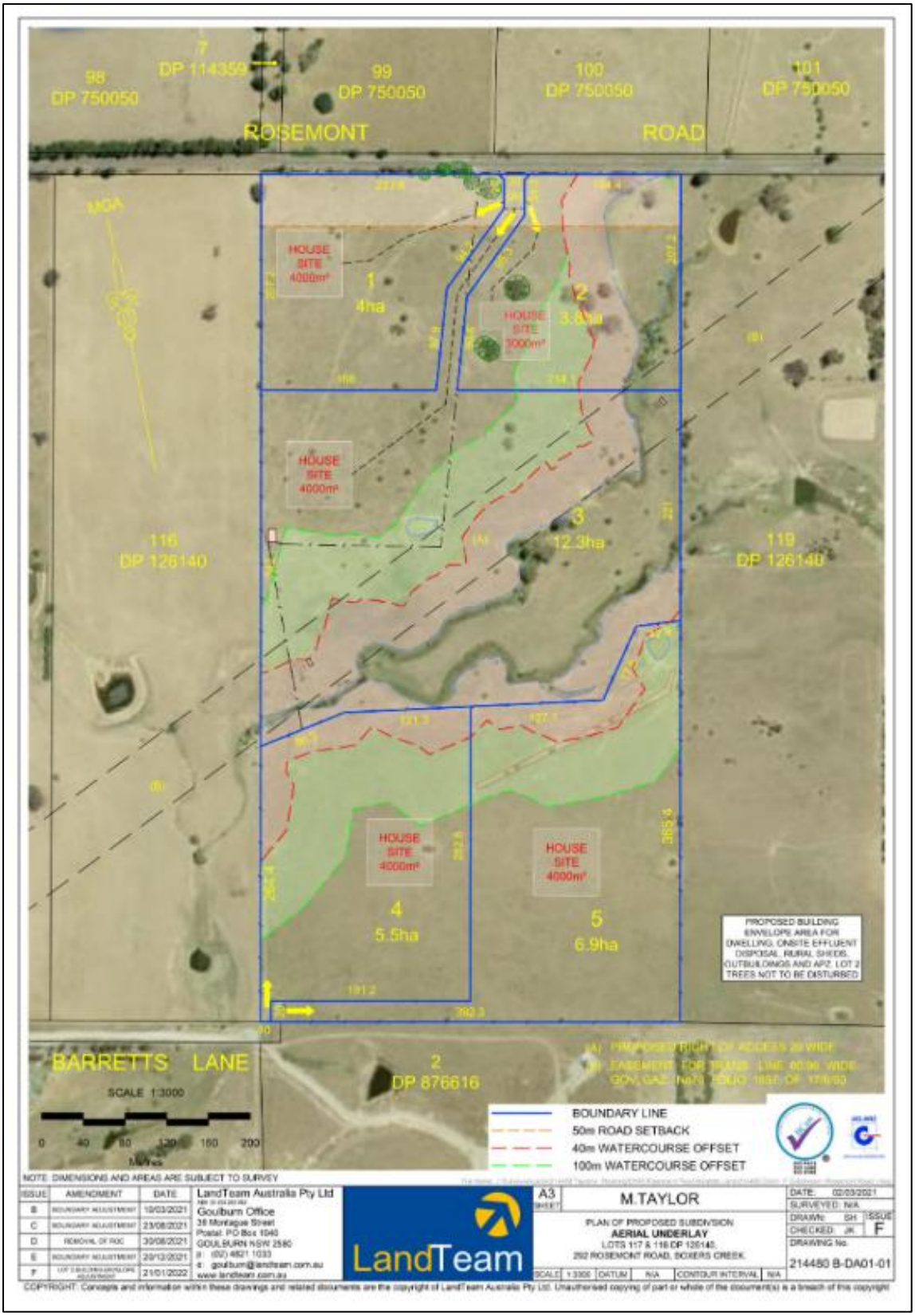


Figure 2. Site Plan of the Proposed Development (Land Team 2021)

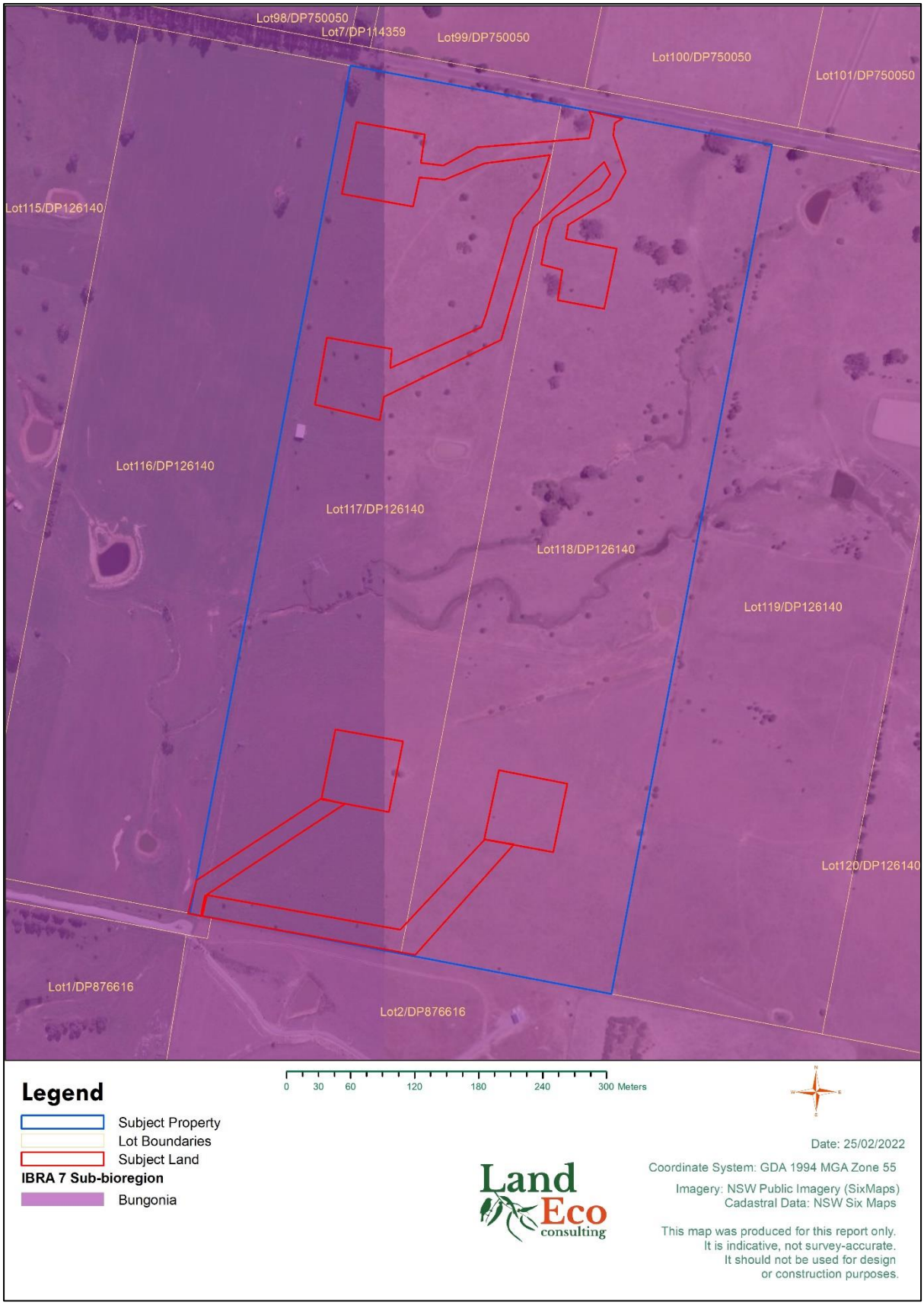


Figure 3. The subject property lies within the Bungonia IBRA 7 Subregion of the South-Eastern Highlands IBRA7 Bioregion.

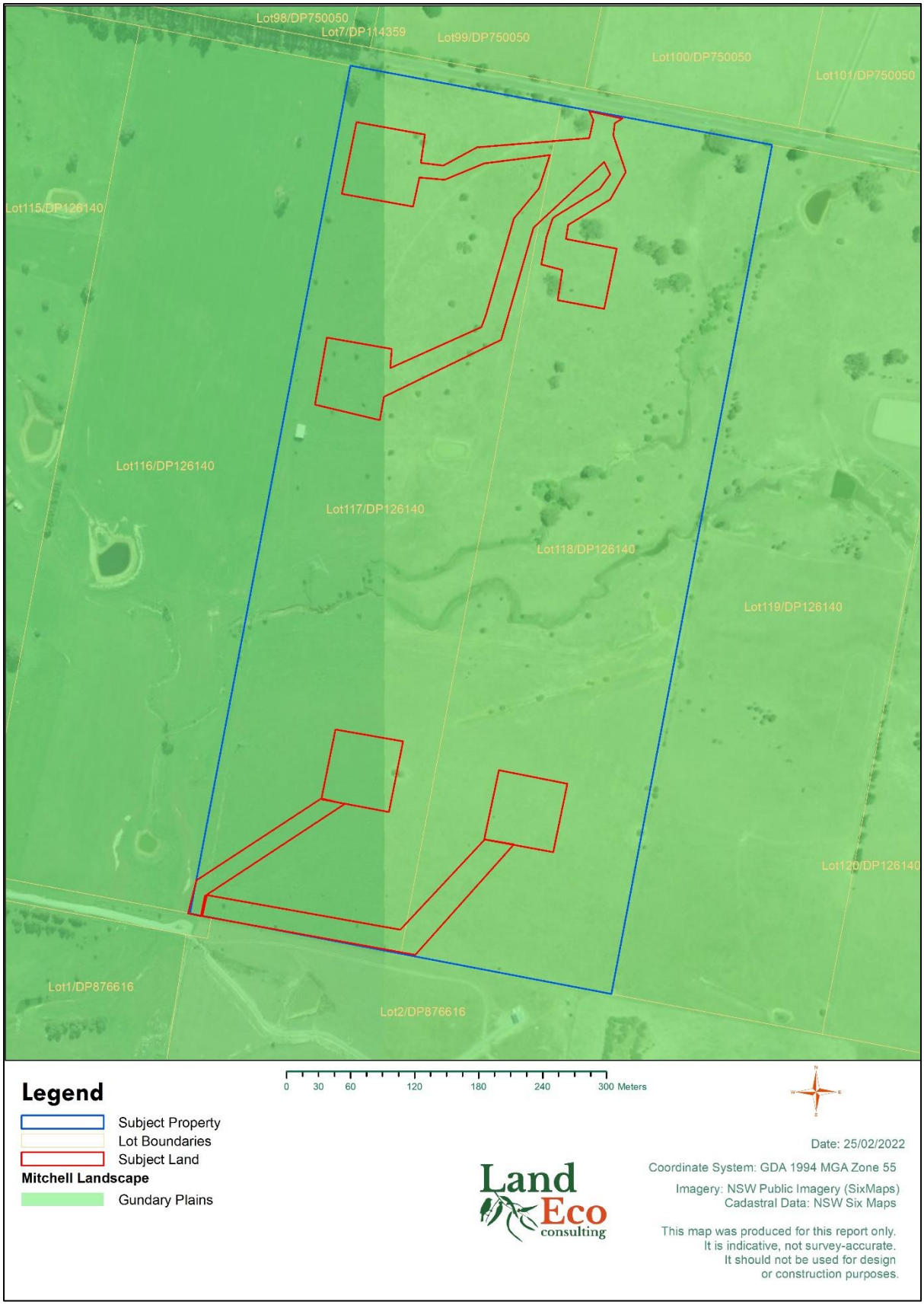


Figure 4. The Mitchell Landscapes that comprise the subject property.

1.9 Biodiversity Value Mapping

At the time of preparing this report, the subject property contained no land mapped as 'Biodiversity Value' (**Figure 5**).

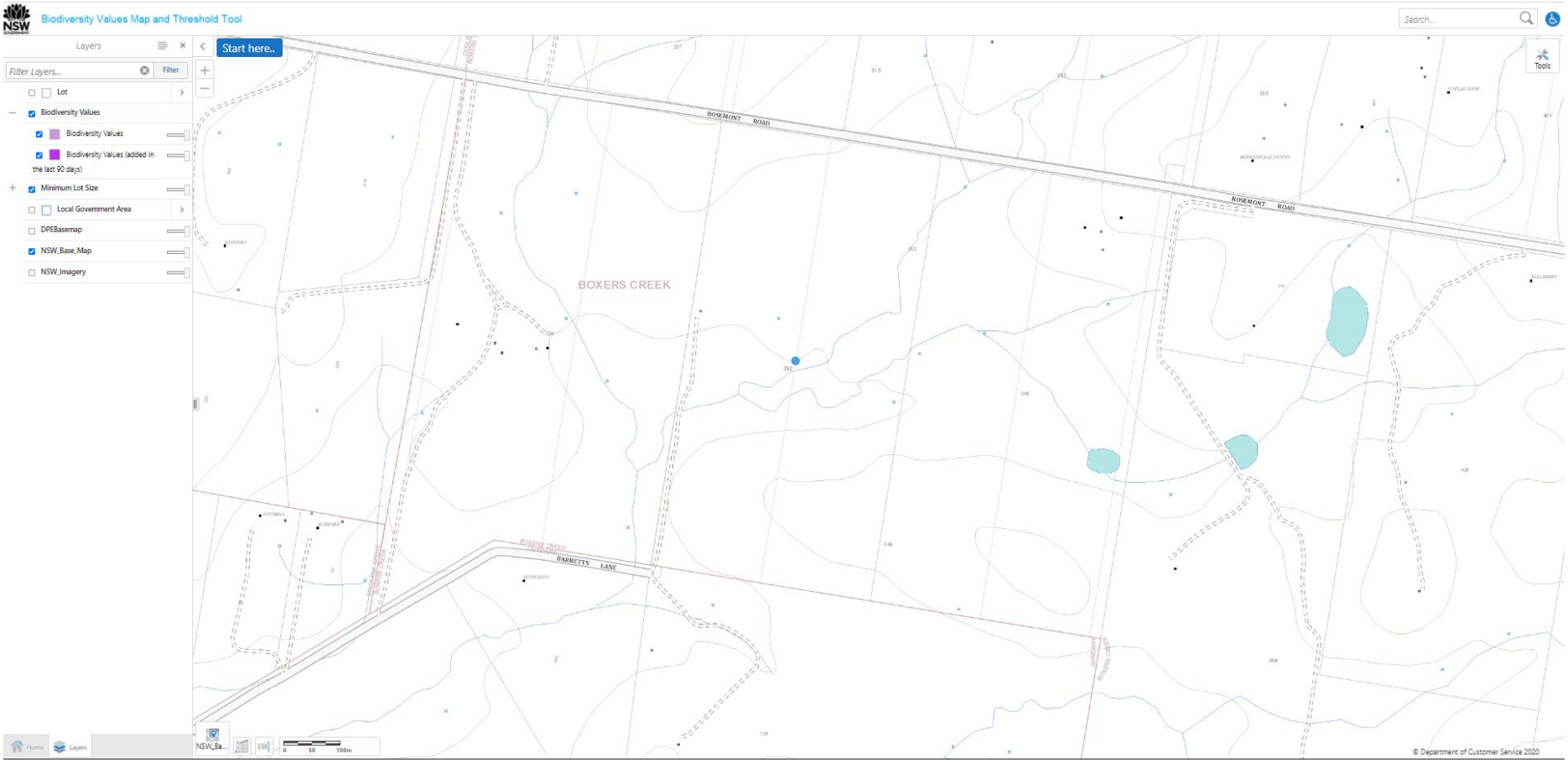


Figure 5. Biodiversity Values Map and Threshold Tool (DPIE 2022a)

2. Vegetation

2.1 Historically Mapped Vegetation Communities

The only readily accessible historical dataset encompassing the subject land was Southeast NSW Native Vegetation Classification and Mapping - SCIVI. VIS_ID 2230 (DPIE 2010) (**Figure 6**). The vegetation mapping in this dataset is broad, and inaccurate.

2.2 Plant Community Types confirmed in subject land

Field survey conducted by Land Eco confirmed one distinct PCT within the subject land (**Figure 7**) *1330: Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.*

2.2.1 Selection Process for PCT 1330: Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion

The selection criteria listed within **Table 3** were selected to develop the PCT shortlist. PCT selection was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2019c). Entering the criteria into the BioNet Vegetation Classification System tool revealed a shortlist of candidate PCT.

Table 3. Plant Community Type Selection Criteria

Selection Criteria	Search Tool
IBRA Bioregion	South Eastern Highlands
IBRA Subregion	Bungonia
Indigenous Upper Stratum Species	*Eucalyptus melliodora*
Indigenous Mid Stratum Species	
Indigenous Ground Species	*Austrostipa bigeniculata* *Rumex brownie* *Urtica incisa*

This selection process delivered one candidate PCT:

1. 1330 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion

The low species diversity within this ecosystem on the subject property is owing to the historic management of the land through clearing and grazing. However, the geological and geographic characteristics along with mature *Eucalyptus melliodora* (Yellow Box) confirmed the presence of this PCT.

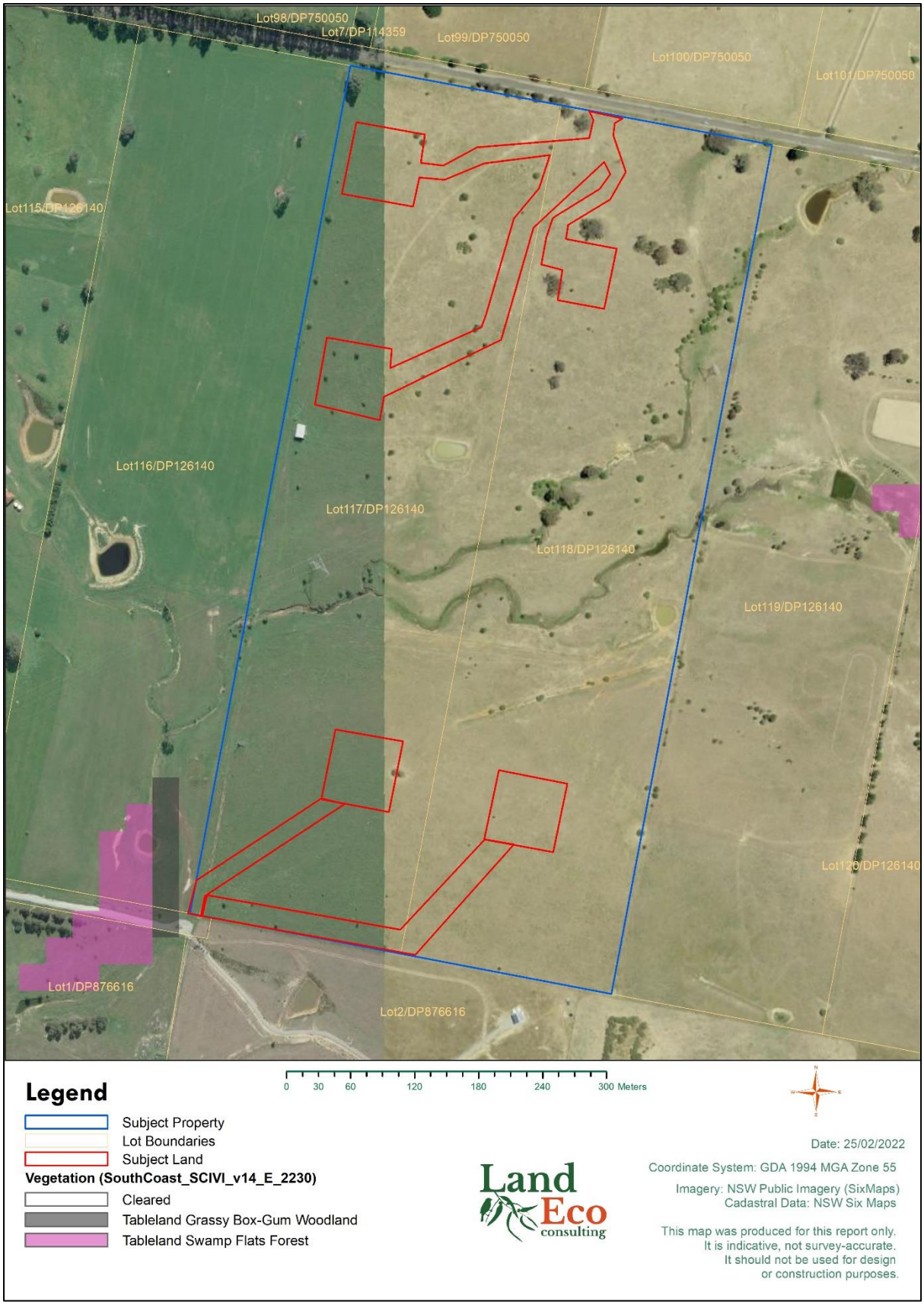


Figure 6. Historically Mapped Vegetation in the Vicinity of the subject land.

2.2.2 Descriptions of the Plant Community Types located within the subject land

The vegetation communities identified and their condition at the time of survey, within the subject land is detailed in **Table 4** and **Figure 7.**

Table 4. Floristic Summary of Native Vegetation in the Subject Property

PCT 1330 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	
PCT Statistics	
Estimated % Cleared: 94% Vegetation Class: Southern Tableland Grassy Woodlands Vegetation Formation: Grassy Woodlands	
Description in VIS	
Diagnostics Features: Woodland with a sparse shrub layer and dense grassy groundcover. Landscape Position: Occurs on loamy soils on undulating terrain between 500 and 900m on the tablelands.	
Description of the Vegetation on subject land	
One distinct condition class of PCT1330 was identified; mature woodland with severe weed infestation. The only canopy species present is *Eucalyptus melliodora*. The native shrub-layer/midstrata was absent. The ground layer displayed low diversity owing to over a century of clearing and management for agricultural purposes. ▪ *Austrostipa bigeniculata* ▪ *Rumex brownii* Groundcover on the subject land was dense though severely weed infested. A suite of exotic species, including HTE weeds were identified (full list for each plot sampled in **Appendix B**). The most common species were *Nassella neesiana, Lollium perrenne, Hirschfeldia incana, Bromus catharticus, Bromus hordeum, Lycium ferocissimum, Eleusine tristachya* and *Avena fatua*. This vegetation has some habitat potential for common grassland-adapted fauna however it is not likely to provide any importance to any viable local populations of threatened flora or fauna species.	
Condition Classes	Condition 1: Mature Canopy/Weed Infested
Approximate extent (ha) within subject property	0.70
Approximate extent (ha) to be cleared for the proposed subdivision (subject land)	0 (the subject land has been positioned to avoid all Yellow Box Grassy Woodland)
TEC Status (Biodiversity Conservation Act 2016)	The extent of this PCT on the subject land is considered to form part of the Critically Endangered Ecological Community 'White Box Yellow Box Blakeley's Red Gum Woodland'.

Table 5. Floristic Summary of Non-native Vegetation in the Subject Property

PCT NIL: Non-native Grassland	
PCT Statistics	
N/A	
Description in VIS	
Nil	
Description of the Vegetation on subject land	
This non-native vegetation was dominated by >50% non-native groundcover species. This was the dominant vegetation community across the subject land. It was derived from historical clearing of woodland from ridges and slopes, and the over-grazing and 'pasture improvement' of the native grassland that is considered likely to have dominated the lowland areas of the subject land. This community was represented by diverse suite of introduced pasture and weed grass and herb species, including HTW weeds. The species assemblage was diverse (**Appendix B**). The most common species were *Avena fatua, Nassella neesiana, Gnaphalium uliginosum, Eleusine tristachya, Trifolium subterraneum, Lolium perenne, Bromus hordeum and Trifolium arvense* among other species. This vegetation has some habitat potential for common grassland-adapted fauna however it is not likely to provide any importance to any viable local populations of threatened flora or fauna species.	
Condition Classes	Condition 1: Non-native (Exotic) Grassland
Approximate extent (ha) within subject property	31.4
Approximate extent (ha) to be cleared for the proposed subdivision (subject land)	4.19
TEC Status (Biodiversity Conservation Act 2016)	This vegetation is non-native and does not meet the criteria to be considered any threatened ecological community.

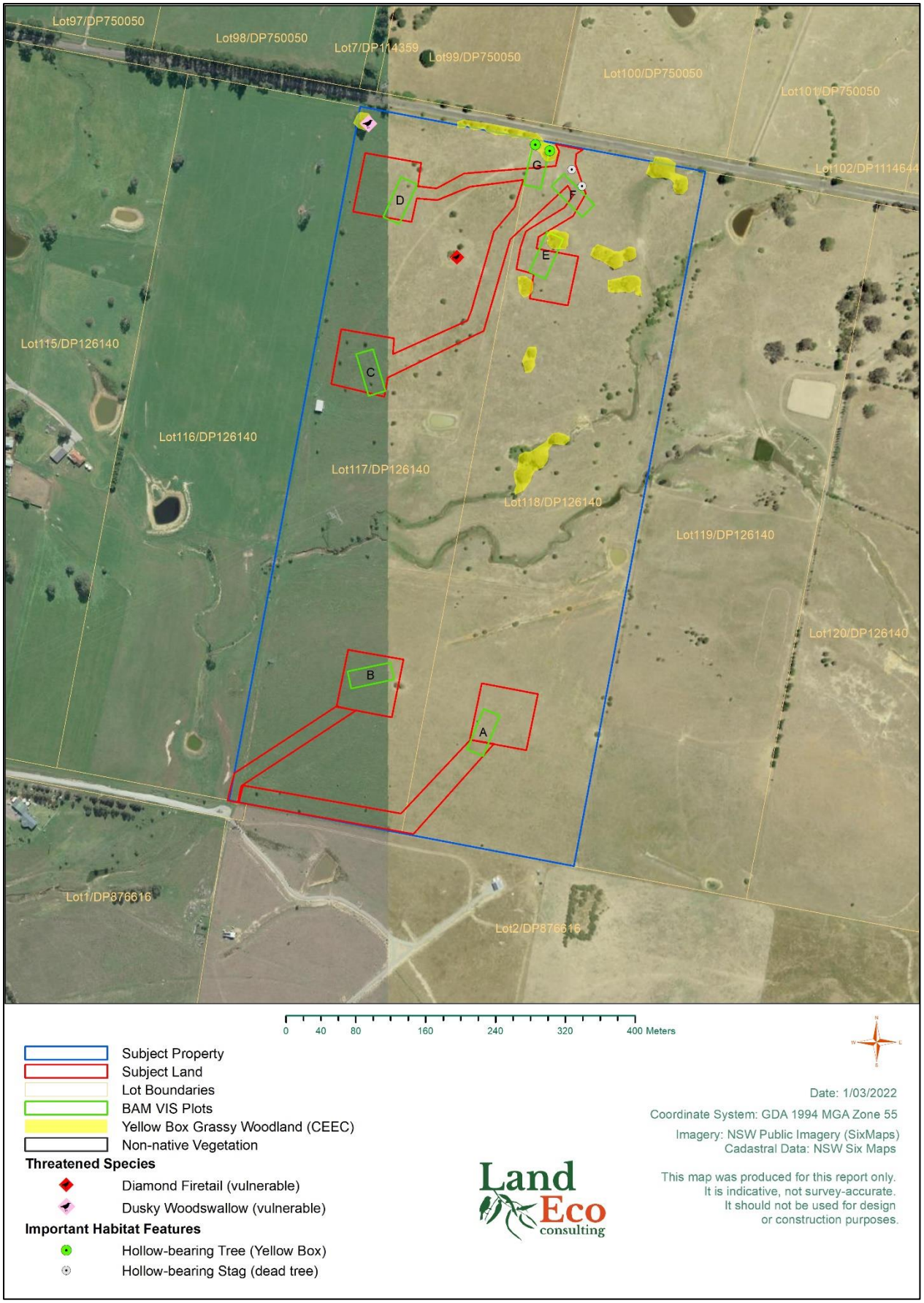


Figure 7. Field validated vegetation mapping within the subject land.

3. Threatened Species

3.1 Habitat Features for Species and Ecosystem Credit Fauna Species

The Land Eco Consulting Ecologists compiled a detailed summary of potential habitat for threatened fauna species, including both Species Credit and Ecosystem Credit threatened fauna species (

Table 6).

A complete list of the fauna species recorded opportunistically during the field survey effort is presented (**Appendix A**). Two threatened species were recorded in the subject land (**Figure 7**):

- Diamond Firetail (*Stagonopleura guttata*) – BC Act: Vulnerable
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) – BC Act: Vulnerable

Table 6. Fauna Habitat Values on the subject land

Habitat component	Site values
Coarse woody debris	Smalls logs, hollow tree stumps and debris occur sparsely across the subject land.
Rock outcrops and bush rock	Absent.
Caves, crevices and overhangs	Absent.
Culverts, bridges, mine shafts, or abandoned structures	Absent.
Nectar/lerp-bearing Trees	*Eucalyptus melliodora* on the subject land have the potential to provide foraging habitat to nomadic nectivorous birds such as the Swift Parrot and Little Lorikeet when the trees are in flower. The subject property would not be able to support a population of either of these species.
Mistletoes	Absent
Nectar-bearing shrubs	Absent
Koala browse	*Eucalyptus melliodora* may provide foraging habitat for koalas. This subject property is unlikely to support a population of koalas and is not considered core koala habitat.
Large stick nests	A large stick nest was observed within a *Eucalyptus melliodora* in the north-east of the subject land. This likely belongs to a pair of Nankeen Kestrels observed nearby.
Sap and gum sources	Absent
She-oak fruit (Glossy Black Cockatoo feed)	Absent
Seed-bearing trees and shrubs	Seed-bearing *Eucalyptus melliodora* occur on the subject land.
Soft-fruit-bearing trees	Absent
Dense shrubbery and leaf litter	Absent
Tree hollows	Four hollow-bearing trees including one stag were identified on the subject land with hollows ranging from <5cm to >10cm in diameter.
Decorticating bark	A small amount of decorticating bark occurs on the *Eucalyptus melliodora* trees on the subject land.
Tree canopy and shrubbery (shelter and insect prey)	The *Eucalyptus melliodora* trees on the subject land provide very sparse and isolated shelter. However, a pair of Diamond Firetails were observed nesting within a priority weed (*Lycium ferocissimum*), its thorny dense habit protecting the birds from feral cats, demonstrating the importance of all habitat features in sparse rural landscapes.
Wetlands, soaks and streams	A riparian corridor occurs through the centre of the subject land. None of this habitat will be impacted by the subdivision.
Open water bodies	Absent
Estuarine, beach, mudflats, and rocky foreshores	Absent.
Open grassland	The majority of the habitat in the subject land consists of open grassland with scattered paddock trees. This habitat provides foraging opportunities for common grassland birds, and a small suite, of nomadic threatened bird species.

3.2 Candidate Ecosystem Credit Species

Threatened fauna species (that are 'ecosystem credit species') are predicted associated with the subject land. These species are listed below in **Table 7.** Most of these species are not considered likely to occur on the subject land, and therefore, do not require further assessment. A test of significance' in accordance with section 7.3 of the BC Act has been undertaken to assess the impact of the DA upon each of these species (see **section 4.1**).

Table 7. Candidate Ecosystem credits predicted to occur within the subject land.

Scientific Name	BC Act Status	Likelihood of Occurrence on Subject Land	Test of Significance Required?
Anthochaera phrygia Regent Honeyeater (Foraging)	Critically Endangered	Moderate potential to occur. May forage in mature *Eucalyptus melliodora*. Unlikely to remain in the locality for extended periods as the habitat is open and disturbed.	Yes
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	Present. Observed on the Subject Land by Land Eco during the site visit.	Yes
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	Vulnerable	Moderate potential to occur. May forage in mature *Eucalyptus melliodora* and the exotic *Crataegus monogyna* (Hawthorn).	Yes
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Vulnerable	Not likely to occur. There is no suitable foraging or breeding habitat for this species. No suitable feed trees present.	No
Chthonicola sagittata Speckled Warbler	Vulnerable	Low potential to occur. Habitat too open. No suitable low shrub habitat or sparse grassy understorey to be removed. The exotic grassland is too dense for this species.	No
Climacteris picumnus victoriae Brown Treecreeper	Vulnerable	Low potential to occur. Habitat too open and not enough woody debris.	No
Circus assimilis Spotted Harrier	Vulnerable	Moderate potential to occur. This raptor is highly mobile and not resident in the locality. May forage in the open exotic grassland and remaining tree canopy, though this will continue post development. No suitable nest trees will be cleared.	No
Daphoenositta chrysoptera Varied Sittella	Vulnerable	Low potential to occur. Habitat too open. No suitable forest habitat will be removed.	No
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	Not likely to occur. There is no suitable foraging or breeding habitat for this species.	No
Ehpthianura albifrons White-fronted Chat	Vulnerable	Low potential to occur. Habitat too open. No suitable low shrub habitat or sparse grassy understorey to be removed. The exotic grassland is too dense for this species.	No
Ephippiorhynchus asiaticus Black-necked Stork	Vulnerable	Unlikely to occur. This species requires wetlands. Such habitat is absent from the subject land.	No
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	Moderate potential to occur. May forage around canopies of mature *Eucalyptus melliodora* and roost/breed in hollows.	Yes
Grantiella picta Painted Honeyeater	Vulnerable	Not likely to occur. There is no suitable foraging or breeding habitat for this species. It requires woodland habitat with mistletoes which are not present in suitable density.	No
Glossopsitta pusilla Little Lorikeet	Vulnerable	Moderate potential to occur. May forage in mature *Eucalyptus melliodora*. Unlikely to breed as habitat is open and disturbed.	Yes
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Vulnerable	Moderate potential to occur. This raptor is highly mobile and not resident in the locality. May forage in the open exotic grassland and remaining tree canopy, though this will continue post development.	No
Hieraaetus morphnoides Little Eagle (Foraging)	Vulnerable	Moderate potential to occur. This raptor is highly mobile and not resident in the locality. May forage in the open exotic grassland and remaining tree canopy, though this will continue post development.	No
Lathamus discolour Swift Parrot (Foraging)	Endangered	Moderate potential to occur. May forage in mature *Eucalyptus melliodora*. Unlikely to breed as habitat is open and disturbed.	Yes
Lophoictinia isura Square-tailed Kite (Foraging)	Vulnerable	Moderate potential to occur. This raptor is highly mobile and not resident in the locality. May forage in the open exotic grassland and remaining tree canopy, though this will continue post development.	No
Melithreptus gularis gularis Black-chinned Honeyeater	Vulnerable	Low potential to occur. Habitat too open. No suitable forest habitat will be removed. Unlikely to breed as habitat is open and disturbed.	No

Scientific Name	BC Act Status	Likelihood of Occurrence on Subject Land	Test of Significance Required?
Melanodryas cucullata cucullata Hooded Robin	Vulnerable	Low potential to occur. Habitat too open. No suitable forest habitat will be removed. Unlikely to breed as habitat is open and disturbed.	No
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Vulnerable	Moderate potential to occur. May forage around canopies of mature *Eucalyptus melliodora* and roost/breed in hollows.	Yes
Miniopterus australis Little Bent-winged bat (Foraging)	Vulnerable	Low potential to occur. May occasionally forage around canopies of mature *Eucalyptus melliodora*. No suitable roost sites in the area. No suitable forage habitat will be impacted. Confirmed absent during bat surveys in November-December 2021.	No
Miniopterus orianae oceanensis Large Bent-winged bat (Foraging)	Vulnerable	Low potential to occur. May occasionally forage around canopies of mature *Eucalyptus melliodora*. No suitable roost sites in the area. No suitable forage habitat will be impacted. Confirmed absent during bat surveys in November-December 2021.	No
Neophema pulchella Turquoise Parrot	Vulnerable	Low potential to occur. Low abundance of native groundcover limited suitable foraging habitat. May breed in hollows though habitat is too open and disturbed.	No
Ninox connivens Barking Owl (Foraging)	Vulnerable	Moderate potential to hunt for prey items (birds and medium-sized mammals) that occupy the subject land. This owl is highly mobile and not resident in the locality. No highly suitable habitat will be removed.	No
Ninox strenua Powerful Owl (Foraging)	Vulnerable	Moderate potential to hunt for prey items (birds and medium-sized mammals) that occupy the subject land. This owl is highly mobile and not resident in the locality. No highly suitable habitat will be removed.	No
Nyctophilus corbeni Corben's Long-eared Bat	Vulnerable	Moderate potential to occur. May forage around canopies of mature *Eucalyptus melliodora* and roost/breed in hollows.	Yes
Petaurus australis Yellow-bellied Glider	Vulnerable	Low likelihood of occurring. Limited suitable foraging or breeding habitat for this species. No connectivity to substantial habitat.	No
Petroica boodang Scarlet Robin	Vulnerable	Moderate potential to forage on the subject land on occasion as it passes through on migration. Habitat is too disturbed for breeding by this species.	Yes
Petroica phoenicea Flame Robin	Vulnerable	Moderate potential to forage on the subject land on occasion as it passes through on migration. Habitat is too disturbed for breeding by this species.	Yes
Phascolarctos cinereus Koala (Foraging)	Vulnerable	Not likely to occur. Limited suitable foraging or breeding habitat for this species. No connectivity to substantial habitat.	No
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	Vulnerable	Low potential to occur. May forage in mature *Eucalyptus melliodora*. Edge of the natural range of this species, occurrences would be infrequent. No important forage habitat will be impacted.	No
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Vulnerable	Moderate potential to occur. May forage around canopies of mature *Eucalyptus melliodora* and roost/breed in hollows.	Yes
Stagonopleura guttata Diamond Firetail	Vulnerable	Present. Breeding pair observed within *Lycium ferocissimum* on the Subject Property.	Yes
Scoteanax rueppellii Greater Broad-nosed Bat	Vulnerable	Moderate potential to occur. May forage around canopies of mature *Eucalyptus melliodora* and roost/breed in hollows.	Yes
Varanus rosenbergi Rosenberg's Goanna	Vulnerable	Not likely to occur. There is no suitable foraging or breeding habitat for this species. No suitable vegetation or termite mounds.	No

3.3 Candidate Species Credit Species

This section provides a summary of the candidate Species Credit fauna (**Table 8**) and flora species (**Table 9**) for the subject land derived from a 10km BioNet Atlas Search (DPIE 2022c). A summary of the targeted survey effort applied to each species is provided along with the results of the survey effort, specifically whether or not a survey is still required to assess the presence and extent of any of the candidate species (**Table 8**).

Table 8. Candidate Fauna Species Credits predicted to occur within the subject land.

Scientific Name	NSW BC Act (2016) listing status	Suitable Habitat Present within/around the subject land?	Likelihood of Occurrence of Species Credit on subject land	Test of Significance Required?
Aprasia parapulchella (Pink-tailed Legless Lizard)	Vulnerable	No suitable rock outcrop nor coarse woody debris for this species to shelter, breed or forage under.	Unlikely. No suitable rock habitat.	No
Anthochaera phrygia Regent Honeyeater (Breeding)	Critically Endangered	There is no suitable nesting habitat, only foraging habitat. The subject land is not included on the map of important areas for Regent Honeyeater.	Unlikely. Too disturbed and dominated by aggressive birds.	No
Burhinus grallarius Bush Stone-curlew	Endangered	Subject land contains no suitable habitat as it is disturbed grassland. No suitable coarse woody debris present.	Unlikely. No suitable shelter or coarse woody debris.	No
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Vulnerable	This species requires large trees hollows for breeding. No suitable hollows large hollows in forest or woodland. Not likely to nest.	Unlikely. No suitable nest trees.	No
Calyptorhynchus lathami Glossy Black- Cockatoo (Breeding)	Vulnerable	This species requires living or dead trees with hollows greater than 15cm diameter and greater than 5m above ground for breeding. The hollows on the subject land are unlikely to be suitable for breeding. No hollows will be removed.	Unlikely. No suitable nest trees.	No
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	The subject land occurs within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices. Suitable foraging habitat occurs around the mature *Eucalyptus melliodora*. This habitat will not be impacted. It may also forage over open grassland. Targeted surveys were conducted with Anabat Express deployed November-December 2021. This survey revealed no individuals.	Low. May forage or fly-over on occasion.	No
Delma impar Striped Legless Lizard	Vulnerable	No suitable rock outcrop nor coarse woody debris for this species to shelter, breed or forage under.	Unlikely. No coarse woody debris or rock.	No
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Vulnerable	This species builds a stick nest in tall trees. No suitable nest trees will be cleared for the proposed development.	Unlikely. May nest in trees along the creek however these are outside of the subject land.	No
Heleioporus australiacus Giant Burrowing Frog	Vulnerable	This species is dependent on flowing creeks, drainage lines and hanging swamps on the top of sandstone plateaus and deeply dissected gullies. There were creeks and wet areas in the subject land. The subject land is metasediments (ancient metamorphosed sedimentary rock). There are no recent proximal records.	Unlikely. No suitable spring or sandstone habitat.	No

Scientific Name	NSW BC Act (2016) listing status	Suitable Habitat Present within/around the subject land?	Likelihood of Occurrence of Species Credit on subject land	Test of Significance Required?
Hieraaetus morphnoides Little Eagle (Breeding)	Vulnerable	This species builds a stick nest in tall trees. No suitable nest trees will be cleared for the proposed development.	Unlikely. May nest in trees along the creek however these are outside of the subject land.	No
Lathamus discolour Swift Parrot (Breeding)	Endangered	The subject land provides foraging habitat for Swift Parrot. The species does not breed on mainland Australia. This subject land is not located in the 'important areas' mapping.	Unlikely. Does not breed on mainland Australia.	No
Litoria aurea Green and Golden Bell Frog	Endangered	The Green and Golden Bell Frog requires marshes, dams and stream-sides, particularly those containing bulrushes (*Typha* spp.) or spike rushes (*Eleocharis* spp.) for breeding. No suitable breeding habitat occurs within the subject land. The Green and Golden Bell Frog may forage in open grassy areas, away from water during wet conditions but will retreat back to water during dry times. The proposed subdivision has been deliberately located outside of the 40m wide 'waterfront land'. The dry exotic grassland in the subject land is dense and not-suitable for Green and Golden Bell Frog.	Unlikely. Has not been recorded in Goulburn for multiple decades. No suitable habitat.	No
Lophoictinia isura Square-tailed Kite (Breeding)	Vulnerable	This species builds a stick nest in tall trees. May breed in mature *Eucalypts melliodora* as trees of this size are rare across the landscape. This habitat will not be impacted.	Unlikely. May nest in trees along the creek however these are outside of the subject land.	No
Macropus parma Parma Wallaby	Vulnerable	This species requires dense wet sclerophyll forest or rainforest with a dense shrub layer. Such habitat does not occur on the subject land.	Unlikely. No suitable habitat.	No
Miniopterus australis Little Bent-winged Bat (Breeding)	Vulnerable	This species breeds in caves, tunnels, mine shafts, culverts and outcrops. None of which occur in or near the subject land or nearby.	Unlikely. No suitable breeding habitat (no escarpments, caves, or human structures) within 100m of the subject land.	No
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	Vulnerable	This species breeds in caves, tunnels, mine shafts, culverts and outcrops. None of which occur in or near the subject land or nearby.	Unlikely. No suitable breeding habitat (no escarpments, caves, or human structures) within 100m of the subject land.	No
Myotis macropus Southern Myotis	Vulnerable	No riparian habitat or waterbodies suitable for foraging by this species will be impacted by the subdivision of the subject land. No suitable shelter habitat (e.g. caves, crevices or culverts) are proposed to be impacted for the subdivision.	Unlikely. No suitable foraging habitat in the subject land. No caves or similar roost structures will be impacted.	No
Ninox connivens Barking Owl (Breeding)	Vulnerable	This species requires living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground for breeding. The hollows on the subject land are not of suitable dimension.	Unlikely.	No

Scientific Name	NSW BC Act (2016) listing status	Suitable Habitat Present within/around the subject land?	Likelihood of Occurrence of Species Credit on subject land	Test of Significance Required?
Ninox strenua Powerful Owl (Breeding)	Vulnerable	This species requires living or dead trees with hollows greater than 20 cm diameter for breeding. The hollows on the subject land are not of suitable dimension.	Unlikely. No suitable hollows.	No
Petaurus norfolcensis Squirrel Glider	Vulnerable	This species requires suitable forage and shelter trees in forest or woodland. Limited such habitat occurs on the subject land with no connectivity to more substantial habitat.	Unlikely. No hollow-bearing trees.	No
Phascolarctos cinereus Koala (Breeding)	Vulnerable	This species requires suitable forage trees in forest or woodland. Substantial suitable habitat capable of supporting a population is absent from the Subject Land.	Unlikely. No trees in the subject land.	No
Phascogale tapoatafa (Brush-tailed Phascogale)	Vulnerable	This species requires living or dead trees with hollows 2.5-4 cm diameter. While suitable hollows occur, the habitat on the subject property is open and disturbed, unsuitable for this species.	Unlikely. No hollow-bearing trees.	No
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Vulnerable	No suitable breeding habitat.	Unlikely. No roost colony on subject land.	No
Synemon plana Golden Sun Moth	Endangered	The subject site is located east of the Lake George Range. There are no proximal records of Goulburn Sun Moth in the Goulburn area.	Unlikely. No proximal records of this species.	No

Table 9. Candidate Flora Species Credits predicted to occur within the subject land.

Scientific Name	NSW BC Act (2016) listing status	Targeted Survey Conducted	Habitat Present on subject land / Proximity of Species Records	Biodiversity Risk Weighting	Test of Significance Required?
Dichanthium setosum Bluegrass	Endangered	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This species was not found.	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas.	High – 2	Targeted survey confirmed absence. No further impact assessment required.
Bossiaea oligosperma Few-seeded Bossiaea	Vulnerable	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This species was not found.	Known from two disjunct areas - the lower Blue Mountains in the Warragamba area (Wollondilly, Allum, Tonalli River catchments) and the Windellama area in Goulburn Mulwaree Shire, where it is locally abundant. A 1960s record for the Araluen valley south of Braidwood is credible but has not been relocated.	High – 2	Targeted survey confirmed absence. No further impact assessment required.
Calotis glandulosa Mauve Burr Daisy	Vulnerable	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This species was not found.	The distribution of the Mauve Burr-daisy is centred on the Monaro and Kosciuszko regions. There are three known sites in the upper Shoalhaven catchment. There are old and possibly dubious records from near Oberon, the Dubbo area and Mt Imlay. Found in montane and subalpine grasslands in the Australian Alps. Found in subalpine grassland (dominated by Poa spp.), and montane or natural temperate grassland dominated by Kangaroo Grass (Themeda australis) and Snow Gum (Eucalyptus pauciflora) Woodlands on the Monaro and Shoalhaven area. Appears to be a coloniser of bare patches, which explains why it often occurs on roadsides. Apparently common on roadsides in parts of the Monaro, though it does not persist for long in such sites. Does not persist in heavily-grazed pastures of the Monaro or the Shoalhaven area.	High – 2	Targeted survey confirmed absence. No further impact assessment required.
Diuris aequalis Buttercup Doubletail	Endangered	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This species was not found.	Has been recorded in Kanangra-Boyd National Park, Gurnang State Forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago and Bungendore. The type location (from the 19th Century) is Liverpool, west of Sydney. However, this and other questionable records from the Sydney metropolitan area are unlikely based on current knowledge of the species. Flowering occurs between mid-October and mid-November in the southern part of its range, and between mid-November and early December in the populations north of the Abercrombie River.	High – 2	Targeted survey confirmed absence. No further impact assessment required.
Swainsona sericea Silky Swainson-pea	Vulnerable	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This	Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. It emerges and flowers in spring.	High – 2	Targeted survey confirmed absence. No further impact assessment required.

Scientific Name	NSW BC Act (2016) listing status	Targeted Survey Conducted	Habitat Present on subject land / Proximity of Species Records	Biodiversity Risk Weighting	Test of Significance Required?
		species was not found.			
Swainsona recta Small Purple-pea	Endangered	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This species was not found.	Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Over 80% of the southern population grows on a railway easement.It is also known from the ACT.	High – 2	Targeted survey confirmed absence. No further impact assessment required.
Rutidosis leptorrhynchoides Button Wrinklewort	Endangered	A targeted survey was undertaken in October, November and December 2021 at an appropriate time of year after recent rain. This species was not found.	Local populations at Goulburn, the Canberra - Queanbeyan area and at Michelago. Other populations occur in Victoria.	High – 2	Targeted survey confirmed absence. No further impact assessment required.

4. Impact Summary

This chapter of the report details the type and extent of impacts to biodiversity that will occur as a result of the proposed development.

4.1 Vegetation Clearing

While no native vegetation belonging to an identified PCT will be removed for the proposed development, approximately 4.19 ha of exotic dominated grassland as well as approximately 20 mature exotic shrubs providing nesting and foraging habitat to threatened birds will be removed. Additionally, two large hollow-bearing stags are likely to be removed for the proposed development.

4.2 Test of Significance

Threatened species impact assessment is an integral part of environmental impact assessment for DA projects that involve the clearing of any habitat for threatened species, populations or ecological communities listed under the BC Act. The objective of section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act), the test of significance (aka 5-part test), is to provide standardised and transparent consideration of threatened species and ecological communities, and their habitats, through the development assessment process.

The list of potential species should be provided to a consent authority/determining authority along with the test of significance. Reasons should be provided to show how the list was derived and why any threatened species recorded or predicted to occur have been omitted. A species does not have to be considered as part of the test of significance if recent and reliable data, relating to the study area and subject site and derived from field surveys consistent with OEH guidelines, clearly show that the species:

- does not occur in the study area, and
- will not use on-site habitats on occasion, and
- will not be influenced by off-site impacts of the proposal.

Justification for excluding a species from the assessment must be provided with the test of significance to the consent authority, including details of supporting surveys or studies. Otherwise all species likely to occur in the study area, and known to use that type of habitat, should be considered in the rationale that determines the list of threatened species and ecological communities for the test of significance.

Land Eco provide rationale for exclusion of any threatened species from the 'test of significance'. Some species have been excluded based on an assessment of habitat, other species were excluded following targeted survey (**Table 7;Table 8;Table 9**).

A Test of Significance (**Appendix C**) has been prepared for the following species and communities that are known to occur or considered likely to occur on the subject land:

Nomadic Nectarivores:

1. *Anthochaera phrygia* Regent Honeyeater (BC Act: Critically Endangered)
2. *Glossopsitta pusilla* Little Lorikeet (BC Act: Vulnerable)
3. *Lathamus discolor* Swift Parrot (BC Act: Endangered)

Resident Woodland Birds:

1. *Artamus cyanopterus cyanopterus* Dusky Woodswallow (BC Act: Vulnerable)
2. *Stagonopleura guttata* Diamond Firetail (BC Act: Vulnerable)

Nomadic Woodland Birds:

1. *Callocephalon fimbriatum* Gang-gang Cockatoo (BC Act: Vulnerable)
2. *Petroica boodang* Scarlet Robin (BC Act: Vulnerable)
3. *Petroica phoenica* Flame Robin (BC Act: Vulnerable)

Hollow-dwelling Microbats:

1. *Falsistrellus tasmaniensis* Eastern False Pipistrelle (BC Act: Vulnerable)
2. *Nyctophilus corbeni* Corben's Long-eared Bat (BC Act: Vulnerable)
3. *Scoteanax rueppellii* Greater Broad-nosed Bat (BC Act: Vulnerable)
4. *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat (BC Act: Vulnerable)
5. *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat (BC Act: Vulnerable)

Threatened Ecological Communities:

1. White Box Yellow Box Blakely's Red Gum Grassy Woodland (BC Act: Critically Endangered)

4.3 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the subject land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. The indirect impacts of this proposed development are outlined in **Table 10.**

Table 10. Indirect Impacts Summary

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	White Box Yellow Box Blakeley's Red Gum Woodland All potentially occurring threatened species.	The proposed development may increase surface run-off into the adjacent habitat which may in turn increase weed infestations within the habitat. Accidental damage to mature *Eucalyptus melliodora* during construction.	Weed intensity may reduce native vegetation integrity. Loss of mature hollow-bearing trees.
(b) reduced viability of adjacent habitat due to edge effects	White Box Yellow Box Blakeley's Red Gum Woodland All potentially occurring threatened species.	The proposed subdivision may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects, however, the effects of this will be low owing to the extremely high density and species richness of weeds already present.	Edge effects may increase weed intensity and reduce vegetation integrity.
(c) reduced viability of adjacent habitat due to noise, dust or light spill	White Box Yellow Box Blakeley's Red Gum Woodland All potentially occurring threatened species.	Earthworks may cause increase in dust, vibration and noise. However, as the vegetation is located in a disturbed area that is a working cattle and sheep farm, such issues are already present within the subject land and surrounds. It is therefore unlikely the proposed works will significantly exacerbate any of these issues.	N/A
(d) transport of weeds and pathogens from the site to adjacent vegetation	White Box Yellow Box Blakeley's Red Gum Woodland All potentially occurring threatened species.	The proposed construction and operation of the subdivision may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area surrounding the development to a couple of metres.	Edge effects may increase weed intensity and reduce vegetation integrity.
(e) increased risk of starvation, exposure and loss of shade or shelter	All potentially occurring threatened species.	No substantial vegetation will be removed for the proposed development. 0.19 ha of exotic grassland will be removed exposing animals that have adapted to utilise this dense grassland.	Exposure and loss of shelter for limited number of reptiles and birds that may utilise the exotic grassland.
(f) loss of breeding habitats	All potentially occurring threatened species.	The proposed development will not remove any important breeding habitats as the site is already highly disturbed and historically cleared. All substantial habitat features including hollow-bearing trees will be retained.	N/A

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(g) trampling of threatened flora species	Nil	No threatened flora species were identified within the subject land. It is unlikely that any threatened flora occur.	N/A
(h) inhibition of nitrogen fixation and increased soil salinity	Nil	It is unlikely that these issues affect the subject land, nor is it likely that the proposed development will exacerbate such impacts.	N/A
(i) fertiliser drift	White Box Yellow Box Blakeley's Red Gum Woodland	This issue is not likely to affect the vegetation on the subject land. Fertiliser has already been applied extensively across the subject land as a result of historical agricultural pursuits.	N/A
(j) rubbish dumping	White Box Yellow Box Blakeley's Red Gum Woodland	This issue is not expected to be exacerbated as a result of the proposed development. Rubbish disposal will be managed via standard council-administered process for residential dwellings.	N/A
(k) wood collection	White Box Yellow Box Blakeley's Red Gum Woodland	This is not an issue on the subject land as there is low amounts of coarse woody debris.	N/A
(l) bush rock removal and disturbance	Nil	This issue is not relevant to the subject land as there is no bush rock.	N/A
(m) increase in predatory species populations	Nil	The subject land and surrounds are already inhabited by predatory pest species, most notably fox. Therefore, it is unlikely that the proposed works will increase predatory species populations.	N/A
(n) increase in pest animal populations	Nil	The subject land and surrounds already supports a population of house mouse, black rat, house sparrow, common myna, European blackbird, red fox, brown hare and common rabbit, therefore, it is unlikely that the proposed works will significantly increase pest species populations on the subject land or surrounds.	N/A
(o) increased risk of fire	Nil	It is unlikely that the proposed development will increase risk of fire to any bushland in or around the subject land.	N/A
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Nil	The proposed development will not result in the removal of any important breeding or foraging habitat for threatened species. All substantial habitat features including mature trees will be retained.	N/A

4.4 Prescribed and Uncertain Impacts

This list of impacts includes all of those impacts on biodiversity values not caused by direct vegetation clearing or development that have been prescribed by the *Biodiversity Conservation Regulation 2017*.

Prescribed biodiversity impacts require an assessment of the impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance. This is discussed in **Table 11** below.

Table 11. Prescribed and Uncertain Impacts.

Will there be impacts on any of the following	Yes/No	Details
Species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance	No	There are no karst, caves, crevices, cliffs and other features of geological significance on or near the subject land.
Habitat of threatened species or ecological communities associated with rocks	No	There are no rocks important to threatened species or ecological communities on the subject land.
Habitat of threatened species or ecological communities associated with human made structures	No	There are no threatened species or ecological communities located within the subject land that are associated with human made structures.
Habitat of threatened species or ecological communities associated with non-native vegetation	Yes	Non-native vegetation within the subject land consisted of degraded paddocks infested with environmental weeds. A pair of Diamond Firetails (*Stagonopleura guttata*) were observed sheltering, potentially nesting, within an African Boxthorn (*Lycium ferocissimum*) which is listed as a Weed of National Significance. This habitat is likely to be cleared for the proposed development. Additionally, approximately 4.19ha of exotic grassland offering foraging habitat to threatened birds will also be removed for the proposed development.
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Yes	The proposed development will not impact upon habitat of threatened species that facilitates the movement of those species across their range. The habitat to be impacted is restricted to exotic, weed-infested grassland which offers low quality, temporary foraging habitat for threatened species. The species likely to utilise the habitat are highly mobile and not likely to be impacted by impacts to 4.19ha of exotic grassland.
Movement of threatened species that maintains their life cycle	Yes	While potential breeding habitat was identified on the subject land and threatened species were recorded within the subject land, all substantial habitat features including hollow-bearing trees will be retained. The habitat to be impacted is of low quality and condition such that it is not considered to be important to the bioregional persistence of any threatened species that may occur. The species likely to utilise the habitat are highly mobile and not likely to be impacted by impacts to 4.19ha of exotic grassland.
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)	No	No watercourses, waterbodies, groundwater or catchments will be impacted by the proposed development.
Wind turbine strikes on protected animals	No	There are no wind turbines proposed on the subject land.
Vehicle strikes on threatened species of animals or on animals that are part of a TEC	No	It is unlikely that vehicle strikes will be an issue given the proposed development consists of a residential estate with a designated, slow speed limit.

5. Avoid and Minimise Impacts

5.1 Impact Mitigation and Minimisation Measures

This section of the report details recommended efforts to avoid and minimise impact on biodiversity values associated with the proposed development. Measures to be implemented before, during and post construction to avoid and minimise the impacts of the project are detailed in (**Table 12**). The final project footprint including construction and operation is presented as the 'subject land' (**Figure 1;Figure 2**).

Considering the nature and scale of the proposed development; the character of the study area; the historic disturbance and fragmentation, and maintenance of vegetation within the Subject Property in conjunction with the proposed impact mitigation measures, there are unlikely to be any appreciable indirect impacts on biodiversity arising from the proposal that have not been addressed in **Table 12** below.

Table 12. Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project

Impact / Action	Outcome	Timing	Responsibility
Project Location	The project location lies between an area that has been historically cleared and maintained through historical clearing, pasture improvement and grazing. Owing to the project location, the proposal is unlikely to significantly exacerbate the fragmentation of native vegetation, or impact on any preferential fauna habitat. The Ecologist site assessment revealed that there are minimal alternative locations available for the project location within the Subject Property without compromising the viability of the project.	Pre-construction phase	Proponent
Project Design	The proposed development requires the clearing 4.19 ha of exotic grassland which offers low biodiversity value. This impact will result in minimal loss to regional biodiversity due to the location of the site within a historically cleared/ degraded area.	Pre-construction phase	Proponent
Vegetation Clearing	A qualified Ecologist should be present to supervise all substantial vegetation clearing including mature shrubs and hollow-bearing stags. The Ecologist will be available to salvage and relocate any bird nests or other native fauna that is displaced during the clearing process.	Construction phase	Proponent Project Ecologist
Coarse Woody Debris	Relocate all felled trees to the riparian corridor so that these trees can continue to provide habitat in the form of 'coarse woody debris' which is an essential habitat component in the Yellow Box Grassy Woodland ecosystem, and necessary for the survival of threatened woodland birds.	Construction Phase	Proponent Construction Contractor
Erosion and Sedimentation	Appropriate erosion and sediment control must always be erected and maintained during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. As a minimum, such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).	Construction phase	Proponent Construction Contractor Construction Engineer
Storage and Stockpiling (Soil and Materials)	Allocate all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site in order to avoid the potential of incurring indirect impacts on biodiversity values.	Construction phase	Construction Contractors
Stormwater and Wastewater	All stormwater and sewage disposal and transport systems must be appropriately designed by Engineers. Potential impacts relating to stormwater and runoff will be managed during construction and operation phases in accordance with engineers plans. The CEMP will guide stormwater management during the construction phase of development.	During and Post-construction phase	Proponent Construction Engineer
Revegetation of Woodland Bird Habitat	The subject land is partially mapped as containing 'Terrestrial Biodiversity' (**Figure 8**) and is subject to clause 7.2 of the Goulburn-Mulwaree LEP aimed at protecting native flora and fauna, and encouraging the recovery of threatened species. It is recommended that revegetation of native flora is carried-out to replace Diamond Firetail, Dusky Woodswallow and Gang-gang Cockatoo habitat removed for the development. The loss of 20 of the exotic mature shrubs should be replaced with at least 40 tubestock of shrubs representative of White Box Yellow Box Blakely's Red Gum Grassy Woodland flora assemblage at a (replacement ratio of 1:2) along the riparian corridor within the subject land.	Post-construction phase	Proponent Project Ecologist Landscape Contractors

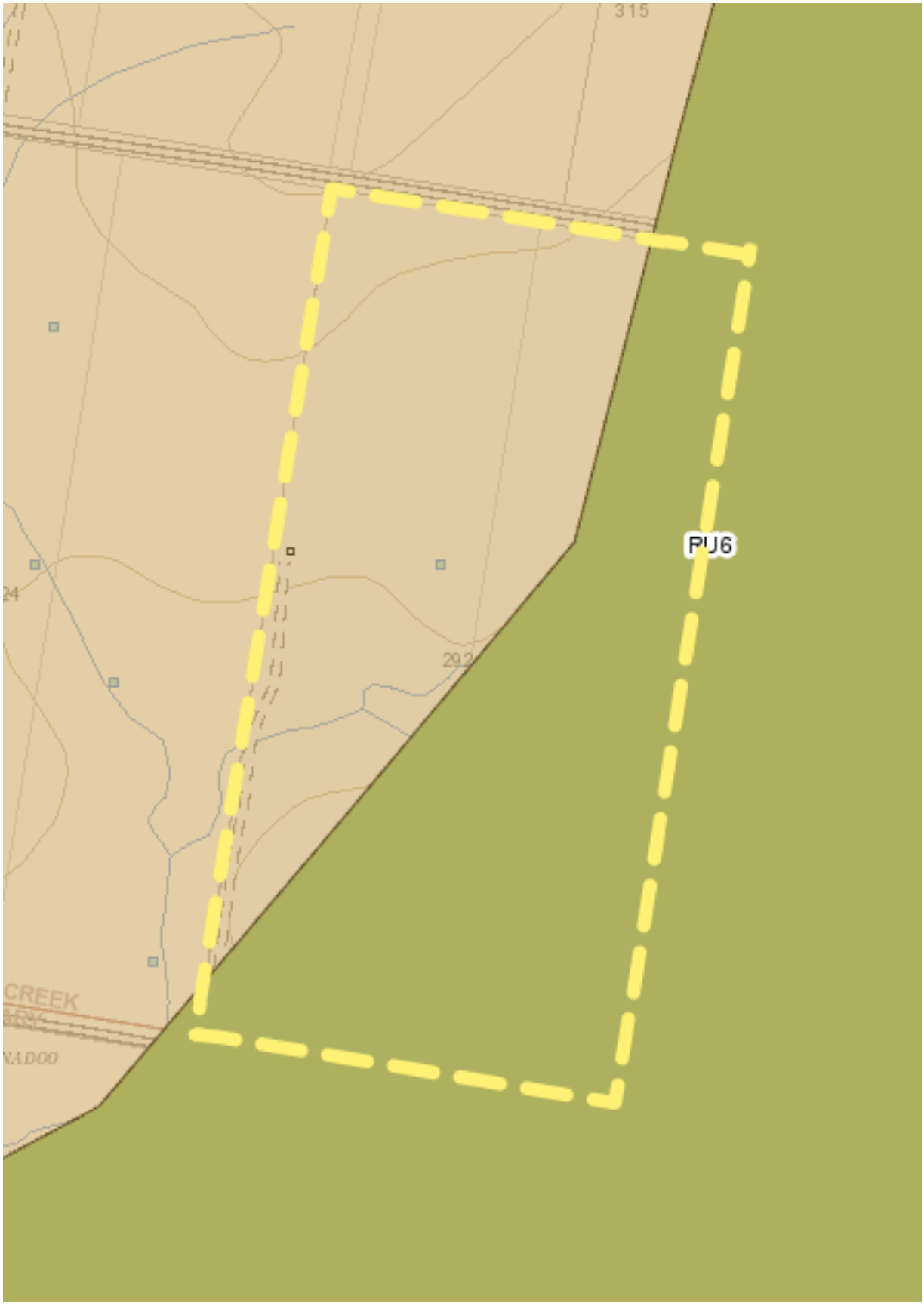


Figure 8. Land mapped as containing 'Terrestrial Biodiversity' within the subject property

6. Other Relevant Legislation, Plan & Policies Requiring Address

6.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

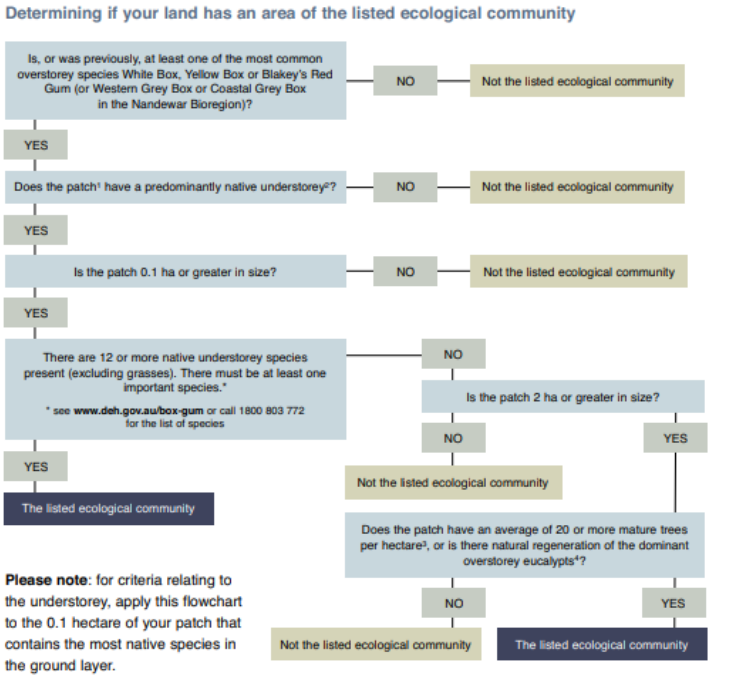
One EPBC Act listed Critically Endangered Ecological Community (CEEC) was located within the subject land, *White Box Yellow Box Blakeley's Red Gum Woodland*.

The vegetation on the subject land has a sparse, mature remnant canopy though a predominantly exotic understorey with just four native understorey species from the Commonwealth "White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Important Species List" (**Table 13**).

As such, the vegetation in the subject land does not meet the criteria to be assessed under the EPBC Act.

Table 13. Flowchart to determine if a patch meets the criteria to be assessed as White Box Yellow Box Blakeley's Red Gum Woodland under Commonwealth legislation (Commonwealth DEH 2006)

The flowchart below represents the lowest condition at which patches are included in the listed ecological community. This is not the ideal state of the ecological community. Large patches, those that link remnants in the landscape, those that occur in highly cleared areas, those that contain rare, declining or threatened species, and those that represent the entire range of the ecological community, are important for the long-term future of the ecological community.



[1] Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:
- an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
- the area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha (1000m²) or greater.

[2] A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)

[3] Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

[4] Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

Suitable habitat for several EPBC Act (Commonwealth) threatened fauna species was also present in the subject land. It is not considered likely that this small area of impact to vegetation that is historically disturbed and cleared, could significantly affect any threatened or migratory species that is listed under the EPBC Act.

6.2 Groundwater Dependent Ecosystems

The Commonwealth Groundwater Dependent Ecosystem (GDE) Policy defines GDEs as ecosystems, which have their species composition and their natural ecological processes determined by groundwater (DLWC 2002). The Policy defines groundwater as the water beneath the earth's surface that has filtered down to the zone where the earth or rocks are fully saturated (DLWC 2002). Ecosystems vary dramatically in the degree of dependency of groundwater, from having no apparent dependence through to being entirely dependent on it (DLWC 2002). The Australian Government Atlas of Groundwater Dependent Ecosystems (BOM 2019a) was used to identify any previously mapped GDEs that occur in or near the subject land. This atlas identifies GDEs reliant on surface groundwater (rivers, springs and wetlands) and subsurface groundwater (vegetation).

The GDE Atlas was reviewed and it was identified that the subject land does not contain a GDE (DLWC 2002). During on-ground surveys no GDE were evident.

6.3 State Environmental Planning Policy (Koala Habitat Protection)

SEPP Koala Habitat Protection only applies to land which:

- (i) has an area of more than 1 hectare; or
- (ii) has, together with any adjoining land in the same ownership, an area of more than 1 hectare whether or not the development application applies to the whole, or only part, of the land.

The SEPP Koala Habitat Protection does not apply to the Subject Property because no native trees will be impacted by the development.

6.4 State Environmental Planning Policy No 19 - Bushland in Urban Areas (SEPP 19)

The subject land does not directly border any Council-mapped Bushland Reserves or land designated for Open Space.

6.5 State Environmental Planning Policy Coastal Management

The subject land is not located within the Coastal Zone and as a result, does not require further assessment as per this SEPP (SEPP Coastal Management 2018).

6.6 Goulburn-Mulwaree Local Environmental Plan 2009

6.6.1 Zoning

Under the Goulburn-Mulwaree Local Environmental Plan (2009), the subject land is zoned 'RU6 Transition'.

Zone RU6 Transition

1 Objectives of zone

- To protect and maintain land that provides a transition between rural and other land uses of varying intensities or environmental sensitivities.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.

The proposed development is permitted with consent.

6.7 Goulburn-Mulwaree Development Control Plan 2009

The proponent will adhere to all controls listed in the DCP that relate to the subject land. The following controls are relevant to biodiversity, and therefore provided in verbatim here.

6.7.1 Landscaping (3.5)

Objective

Provide well-designed, constructed and maintained landscapes that are an asset to the community. Well-designed landscapes contribute to the attractiveness of outdoor spaces, to the protection of the natural environment and to the health and well being of the community. Promote good landscape design. Good design is critical in producing environmentally sustainable landscapes. Provide attractive landscapes that are consistent with the visual character of the landscapes within the Goulburn Mulwaree local government area. Provide for public safety by allowing for passive surveillance and other management techniques. Provide open space for recreation within residential developments. Provide for privacy, summer shade and winter solar access. Promote the use of local native plant species to provide habitat for native fauna, to minimise water usage, to decrease the need for insecticide and pesticide for exotic plant species and to achieve biodiversity objectives. Ensure that landscaping is an integral part of the site planning process and that it suits the proposed development. Ensure that the positive landscape values of the site are not compromised.

6.7.2 Tree and vegetation preservation (3.9)

Objective

The objective of these provisions is to preserve the amenity, biodiversity and ecology of the area through the preservation of trees and other vegetation.

Controls

Definitions

Tree means: a perennial plant with:

- (i) one or more self-supporting trunks, any one of which has a circumference of 30cm or more (at a height of 40 cm above existing ground level), or
- (ii) a height of 2.5 metres or more, or a branch spread of more than 2.5 metres.

Other Vegetation means:
Remnant Native Vegetation including:
(i) trees,
(ii) understorey plants,
(iii) ground cover,
(iv) plants occurring in a wetland.

Note: Native Vegetation has the same meaning as in the Native Vegetation Act 2003. General Clause 5.9 of the LEP 2009 applies to all trees and shrubs in Heritage Conservation Areas, on land that contains a Heritage Item and land identified as 'Biodiversity Hot Spots' and mapped wetlands. Heritage Conservation Areas are shown on the LEP 2009 Heritage Maps. Heritage Items are listed in Schedule 5 to the LEP 2009. 'Biodiversity Hot spots' are identified in figure 3.9 and mapped wetlands in figure 3.8 (of the DCP)

A person must not ringbark, cut down, top, lop, remove, injure or wilfully destroy any tree or other vegetation identified above without the authority conferred by a development consent or a permit granted by the Council. Any removal of native vegetation including trees, shrubs and other vegetation that occurs in an area zoned non-urban and non-industrial, may require consent under the Native Vegetation Act unless on exemption applies. Applicants should contact the NSW Local Land Services – South East for details.

7. Conclusion

The proposed development site has been chosen as it is located in a key position on the fringe of Goulburn township and provides an optimal setting for 'life-style' residential blocks which are in increasing demand but low supply. The subject land is an optimal location for development for the benefit of the town and community of Goulburn.

The subject land has been historically cleared and managed for agricultural purposes for over 100 years. Most of the subject land consists of non-native (exotic) pasture-improved and regularly grazed grassland. A small area in the north-east of the subject land contains native grassy woodland, however, it is severely weed-infested. No native vegetation will be directly impacted for the proposed rezoning and subdivision.

The native grassland vegetation belongs to one distinct plant community type (PCT):

- PCT 1330: Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.

The area of PCT 1330 within the subject land comprises an occurrence of 'White Box Yellow Box Blakeley's Red Gum Woodland' which is listed as a Critically Endangered Ecological Community under the NSW *Biodiversity Conservation Act 2016*. The condition of this vegetation is poor. It is historically disturbed, isolated and weed infested.

Upon completion of a Test of Significance, Land Eco Consulting are satisfied that the proposed development will not incur significant effects to a local occurrence of 'White Box Yellow Box Blakeley's Red Gum Woodland' nor any potentially occurring threatened species or ecological community as listed under the NSW *Biodiversity Conservation Act 2016*.

Recommendations have been put forward to reduce impacts of the proposed development upon biodiversity:

- Ensure all contractors employed to work within the subject land are suitably qualified, experienced and informed of the sensitive ecological features and potentially occurring threatened species;
- Assign a Project Ecologist to conduct and oversee all ecological compliance requirements associated with conducting a proposed development in line with all relevant state and commonwealth legislation and guidelines;
- Ensure an Ecologist is present during the clearing of all vegetation both native and exotic related to the proposed activity;
- Implement all relevant biological hygiene protocols and requirements as per NSW Government guidelines.
- Ensure ongoing management of priority weeds according to statutory requirements.
- Ensure all trees that occur outside of the development footprint are protected from harm during earthworks and construction.
- Remediate the small patches of White Box Yellow Box Blakeley's Red Gum Woodland and revegetate the riparian corridor with locally indigenous flora

During occupation of the subdivision there is potential for the proposal to indirectly impact surrounding vegetation and habitat values through:

- Introduction of weed propagules by vehicle and increased edge effects.
- Erosion and sedimentation as a result of runoff from hard stand areas.

These issues will be actively managed through designated plans that will be prepared to manage open space proposed as part of the development.

State Environmental Planning Policy (Koala Habitat Protection) has been assessed, and the subject land does not contain 'Potential' or 'Core' Koala Habitat.

The proposed development will be of no significant consequence to biodiversity in the locality, region or bioregion. Subject to the proponent implementing the mitigation measures proposed in this report, Land Eco Consulting hold the opinion that the proposed development is suitable to the location and recommend this development for approval.

8. References

Australian Standard 4970 (2009) Protection of Trees on Development Sites

Churchill, S. (1998) Australian Bats, Reed New Holland, Sydney.Clark N.R. and Jones D.C., 1991, Penrith 1:100 000 Geological Sheet 9030, 1st edition. Geological Survey of New South Wales, Sydney.

Commonwealth of Australia (2016) Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions)

Commonwealth of Australia Bureau of Meteorology (BOM) (2022) Groundwater Dependent Ecosystems Atlas. Australian Government Bureau of Meteorology. http://www.bom.gov.au/water/groundwater/gde/map.shtml

Commonwealth of Australia Department of Environment and Conservation (DEC) (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), Department of Environmental Conservation, New South Wales Department of Environment and Conservation, Hurstville, NSW.

Commonwealth of Australia Department of Environment & Energy (DEE) (2022) Protected Matters Search Tool. Department of the Environment and Energy. http://www.environment.gov.au/epbc/pmst/ [19/02/2022]

Commonwealth of Australia Department of the Environment & Energy (DEE) (2018). Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)

Commonwealth of Australia Department of Environment & Energy (DEE) (2019) Protected Matters Search Tool. Department of the Environment and Energy. http://www.environment.gov.au/epbc/protect/index.html [accessed 23/02/2022]

Commonwealth of Australia Department of Environment & Heritage (DEH) (2006) EPBC Act policy statement 3.5 - White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands

Costermans, L. (2018) Native Trees and Shrubs of South-Eastern Australia

Eco Logical (2007) Goulburn Mulwaree Biodiversity Strategy Final Volume 1: Report

Falconer, R. (2004). Down by the Riverside: A field and management guide to native plants in and about the rivers of the Goulburn District, NSW. Goulburn Field Naturalists Society.

Google (2019) Google Earth Pro. Aerial Imagery [accessed 23/02/2022]

Goulburn-Mulwaree Council (2009a) Development Control Plan 2009

Goulburn-Mulwaree Council (2009b) Local Environmental Plan 2009

Harden, G.J. (ed) (2002) Flora of New South Wales Volume 2. NSW University Press: Sydney.

Harden, G.J. (ed) (1992) Flora of New South Wales Volume 3. NSW University Press: Sydney.

Harden, G.J. (ed) (1993) Flora of New South Wales Volume 4. NSW University Press: Sydney.

Harden, G.J. (ed) (2000) Flora of New South Wales Volume 1. NSW University Press: Sydney.

Kahn, L., Heard, B. & Whalley, W. (2003). Pasture Plants of the Slopes and Tablelands of NSW: A Field Guide to the Recognition and Attributes of 70 Plants. 2nd Edition. Department of Land and Water Conservation, NSW.

Land Team (2021) Plan of Proposed Subdivision Lots 117 & 118 DP126140 292 Rosemont Road, Boxers Creek. A3 Sheet. M. Taylor. Date 02/03/2021

Landcom (2004) Managing Urban Stormwater: Soils and Construction 'The Blue Book', Volume 1, Fourth Edition, New South Wales Government, ISBN 0-9752030-3-7

Mitchell, P.B. (2002) NSW Ecosystems Study: Background and Methodology

NSW Department of Environment & Climate Change (2009) Threatened species survey and assessment guidelines: field survey methods for fauna Amphibians

NSW Department of Environment & Conservation (DEC) (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW.

NSW Department of Environment & Conservation (DEC) (2005) Recovery Plan for the Large Forest Owls. Hurstville, NSW: DEC. Available from: https://www.environment.nsw.gov.au/research-and-publications/publications-search/recovery-plan-for-the-large-forest-owls

NSW Department of Environment & Conservation (DEC) (2006) Draft Recovery Plan for the Green and Golden Bell Frog (Litoria aurea). Hurstville, NSW: DEC. Available from: http://www.environment.nsw.gov.au/resources/nature/recoveryplanGreenGoldBellFrogDraft.pdf.

NSW Department of Environment & Conservation (DEC) (2007). Threatened Species Assessment Guidelines: The Assessment of Significance. Department of Environment and Climate Change NSW.

NSW Department of Land & Water Conservation (2002) The NSW State Groundwater Dependent Ecosystem policy: A component policy of the NSW State Groundwater Policy Framework Document. NSW Department for Land and Water Conservation.

NSW Department of Primary Industries (DPI) (2012) Risk assessment guidelines for groundwater dependent ecosystems, Volume 3 – Identification of high probability groundwater dependent ecosystems on the coastal plains of NSW and their ecological value. Department of Primary Industries – Department of Water.

NSW Department of Primary Industries (DPI) (2019) Priority Weeds. NSW Weeds Wise. Department of Primary Industries. https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=3 [accessed 23/02/2022]

NSW Department of Planning Industry & Environment (DPIE) (2010) Southeast NSW Native Vegetation Classification and Mapping - SCIVI. VIS_ID 2230 https://datasets.seed.nsw.gov.au/dataset/southeast-nsw-native-vegetation-classification-and-mapping-scivi-vis_id-223006f8a [accessed 23/02/2020]

NSW Department of Planning Industry & Environment (DPIE) (2019c) State Environmental Planning Policy (Coastal Management) 2018 – maps NSW Department of Planning and Environment http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement [accessed 19/02/2022]

NSW Department of Planning Industry & Environment (DPIE) (2022a) Biodiversity Values Map and Threshold Tool https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap [accessed 23/02/2022]

NSW Department of Planning Industry & Environment (DPIE) (2022b) NSW BioNet. The website of the Atlas of NSW Wildlife. Office of Environment and Heritage. http://www.bionet.nsw.gov.au/ [accessed 23/02/2022]

NSW Department of Planning Industry & Environment (DPIE) (2022c) BioNet Vegetation Classification https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx [accessed 23/02/2022]

NSW Department of Planning Industry & Environment (DPIE) (2022d) Planning Portal ePlanning Spatial Viewer https://www.planningportal.nsw.gov.au/ [accessed 23/02/2022]

NSW Local Land Services (2020) Determining buffer distances from water bodies under the Land Management Code https://www.lls.nsw.gov.au/land-management/facts-sheets2/determining-buffer-distances-from-water-bodies-under-the-land-management-code [accessed 23/02/2022]

NSW National Parks and Wildlife Service (NSW NPWS) (2003) Environmental Impact Assessment Guidelines: Green and Golden Bell Frog Litoria aurea. Sydney, NSW: NPWS. Available from: http://www.environment.nsw.gov.au/resources/nature/GAndGbellfrogEia0703.pdf. [accessed 23/02/2022]

NSW Government Spatial Services (2018) Six Maps Clip & Ship https://maps.six.nsw.gov.au/clipnship.html

NSW Office of Environment & Heritage (OEH) (2016a) NSW (Mitchell) Landscapes - version 3.1 Office of Environment and Heritage.

NSW Office of Environment & Heritage (OEH) (2016b). NSW Guide to Surveying Threatened Plants. Office of Environment and Heritage.

NSW Office of Environment & Heritage (OEH) (2018) Threatened Species Test of Significance Guidelines

NSW Office of Environment &Heritage (OEH) (2022) Biodiversity Offsets Scheme entry requirements. Office of Environment and Heritage. https://www.environment.nsw.gov.au/biodiversity/entryrequirements.htm [accessed 23/02/2022]

NSW Scientific Committee (2002) White box yellow box Blakely's red gum woodland - endangered ecological community listing - Determination to make minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/white-box-yellow-box-blakelys-red-gum-woodland-endangered-ecological-community-listing [accessed 23/02/2022]

PlantNET (2018) The NSW Plant Information Network System. Royal Botanic Gardens and Domain Trust, Sydney. http://plantnet.rbgsyd.nsw.gov.au [accessed 23/02/2022]

Richardson, F, Ricardson, R., Shepard, R. (2011) Weeds of the South-East – An Identification Guide for Australia, Second Edition, R.G. and F.J Richardson

Robinson, L. (2003) Field Guide to the Native Plants of Sydney, Third Edition, Kangaroo Press

Thomas, O.D., Johnston, A.J., Scott, M.M., Pogson, D.J., Sherwin, L. Simpson, C.J., MacRae, G.P. & Vassallo, J.J. (2013) Goulburn 1:100 000 Geological Sheet 8828. Geological Survey of New South Wales.

Tozer, M.G., Turner, K. Keith, D.A., Tindall, D., Pennay, C. Simpson, C. MacKenzie, B. Beukers, P. and Cox, S. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Cunninghamia 11(3): 359–406.

9. Appendices

Appendix A. Fauna recorded within the subject land

Appendix B. Flora Lists and Vegetation Condition Data (BAM VIS Field Survey Forms)

Appendix C. Tests of Significance

Appendix D. Weather Conditions During Survey Period

Appendix A. Fauna recorded on subject land during Site Assessments

Class	Scientific Name	Common Name	NSW Biodiversity Conservation Act 2016 Status
Amphibia	*Crinia signifera*	Common Eastern Froglet	Protected
Amphibia	*Uperoleia laevigata*	Smooth Toadlet	Protected
Amphibia	*Limnodynastes tasmaniensis*	Spotted Marsh Frog	Protected
Amphibia	*Limnodynastes peronii*	Striped Marsh Frog	Protected
Amphibian	*Litoria quiritatus*	Bleating Tree Frog	Protected
Aves	*Anthus novaeseelandiae*	Australasian Pipit	Protected
Aves	*Gymnorhina tibicen*	Australian Magpie	Protected
Aves	*Corvus coronoides*	Australian Raven	Protected
Aves	*Acrocephalus australis*	Australian Reed-Warbler	Protected
Aves	*Elanus axillaris*	Black-shouldered Kite	Protected
Aves	*Ocyphaps lophotes*	Crested Pigeon	Protected
Aves	*Platycercus elegans*	Crimson Rosella	Protected
Aves	*Platycercus eximius*	Eastern Rosella	Protected
Aves	*Eolophus roseicapillus*	Galah	Protected
Aves	*Rhipidura albiscapa*	Grey Fantail	Protected
Aves	*Colluricincla harmonica*	Grey Shrike-thrush	Protected
Aves	*Mirafra javanica*	Horsfield's Bushlark	Protected
Aves	*Corvus mellori*	Little Raven	Protected
Aves	*Grallina cyanoleuca*	Magpie-lark	Protected
Aves	*Artamus personatus*	Masked Woodswallow	Protected
Aves	*Falco cenchroides*	Nankeen Kestrel	Protected
Aves	*Philemon corniculatus*	Noisy Friarbird	Protected
Aves	*Anas superciliosa*	Pacific Black Duck	Protected
Aves	*Cuculus pallidus*	Pallid Cuckoo	Protected
Aves	*Strepera graculina*	Pied Currawong	Protected
Aves	*Anthochaera carunculata*	Red Wattlebird	Protected
Aves	*Psephotus haematonotus*	Red-rumped Parrot	Protected
Aves	*Pardalotus striatus*	Striated Pardalote	Protected
Aves	*Coturnix pectoralis*	Stubble Quail	Protected
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	Protected
Aves	*Malurus cyaneus*	Superb Fairy-wren	Protected
Aves	*Smicrornis brevirostris*	Weebill	Protected
Aves	*Hirundo neoxena*	Welcome Swallow	Protected
Aves	*Artamus superciliosus*	White-browed Woodswallow	Protected
Aves	*Egretta novaehollandiae*	White-faced Heron	Protected
Aves	*Rhipidura leucophrys*	Willie Wagtail	Protected
Aves	*Acanthiza nana*	Yellow Thornbill	Protected
Aves	*Lichenostomus chrysops*	Yellow-faced Honeyeater	Protected
Aves	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	Protected
Aves	*Acridotheres tristis*	Common Myna	Unprotected
Aves	*Sturnus vulgaris*	Common Starling	Unprotected
Aves	*Alauda arvensis*	Eurasian Skylark	Unprotected
Aves	*Turdus merula*	European Blackbird	Unprotected

Class	Scientific Name	Common Name	NSW Biodiversity Conservation Act 2016 Status
Aves	*Carduelis carduelis*	European Goldfinch	Unprotected
Aves	*Passer domesticus*	House Sparrow	Unprotected
Aves	*Stagonopleura guttata*	Diamond Firetail	Vulnerable; Protected
Aves	*Artamus cyanopterus*	Dusky Woodswallow	Vulnerable; Protected
Mammalia	*Lepus europeaus*	Brown Hare	Unprotected
Mammalia	*Oryctolagus cuniculus*	European Rabbit	Unprotected
Mammalia	*Chalinolobus gouldii*	Gould's Wattled-bat	Protected
Mammalia	*Chalinolobus morio*	Chocolate Wattled-bat	Protected
Mammalia	*Vespadelus darlingtoni*	Large Forest Bat	Protected
Mammalia	*Vespadelus vulturnus*	Little Forest Bat	Protected
Reptilia	*Egernia cunninghamii*	Cunningham's Skink	Protected
Reptilia	*Pseudonaja textilis*	Eastern Brown Snake	Protected

Appendix B. Flora Lists and Vegetation Condition Data (BAM VIS Field Survey Forms copied from electronic data sheet)

BAM Site - Field Survey Form

Date:	**14.12.21**	**Plot ID:**	**Box Plot A**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	752910
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	60	**Northing:**	6147201
PCT:	Exotic Grassland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
HTE	Nassella neesiana	70	N/A	**80+cm**	0	0
Grass & grasslike (GG)	Austrostipa bigeniculata	10	N/A	**50-79cm**		
Non-native	Hirschfeldia incana	0.5	30	**30-49cm**		
Forb (FG)	Euchiton sphaericus	0.1	2	**20-29cm**		
Non-native	Gnaphalium uliginosum	3	600	**10-19cm**		
Non-native	Eleusine tristachya	5		**5-9cm**		
Non-native	Trifolium subterraneum	2	200	**<5cm**		
Grass & grasslike (GG)	Rytidosperma racemosum subsp. racemosum	8	N/A			
Non-native	Lollium perenne	30	N/A	**Length of Logs (m)**	0	
Non-native	Gnaphalium japonicum	0.5	20	(≥10 cm diameter, >50 cm in length)		
Non-native	Trifolium campestre	0.2	100			
Forb (FG)	Erodium crinitum	0.1	2	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Non-native	Sonchus asper	0.1	10	**1**	2	
Forb (FG)	Dysphania spp.	0.1	30	**2**	40	
HTE	Nassella trichotoma	0.2	10	**3**	5	
Non-native	Erodium cicutarium	0.1	30	**4**	5	
Forb (FG)	Rumex brownii	0.1	3	**5**	15	

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Non-native	Trifolium arvense	5		**Average (#no./5)**	**13.4**
Non-native	Aira spp.	0.1	2		
Non-native	Hordeum leporinum	0.1	15	Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.	
Non-native	Bromus hordeum	10	N/A		
Non-native	Trifolium glomeratum	0.5	30		
Non-native	Vulpia myuros	2	400		
				Growth Form	**Composition Data**	**Structure Data**
				Tree	**0**	**0**
				Shrub	**0**	**0**
				Grass	**2**	**18**
				Forb	**4**	**0.4**
				Fern	**0**	**0**
				Other	**0**	**0**
				H.T.E	**2**	**70.2**
				Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m	
				Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …	

BAM Site - Field Survey Form

Date:	**14.12.21**	**Plot ID:**	**Box Plot B**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	752795
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	220	**Northing:**	6147251
PCT:	Exotic Grassland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
HTE	Nassella neesiana	35		**80+cm**	0	0
Grass & grasslike (GG)	Austrostipa bigeniculata	20		**50-79cm**		
Non-native	Hirschfeldia incana	0.5	50	**30-49cm**		
Forb (FG)	Euchiton sphaericus	0.1	5	**20-29cm**		
Non-native	Gnaphalium uliginosum	2	1000	**10-19cm**		
Non-native	Eleusine tristachya	2	500	**5-9cm**		
Non-native	Trifolium subterraneanium	5		**<5cm**		
Grass & grasslike (GG)	Rytidosperma racemosum subsp. racemosum	6				
Non-native	Lollium perenne	50		**Length of Logs (m)**	0	
Non-native	Gnaphalium japonicum	0.2	100	(≥10 cm diameter, >50 cm in length)		
Non-native	Trifolium campestre	1	400			
Forb (FG)	Erodium crinitum	0.1	1	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Non-native	Sonchus asper	0.2	20	**1**	10	
Non-native	Leontodon saxatilis	0.1	10	**2**	10	
HTE	Nassella trichotoma	1	100	**3**	5	
Non-native	Erodium cicutarium	0.1	3	**4**	2	
Forb (FG)	Rumex brownii	0.2	10	**5**	2	

For **hollows,** count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Non-native	Trifolium arvense	6		**Average (#no./5)**	**5.8**
Non-native	Aira spp.	0.1	5		
Non-native	Hordeum leporinum	1	200	Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.	
Non-native	Bromus hordeum	5			
Non-native	Trifolium glomeratum	0.2	40		
Non-native	Vulpia myuros	0.5	50		
Forb (FG)	Crassula sieberiana	0.1	6		
				Growth Form	**Composition Data**	**Structure Data**
				Tree	**0**	**0**
				Shrub	**0**	**0**
				Grass	**2**	**26**
				Forb	**4**	**0.5**
				Fern	**0**	**0**
				Other	**0**	**0**
				H.T.E	**2**	**36**
				Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m		
				Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …	

BAM Site - Field Survey Form

Date:	**14.12.21**	**Plot ID:**	**Box Plot C**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	752766
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	100	**Northing:**	6147614
PCT:	Exotic Grassland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
HTE	Nassella neesiana	85		**80+cm**	0	0
Grass & grasslike (GG)	Austrostipa bigeniculata	15		**50-79cm**		
Non-native	Hirschfeldia incana	0.5	50	**30-49cm**		
Non-native	Avena fatua	2	200	**20-29cm**		
Non-native	Phalaris aquatica	25		**10-19cm**		
Non-native	Bromus hordeum	10		**5-9cm**		
Non-native	Cirsium vulgare	0.2	50	**<5cm**		
Non-native	Bromus catharticus	6				
Non-native	Hypochaeris radicata	5		**Length of Logs (m)**	0.5	
Non-native	Vulpia myuros	5		(≥10 cm diameter, >50 cm in length)		
Non-native	Dactylis glomerata	0.1	10			
Forb (FG)	Rumex brownii	0.1	2	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Non-native	Hypochaeris glabrata	5		**1**	100	
Non-native	Lollium perrenne	1	300	**2**	100	
Non-native	Trifolium campestre	0.5	100	**3**	100	
				4	100	
				5	100	
				Average (#no./5)	**100**	

For **hollows,** count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Growth Form	Composition Data	Structure Data
Tree	**0**	**0**
Shrub	**0**	**0**
Grass	**1**	**15**
Forb	**1**	**0.1**
Fern	**0**	**0**
Other	**0**	**0**
H.T.E	**1**	**85**

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site - Field Survey Form

Date:	**14.12.21**	**Plot ID:**	**Box Plot D**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	752816
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	200	**Northing:**	6147811
PCT:	Exotic Grassland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
HTE	Nassella neesiana	65		**80+cm**	0	0
Grass & grasslike (GG)	Austrostipa bigeniculata	20		**50-79cm**		
Non-native	Hirschfeldia incana	0.2	20	**30-49cm**		
Non-native	Avena fatua	15		**20-29cm**		
HTE	Crataegus monogyna	2	1	**10-19cm**		
Non-native	Bromus hordeum	6		**5-9cm**		
Non-native	Cirsium vulgare	0.1	10	**<5cm**		
Non-native	Gnaphalium uliginosum	0.1	40			
Non-native	Hypochaeris radicata	0.5	100	**Length of Logs (m)**	0	
Non-native	Vulpia myuros	0.2	100	(≥10 cm diameter, >50 cm in length)		
Non-native	Dactylis glomerata	0.1	5			
Non-native	Holcus lanatus	0.1	3	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Non-native	Hypochaeris glabrata	0.1	10	**1**	100	
Non-native	Lollium perrenne	8		**2**	98	
Non-native	Trifolium campestre	0.1	40	**3**	100	
Non-native	Lactuca serriola	0.1	10	**4**	100	
Non-native	Hordeum leporinum	0.2	20	**5**	100	
Forb (FG)	Rumex brownii	0.1	3	**Average (#no./5)**	**99.6**	

For **hollows,** count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Growth Form	Composition Data	Structure Data
Tree	**0**	**0**
Shrub	**0**	**0**
Grass	**1**	**20**
Forb	**1**	**0.1**
Fern	**0**	**0**
Other	**0**	**0**
H.T.E	**2**	**67**

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site - Field Survey Form

Date:	**15.12.21**	**Plot ID:**	**Box Plot E**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	752987
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	210	**Northing:**	6147751
PCT:	Yellow Box Grassy Woodland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
Tree (TG)	Eucalyptus melliodora	35		**80+cm**	1	1
HTE	Lycium ferocissimum	10		**50-79cm**		
Non-native	Cirsium vulgare	0.5	20	**30-49cm**		
Non-native	Hirschfeldia incana	1	40	**20-29cm**		
Non-native	Malva parviflora	0.2	10	**10-19cm**		
Non-native	Onopordum acanthum	0.5	20	**5-9cm**		
Non-native	Sonchus asper	0.2	10	**<5cm**		
Non-native	Lollium perrenne	20				
HTE	Nassella neesiana	60		**Length of Logs (m)**	0.5	
Grass & grasslike (GG)	Austrostipa bigeniculata	10		(≥10 cm diameter, >50 cm in length)		
Non-native	Bromus catharticus	15				
Non-native	Hordeum leporinum	5		**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Non-native	Rumex crispus	0.1	2	**1**	80	
Non-native	Bromus hordeum	10		**2**	85	
Non-native	Polygonum aviculare	0.1	3	**3**	60	
Non-native	Chenopodium murale	0.1	5	**4**	10	
HTE	Senecio madagascarensis	0.1	5	**5**	15	
Non-native	Eleusine tristachya	2	400	**Average (#no./5)**	**50**	

For **hollows,** count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Non-native	Avena fatua	1	20
Non-native	Erodium cicutarium	0.2	30

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Growth Form	Composition Data	Structure Data
Tree	**1**	**35**
Shrub	**0**	**0**
Grass	**1**	**10**
Forb	**0**	**0**
Fern	**0**	**0**
Other	**0**	**0**
H.T.E	**3**	**70.1**

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site - Field Survey Form

Date:	**15.12.21**	**Plot ID:**	**Box Plot F**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	753030
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	295	**Northing:**	6147796
PCT:	Exotic Grassland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
HTE	Nassella neesiana	80		**80+cm**	0	
Grass & grasslike (GG)	Austrostipa bigeniculata	6		**50-79cm**		2
Non-native	Hirschfeldia incana	1	25	**30-49cm**		
Non-native	Avena fatua	10		**20-29cm**		
Forb (FG)	Rumex brownii	0.2	10	**10-19cm**		
Non-native	Bromus hordeum	5		**5-9cm**		
Non-native	Cirsium vulgare	1	20	**<5cm**		
Non-native	Phalaris aquatica	2	30			
Non-native	Hypochaeris radicata	1	300	**Length of Logs (m)**	0	
Non-native	Vulpia myuros	0.2	500	(≥10 cm diameter, >50 cm in length)		
Non-native	Hordeum leporinum	0.5	500			
Non-native	Vulpia bromioides	0.2	200	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
HTE	Lycium ferocissimum	1.5	20	**1**	100	
Non-native	Malva parviflora	0.2	15	**2**	100	
				3	100	
				4	100	
				5	100	
				Average (#no./5)	**100**	

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Growth Form	Composition Data	Structure Data
Tree	**0**	**0**
Shrub	**0**	**0**
Grass	**1**	**6**
Forb	**1**	**0.2**
Fern	**0**	**0**
Other	**0**	**0**
H.T.E	**2**	**81.5**

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site - Field Survey Form

Date:	**15.12.21**	**Plot ID:**	**Box Plot G**	**Photo #:**	
Zone:	**55H**	**Plot Dimensions:**	**20x50**	**Easting:**	752972
Datum:	**GDA94**	**Middle Bearing (o) at 0m:**	195	**Northing:**	6147854
PCT:	Yellow Box Grassy Woodland	**Condition Class**		**Ecologists:**	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
Tree (TG)	Eucalyptus melliodora	25		**80+cm**	1	1
HTE	Lycium ferocissimum	0.2	4	**50-79cm**	1	1
Non-native	Cirsium vulgare	0.1	5	**30-49cm**		
Non-native	Hirschfeldia incana	5		**20-29cm**		
Non-native	Malva parviflora	0.2	5	**10-19cm**		
Non-native	Onopordum acanthum	0.2	3	**5-9cm**		
Non-native	Sonchus asper	0.5	10	**<5cm**		
Non-native	Lollium perrenne	25				
HTE	Nassella neesiana	65		**Length of Logs (m)**	11	
Grass & grasslike (GG)	Austrostipa bigeniculata	15		(≥10 cm diameter, >50 cm in length)		
Non-native	Bromus catharticus	15				
Non-native	Hordeum leporinum	3	400	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Non-native	Rumex crispus	0.1	2	**1**	80	
Non-native	Bromus hordeum	5		**2**	60	
Non-native	Polygonum aviculare	0.1	5	**3**	90	
Non-native	Chenopodium murale	0.1	1	**4**	90	
Non-native	Lactuca serriola	0.1	3	**5**	95	
Non-native	Eleusine tristachya	1	100	**Average (#no./5)**	**83**	

For **hollows,** count only the presence of a stem containing hollows. For a **multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

Non-native	Avena fatua	15	
Non-native	Erodium cicutarium	0.2	10
Non-native	Hypochaeris radicata	0.2	30
Non-native	Trifolium repens	0.1	20
Non-native	Plantago coronopus	0.1	8
Forb (FG)	Rumex brownii	0.2	5
Non-native	Capsella bursa-pastoris	0.1	10
Non-native	Dactylis glomerata	0.1	8
Non-native	Trifolium subterraneanium	0.2	40
Non-native	Gamochaeta uliginosum	0.1	4
Non-native	Trifolium glomeratum	0.1	10
Forb (FG)	Urtica incisa	0.1	1

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Growth Form	Composition Data	Structure Data
Tree	**1**	**25**
Shrub	**0**	**0**
Grass	**1**	**15**
Forb	**2**	**0.3**
Fern	**0**	**0**
Other	**0**	**0**
H.T.E	**2**	**65.2**

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

Appendix C. Tests of Significance

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016 For Nomadic Nectarivores 1. *Anthochaera phrygia Regent Honeyeater (BC Act: Critically Endangered)* 2. *Glossopsitta pusilla Little Lorikeet (BC Act: Vulnerable)* 3. *Lathamus discolor Swift Parrot (BC Act: Endangered)*		
Ecology	The Swift Parrot and Little Lorikeet are nomadic nectarivorous birds which travel across New South Wales following food availability. The main sources of food are nectar from flowering Eucalyptus/Corymbia and lerp (psyllid bug exudate) on Eucalyptus/Corymbia/Angophora leaves. The Swift Parrot only breeds in Tasmania and migrates to mainland NSW in the autumn-winter months to forage. The Little Lorikeet is known to nest in smooth-barked trees. The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	
Extent of Habitat Impacted on Subject Site	These nomadic nectarivores may occasionally forage on the mature *Eucalyptus melliodora* trees on the subject land. None of this habitat will be directly impacted for the proposed development. Unintentional impacts may occur from accidental clearing or damage to the mature trees, and the added indirect pressures of increased presence of people and the hazards associated with man-made structures. These species are unlikely to breed within the subject land as it is open and disturbed, and outside of the breeding range of the Swift Parrot. All of these species are mobile and capable of travelling large distances. They are unlikely to rely heavily on the foraging habitat within the subject land. It is expected that the habitat present on the subject land would only be used in supplement to more important areas of remnant habitat, such as remnant forests and bushland in the region.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. The habitat to be impacted consists entirely of historically cleared, pasture-improved, managed grassland that has been grazed for over 100 years and is severely weed infested. • Each of these species is wide-ranging, and likely to only utilise the habitat on the subject land in supplement to larger remnant areas. • No suitable breeding habitat will be impacted by the proposed development. • Light spill is not expected to cause significant disturbance to foraging nocturnal fauna as light is not likely to extend significantly above existing base levels associated with the surrounding urban and industrial areas.	
(b) in the case of an endangered ecological community or , whether the proposed development or activity:	**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	**(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**	Approximately 4.19ha of exotic dominated grassland will be removed for the proposed development. No foraging or breeding habitat will be directly or intentionally impacted.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The habitat is already highly fragmented and isolated from more substantial habitat. The proposed development will not alter this reality.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
For Nomadic Nectarivores 1. *Anthochaera phrygia Regent Honeyeater (BC Act: Critically Endangered)* 2. *Glossopsitta pusilla Little Lorikeet (BC Act: Vulnerable)* 3. *Lathamus discolor Swift Parrot (BC Act: Endangered)*		
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	It is not expected that this patch of historically cleared, managed and weed-infested habitat surrounded by rural residential and agricultural land use is important to the survival of these wide-ranging, mobile species in the locality. Especially since it is unlikely that any potential breeding habitat will be impacted.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development is part of the following key threatening process (KTP) listed under section 4.31. of the NSW Biodiversity Conservation Act 2016: 1. Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process) 2. Removal of dead wood and dead trees	
Conclusion The proposed development will not significantly impact on a viable local population of these species, therefore no further impact assessment, such as a Biodiversity Development Assessment Report (BDAR) is necessary for this project to proceed.		

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
For Resident Woodland Birds 1. *Artamus cyanopterus cyanopterus* Dusky Woodswallow *(BC Act: Vulnerable)* 2. *Stagonopleura guttata* Diamond Firetail *(BC Act: Vulnerable)*	
Ecology	The Dusky Woodswallow primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations. Primarily eats invertebrates, mainly insects, which are captured whilst hovering or sallying above the canopy or over water. Nest is an open, cup-shape, made of twigs, grass, fibrous rootlets and occasionally casuarina needles, and may be lined with grass. Nest sites vary greatly, but generally occur in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage. The Diamond Firetail is found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting.
Extent of Habitat Impacted on Subject Site	Both of these woodland birds were identified on the subject land by Land Eco. A breeding pair of Diamond Firetails were observed nesting in an African Boxthorn (*Lycium ferocissimum*). This species is a Weed of National Significance and approximately 20 mature exotic shrubs of this species will be removed for the proposed development. Approximately 4.19ha of foraging habitat in the form of exotic grassland will also be removed. The Dusky Woodswallow will also be impacted by the loss of potential nesting and perching habitat in large stags and loss of foraging habitat in the exotic grassland. Furthermore, altered vegetation structure through ornamental plants may attract more aggressive species such as the Noisy Miner which may exclude these woodland birds.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016 For Resident Woodland Birds 1. *Artamus cyanopterus cyanopterus* Dusky Woodswallow *(BC Act: Vulnerable)* 2. *Stagonopleura guttata* Diamond Firetail *(BC Act: Vulnerable)*		
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development will impact known breeding habitat of the Diamond Firetail, observed nesting in an African Boxthorn, and potential breeding habitat for the Dusky Woodswallow. African Boxthorn is an exotic thorny species and the only semblance of an understorey across the subject property, offering protection from feral predators such as cats. Removing this habitat will make it unlikely that either of these species will breed on the subject land. Revegetating the riparian corridor will offer a preferential alternative to this weedy habitat and is an appropriate offset that will minimise the likelihood of an adverse effect on the life cycle of these species.	
(b) in the case of an endangered ecological community or , whether the proposed development or activity:	**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	**(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**	Approximately 20 mature exotic shrubs representing known and potential breeding habitat will be removed for the proposed development. Approximately 4.19ha of foraging habitat in the form of exotic grassland will also be removed.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The habitat is already highly fragmented and isolated from more substantial habitat. The proposed development will not alter this reality.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	It is not expected that this patch of historically cleared, managed and weed-infested habitat surrounded by rural residential and agricultural land use is important to the survival of these mobile species in the locality. However, these species demonstrate the adaptability and utility of exotic flora in a sparse rural landscape.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development is part of the following key threatening process (KTP) listed under section 4.31. of the NSW Biodiversity Conservation Act 2016: 1. Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process) 2. Removal of dead wood and dead trees 3. Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala*.	
Conclusion The proposed development will not significantly impact on a viable local population of these species, therefore no further impact assessment, such as a Biodiversity Development Assessment Report (BDAR) is necessary for this project to proceed.		

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016 For Nomadic Woodland Birds 1. *Callocephalon fimbriatum Gang-gang Cockatoo (BC Act: Vulnerable)* 2. *Petroica boodang Scarlet Robin (BC Act: Vulnerable)* 3. *Petroica phoenica Flame Robin (BC Act: Vulnerable)*		
Ecology	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger in eucalypts. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub. The Flame Robin breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks.	
Extent of Habitat Impacted on Subject Site	Foraging resources for the Gang-gang cockatoo in the form of approximately 20 exotic shrubs (African Boxthorn and Hawthorn) will be removed for the proposed development. Approximately 4.19ha of foraging habitat for the Scarlet Robin and Flame Robin as they pass through on migration in the form of exotic grassland will also be removed. No highly suitable breeding habitat for any of these species will be removed.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. The habitat to be impacted consists entirely of historically cleared, pasture-improved, managed grassland that has been grazed for over 100 years and is severely weed infested. • Each of these species is wide-ranging, and likely to only utilise the habitat on the subject land in supplement to larger remnant areas. • No suitable breeding habitat will be impacted by the proposed development.	
(b) in the case of an endangered ecological community or , whether the proposed development or activity:	**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	**(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**	Approximately 20 mature exotic shrubs and approximately 4.19ha of exotic grassland representing foraging habitat for these species will be removed for the proposed development. No native trees or possible nesting sites will be cleared.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The habitat is already highly fragmented and isolated from more substantial habitat. The proposed development will not alter this reality.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or	It is not expected that this patch of historically cleared, managed and weed-infested habitat surrounded by rural residential and agricultural land use is important to the survival of these mobile species in the locality.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
For Nomadic Woodland Birds 1. *Callocephalon fimbriatum Gang-gang Cockatoo (BC Act: Vulnerable)* 2. *Petroica boodang Scarlet Robin (BC Act: Vulnerable)* 3. *Petroica phoenica Flame Robin (BC Act: Vulnerable)*	
ecological community in the locality,	
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development is part of the following key threatening process (KTP) listed under section 4.31. of the NSW Biodiversity Conservation Act 2016: 1. Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process) 2. Removal of dead wood and dead trees 3. Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala*.
Conclusion The proposed development will not significantly impact on a viable local population of these species, therefore no further impact assessment, such as a Biodiversity Development Assessment Report (BDAR) is necessary for this project to proceed.	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
For Hollow-dwelling Microbats 1. *Falsistrellus tasmaniensis* Eastern False Pipistrelle (BC Act: Vulnerable) 2. *Nyctophilus corbeni* Corben's Long-eared Bat (BC Act: Vulnerable) 3. *Scoteanax rueppellii* Greater Broad-nosed Bat (BC Act: Vulnerable) 4. *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat (BC Act: Vulnerable) 5. *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat (BC Act: Vulnerable)	
Ecology	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Corben's Long-eared Bat Inhabits a variety of vegetation types, including mallee, bulloke Allocasuarina leuhmanni and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. The Greater Broad-nosed utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. The Eastern Coastal Free-tailed Bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous. The Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, they fly high and fast over the forest canopy, but lower in more open country. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.
Extent of Habitat Impacted on Subject Site	Two large hollow-bearing stags that have the potential to provide shelter to a small roosting colony to these species of hollow-dwelling microbats will be removed for the proposed development. These stags contain small hollows and narrow fissures. Approximately 4.19ha of exotic grassland foraging habitat will also be removed.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016 For Hollow-dwelling Microbats 1. *Falsistrellus tasmaniensis* Eastern False Pipistrelle (BC Act: Vulnerable) 2. *Nyctophilus corbeni* Corben's Long-eared Bat (BC Act: Vulnerable) 3. *Scoteanax rueppellii* Greater Broad-nosed Bat (BC Act: Vulnerable) 4. *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat (BC Act: Vulnerable) 5. *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat (BC Act: Vulnerable)		
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. While potential shelter for a small roosting colony of microbats will be removed, the habitat is of low quality, occurring in a cleared, weed-infested paddock lacking in structural diversity. The habitat to be impacted consists entirely of historically cleared, pasture-improved, managed grassland that has been grazed for over 100 years and is severely weed infested. • Each of these species is wide-ranging, and likely to only utilise the habitat on the subject land in supplement to larger remnant areas. • Light spill is not expected to cause significant disturbance to foraging nocturnal fauna as light is not likely to extend significantly above existing base levels associated with the surrounding urban and industrial areas.	
(b) in the case of an endangered ecological community or , whether the proposed development or activity:	**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	**(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**	Two large hollow-bearing dead trees (stags) representing possible shelter to a small microbat colony and approximately 4.19ha of exotic grassland representing foraging habitat for these species will be removed for the proposed development.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The habitat is already highly fragmented and isolated from more substantial habitat. The proposed development will not alter this reality.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	It is not expected that this patch of historically cleared, managed and weed-infested habitat surrounded by rural residential and agricultural land use is important to the survival of these mobile species in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development is part of the following key threatening process (KTP) listed under section 4.31. of the NSW Biodiversity Conservation Act 2016: 1. Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process) 2. Removal of dead wood and dead trees	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016
For Hollow-dwelling Microbats 1. *Falsistrellus tasmaniensis* Eastern False Pipistrelle (BC Act: Vulnerable) 2. *Nyctophilus corbeni* Corben's Long-eared Bat (BC Act: Vulnerable) 3. *Scoteanax rueppellii* Greater Broad-nosed Bat (BC Act: Vulnerable) 4. *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat (BC Act: Vulnerable) 5. *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat (BC Act: Vulnerable)

Conclusion
The proposed development will not significantly impact on a viable local population of these species, therefore no further impact assessment, such as a Biodiversity Development Assessment Report (BDAR) is necessary for this project to proceed.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016
White Box Yellow Box Blakely's Red Gum Woodland **Critically Endangered Ecological Community**

Extent of Habitat Impacted on Subject Site	No native vegetation belonging to the White Box Yellow Box Blakely's Red Gum Woodland will be directly or intentional removed for the proposed development. Unintentional impacts may occur from accidental clearing or damage to the mature trees, or increased sedimentation from earthworks.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	NA	
(b) in the case of an endangered ecological community or , whether the proposed development or activity:	**(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**	The condition of this CEEC on the subject land is extremely poor. The patch is not connected to other patches in the area, as it is surrounded by dense non-native grassland. The extent of this TEC across both the IBRA subregion and IBRA region is expected to be >500ha. The proposed development will not remove any of this ecosystem. Thus, the proposed development is not likely to place the ecological community at risk of extinction.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The condition of this CEEC on the subject land is extremely poor. The patch is isolated from other patches as it is surrounded by dense non-native grassland. The composition of the vegetation is of low species diversity with severe weed-infestation. It is unlikely that the proposed DA will substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
(c) in relation to the habitat of a threatened species or ecological community:	**(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**	None of this CEEC on the subject land is likely to be removed or modified.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	An area of habitat is not likely to become fragmented as a result of the development.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
White Box Yellow Box Blakely's Red Gum Woodland **Critically Endangered Ecological Community**		
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The area of this CEEC in the subject land is of low quality and not important to the long-term survival of the species or ecological community in the locality, as the community is locally extensive and there is over 500ha in the IBRA subregion.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed development is part of the following key threatening process (KTP) listed under section 4.31. of the NSW Biodiversity Conservation Act 2016: 1. Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process)	
Conclusion The proposed development will not significantly impact on a local occurrence of White Box Yellow Box Blakley Red Gum Woodland, therefore no further impact assessment, such as a Biodiversity Development Assessment Report (BDAR) is necessary for this project to proceed.		

Appendix D. Weather Conditions During the Survey Period

Land Eco Consulting carried out on-site surveys in and surrounding the Subject Land for flora and fauna over the following dates:

- 15th December 2021
- 14th December 2021
- 30th November 2021
- 19th November 2021
- 10th November 2021
- 9th November 2021
- 10th October 2021

Weather data (BOM 2021) from this period is presented (**Table 14-17**).

The weather conditions were considered suitable to capture spring-flowering herbs and native grasses. Weather data from Goulburn NSW weather station is presented (**Table 14-17**).

Table 14. Weather Conditions During Survey Period December 2021.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours	km/h		local	°C	%	8th	km/h		hPa	°C	%	8th	km/h		hPa
December 2021	We	13.9	25.4	0	4.4		SE	39	16:49	19.0	79	7	NE	9	1016.3	24.7	57		NNE	20	1013.5
2	Th	9.5	28.4	0	3.4		ENE	26	19:26	19.4	77	2	SSE	4	1016.7	27.3	35		SW	9	1014.0
3	Fr	13.4	29.1	0	5.2		E	41	16:08	22.9	56	0	S	6	1015.0	21.2	76		E	24	1013.6
4	Sa	12.3	24.4	1.8	5.2		ESE	41	16:41	14.5	96	7	NNE	2	1013.3	20.1	61		E	24	1011.5
5	Su	9.9	15.9	0.2	5.4		ESE	41	10:51	11.9	80	7	ESE	19	1020.5	12.8	76		E	28	1020.4
6	Mo	8.9	19.9	0	1.8		ENE	39	08:16	14.5	63	2	NE	26	1018.5	18.1	59		NE	19	1015.0
7	Tu	10.5	26.0	0	1.8		SW	46	15:08	19.9	71	1	NW	13	1011.6	23.7	54		W	26	1009.0
8	We	12.7	14.6	0.8	3.6		ESE	30	10:35	13.2	95	8	E	15	1012.8	12.9	96		ENE	9	1011.8
9	Th	11.3	21.0	7.8	2.0		NE	46	13:32	14.6	95	8	ENE	9	1009.3	13.7	96		N	17	1007.5
10	Fr	9.9	13.2	37.0	3.4		SSW	61	05:33	10.2	99	8	SW	15	1006.4	10.6	98		WSW	20	1007.8
11	Sa	6.4	19.6	33.6	3.2		S	44	08:47	12.9	69	7	S	24	1014.8	18.3	53		SE	28	1013.9
12	Su	4.8	20.9	0.2	3.0		SE	30	16:44	14.3	63	1	SE	15	1017.6	18.4	52		E	9	1014.8
13	Mo	5.8	26.3	0	4.2		SSW	31	13:42	11.0	92	8	NE	7	1015.6	24.1	33		WSW	17	1012.1
14	Tu	6.3	27.8	0	4.2		SSE	35	10:26	19.1	74	1	N	2	1014.2	26.8	32		ESE	13	1013.2
15	We	8.3	31.1	0	4.8		WSW	69	15:50	21.6	55	0	NW	7	1012.6	30.0	31		WNW	26	1009.2
16	Th	14.2	25.9	0	6.0		E	37	17:18	19.9	72	1	E	4	1012.3	22.9	61		ESE	22	1011.3
17	Fr	12.2	28.1	0	5.8		NE	31	21:04	17.5	66	1	NE	20	1015.8	26.9	37		NNW	19	1012.8
18	Sa	13.1	31.3	0	5.8		W	89	19:29	25.6	53	1	NW	26	1012.8	28.7	45		NW	22	1010.9
19	Su	15.6	25.8	7.8	6.0		NW	87	17:07	22.0	65	7	NNW	24	1008.7	19.2	79		NW	41	1007.7
20	Mo	14.0	26.4	1.2	2.6		W	46	13:16	19.7	42	2	NW	19	1013.4	25.3	28		WNW	28	1012.3

21	Tu	6.0	29.1	0	6.4		W	39	12:36	20.5	48	0	WNW	17	1013.3	28.6	24		WNW	24	1011.2
22	We	9.0	30.3	0	6.8		ESE	39	15:50	17.1	89	4	Calm		1012.1	29.7	30		WNW	13	1009.0
23	Th	14.9	26.3	0	5.8		SW	56	13:06	18.0	97	7	NE	13	1012.0	20.3	97		E	11	1009.5
24	Fr	14.1	25.2	11.8	6.4		ENE	30	17:40	15.9	97	8	E	9	1015.0	23.3	65		SSW	13	1012.1
25	Sa	13.5	30.5	0.2	3.2		ENE	59	18:51	22.2	74	1	NNW	6	1014.3	29.9	31		SSW	11	1012.0
26	Su	13.4	21.7	0.6	6.6		ESE	56	16:14	19.8	88	7	E	13	1014.4	16.2	98		E	11	1013.4
27	Mo	10.5	18.2	7.0	3.0		SE	41	16:20	12.1	88	8	SE	19	1018.3	16.5	62		SE	24	1017.2
28	Tu	9.5	18.3	0	2.8		SE	33	23:19	13.3	67	4	ESE	19	1019.9	16.6	56		ESE	17	1017.8
29	We	2.9	23.9	0	2.6		E	26	16:54	13.1	78	1	N	6	1018.7	21.1	46		NE	9	1015.3
30	Th	8.0	27.0	0	4.8		NE	26	15:26	14.0	99	1	Calm		1016.7	26.2	28		E	13	1014.1
31	Fr	6.9	29.2	0	4.8		NE	46	14:49	19.4	72	0	N	2	1015.4	28.7	25		ESE	11	1012.1
Statistics for December 2021																					
Mean		10.4	24.5		4.4					17.1	76	3		11	1014.5	22.0	55			18	1012.5
Lowest		2.9	13.2	0	1.8					10.2	42	0	Calm		1006.4	10.6	24		#	9	1007.5
Highest		15.6	31.3	37.0	6.8		W	89		25.6	99	8	#	26	1020.5	30.0	98		NW	41	1020.4
Total				110.0	135.0																

Table 15. Weather Conditions During Survey Period November 2021.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours	km/h		local	°C	%	8th	km/h		hPa	°C	%	8th	km/h		hPa
November 2021 1	Mo	2.8	22.0	0	4.0		WNW	37	14:32	9.3	99	7	Calm		1025.8	21.2	42		WNW	17	1022.8
2	Tu	3.0	23.0	0	3.2		ENE	41	16:21	16.7	62	0	NE	17	1026.7	22.2	40		E	19	1024.5
3	We	10.2	23.6	0	5.0		NNE	28	06:38	15.7	70	2	NNE	19	1025.2	22.9	47		WNW	2	1020.8
4	Th	13.6	16.7	3.0	3.2		ENE	28	20:05	15.2	99	8	NNE	6	1021.1	15.7	98		ESE	7	1019.5
5	Fr	12.2	16.6	23.0	1.0		E	30	05:40	13.6	92	8	ENE	19	1021.0	15.1	92		E	15	1018.3
6	Sa	12.2	24.1	3.8	1.0		NW	31	14:03	15.8	85	4	N	9	1014.8	22.9	50		W	11	1009.9
7	Su	13.3	24.0	17.6	3.8		SW	39	17:04	17.3	91	3	NNW	13	1008.6	22.3	54		NNW	15	1006.7
8	Mo	13.3	23.6	1.0	2.8		NNW	39	15:12	16.5	83	5	WNW	20	1008.0	22.8	46		NNW	26	1007.2
9	Tu	11.4	22.7	0.2	0.2		N	50	13:35	16.5	78	1	E	11	1012.0	22.2	43		NNW	30	1009.9
10	We	9.5	22.0	2.8	5.2		NW	35	13:01	15.8	99	8	N	9	1009.5	20.3	73		NW	13	1004.9
11	Th	11.0	21.1	17.6	2.4		E	39	14:37	17.0	52	2	N	11	1005.2	17.8	74		ENE	24	1002.6

12	Fr	7.8	18.0	44.8	2.4		N 52	19:22	10.4	96	7	NE 15	997.0	16.0	86		N 17	993.2
13	Sa	8.1	13.3	9.6	1.6		N 54	02:51	8.5	93	8	N 31	997.1	12.5	80		N 31	997.4
14	Su	6.6	14.3	6.6	1.8		NNW 72	16:29	10.5	72	2	N 39	1005.3	8.5	92		N 46	1003.1
15	Mo	4.7	13.7	2.2	2.8		NNW 83	03:52	6.6	75	7	WNW 48	1004.9	12.8	68			1006.7
16	Tu	3.8	16.3	1.0	2.0				10.2	63	1		1014.5	15.3	46		NW 15	1015.6
17	We	1.1	20.4	0	3.6		ESE 28	12:58	12.8	69	1	NNE 13	1022.5	18.5	45		NE 6	1019.7
18	Th	3.8	23.5	0	3.4		W 46	09:34	15.7	74	0	NNW 6	1019.4	22.7	34		WNW 24	1014.9
19	Fr	12.9	24.3	0	5.4		W 61	09:06	18.8	61	7	WNW 26	1012.5	21.3	56		WNW 20	1011.8
20	Sa	13.4	18.1	0.6	2.8		NW 35	11:11	16.7	94	8	NW 13	1010.1	16.5	95		WNW 19	1010.5
21	Su	9.9	13.6	19.0	1.8		ESE 43	10:11	11.1	99	8	SE 17	1015.8	11.9	91		ESE 22	1016.2
22	Mo	7.2	18.4	1.2	1.6		ESE 39	10:14	12.0	79	7	ESE 20	1022.6	17.2	53		E 26	1020.3
23	Tu	10.1	21.9	0.2	2.8		ENE 35	10:49	13.9	83	7	ENE 19	1020.4	19.8	63		ENE 20	1017.9
24	We	13.1	23.1	0	2.6		NNE 31	16:13	17.5	83	7	Calm	1016.6	21.2	80		WSW 11	1013.8
25	Th	16.1	23.1	18.6	2.0		SE 31	20:53	19.9	90	6	NE 11	1011.3	23.0	72		NW 13	1007.0
26	Fr	12.5	14.4	6.8	2.6		SE 57	13:47	12.7	99	8	SE 17	1010.5	13.5	88		SE 35	1010.8
27	Sa	9.1	12.1	12.2	2.4		SSE 48	09:04	10.0	99	8	SSE 28	1019.0	11.2	91		SSE 24	1019.3
28	Su	8.3	15.0	0.2	0.6		SSE 33	08:55	11.5	83	7	SE 20	1022.8	13.2	77		ESE 22	1020.4
29	Mo	8.3	23.6	0.2	1.4		ENE 28	16:52	13.0	72	2	E 9	1020.2	22.4	47		W 7	1016.2
30	Tu	11.3	25.7	0	3.2		E 33	15:05	14.0	94	8	NNW 6	1018.0	24.5	41		E 11	1014.5
Statistics for November 2021																		
Mean		9.4	19.7		2.6				13.8	82	5	16	1014.6	18.2	65		18	1012.5
Lowest		1.1	12.1	0	0.2				6.6	52	0	Calm	997.0	8.5	34		WNW 2	993.2
Highest		16.1	25.7	44.8	5.4		NNW 83		19.9	99	8	WNW 48	1026.7	24.5	98		N 46	1024.5
Total				192.2	78.6													

Table 16. Weather Conditions During Survey Period October 2021.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
October 2021 1	Fr	5.9	20.3	3.8	1.8		NW	46	00:02	16.0	69	6	NE	15	1007.9	14.9	64		W	31	1004.4
2	Sa	7.0	16.8	0.8	1.8		W	43	12:36	13.0	86	7	W	20	1005.1	13.8	80		WNW	20	1002.2

3	Su	7.2	18.2	2.8	1.6		W	52	13:06	13.1	81	3	W	30	1005.1	16.5	62		WNW	33	1002.6
4	Mo	5.1	18.1	0	2.4		WNW	72	18:51	14.5	81	1	NNW	6	1000.8	16.2	44		W	37	1001.3
5	Tu	3.6	13.7	0	4.2		W	81	11:39	9.1	78	3	W	33	1007.7	11.7	52		W	44	1009.2
6	We	4.3	17.9	0	3.4		W	48	09:48	10.5	70	0	W	31	1016.0	17.0	37		W	37	1012.9
7	Th	2.0	21.4	0	4.0		NW	70	08:49	17.9	36	0	NW	37	1007.2	20.3	38		WNW	35	1008.7
8	Fr	0.3	20.3	0	4.4		NNW	33	13:49	8.5	99	4	Calm		1018.6	19.3	33		NNW	11	1015.5
9	Sa	1.5	23.1	0	3.4		W	43	13:17	13.3	69	2	NW	13	1017.2	22.4	32		WNW	22	1014.1
10	Su	7.2	23.0	0.2	2.6		NW	43	11:30	14.0	94	7	SW	9	1010.3	19.3	66		NW	22	1008.0
11	Mo	3.9	13.9	12.6	2.6		E	39	22:31	7.3	80	7	SE	13	1015.8	12.4	54		E	22	1014.8
12	Tu	6.3	11.9	0.4	2.2		E	39	11:01	8.1	90	8	E	17	1018.3	10.9	76		E	24	1016.1
13	We	8.0		0.2	1.2		NE	43	22:32	10.2	80	8	ENE	20	1016.2	13.2	79		ENE	19	1012.5
14	Th	10.1	18.2	0.4	1.6		NNE	39	00:51	11.7	86	7	Calm		1009.3	13.1	98		SE	17	1003.6
15	Fr	5.1	15.3	35.8	2.0		WNW	63	11:47	7.9	84	6	NNW	11	1002.5	12.8	64		WNW	26	999.1
16	Sa	6.7	14.9	0.8	2.2		WNW	67	05:53	7.8	91	7	NW	24	1003.7	14.1	66		W	43	1004.1
17	Su	3.9	17.5	0	1.6		W	41	08:37	11.2	65	1	W	20	1014.1	17.0	49		WNW	22	1012.8
18	Mo	0.4	20.6	0	3.6		WSW	41	14:23	12.9	75	0	NW	6	1016.3	19.1	43		W	26	1014.6
19	Tu	7.3	18.6	0.2	3.8		WSW	54	12:20	15.7	73	2	WNW	13	1016.2	15.1	57		SSE	24	1016.5
20	We	1.6	17.2	0	4.0		SSE	44	09:43	12.8	91	7	SSE	24	1018.8	15.5	82		SE	24	1018.0
21	Th	10.1	19.9	1.2	2.0		E	31	14:58	12.6	95	7	ESE	9	1018.0	17.7	64		NNE	7	1015.6
22	Fr	6.4	22.6	0.2	2.0		ESE	15	08:14	13.5	99	7	ENE	7	1018.0	20.8	52		Calm		1015.1
23	Sa	6.4	25.4	0	3.6		W	39	10:48	13.1	99	2	Calm		1014.3	23.7	51		W	20	1012.1
24	Su	4.4	18.5	0.2	4.4		W	52	12:55	13.2	67	1	W	17	1015.3	16.5	44		WNW	30	1014.6
25	Mo	-0.1	16.9	0	4.6		NW	43	13:49	10.5	69	1	WNW	20	1016.0	16.0	49		W	20	1015.2
26	Tu	0.7	19.5	0	4.2		WNW	26	10:08	11.6	81	1	SE	4	1020.1	18.4	37		NNW	6	1016.9
27	We	4.2	23.1	0	3.6		W	33	12:38	12.0	85	1	N	9	1018.8	22.1	38		W	17	1015.4
28	Th	2.0	26.3	0	0.6		W	44	12:39	15.0	72	2	NNW	7	1014.2	24.6	29		W	24	1010.9
29	Fr	7.8	19.8	0	4.4		WNW	70	16:17	19.1	49	3	WNW	37	1005.3	19.4	49		WNW	48	1005.4
30	Sa	0.3	16.8	0	4.8		WSW	39	12:21	10.6	61	1	SW	13	1017.2	15.8	36		WNW	19	1016.3
31	Su	-1.8	20.5	0	4.4		E	26	19:58	9.5	77	1	N	4	1025.2	18.4	35		SE	6	1022.8
Statistics for October 2021																					
Mean		4.4	19.0		3.0					12.1	78	3		15	1013.2	17.0	53			23	1011.3
Lowest		-1.8	11.9	0	0.6					7.3	36	0	Calm		1000.8	10.9	29		Calm		999.1
Highest		10.1	26.3	35.8	4.8		W	81		19.1	99	8	#	37	1025.2	24.6	98		WNW	48	1022.8
Total				59.6	93.0																

Table 17. Weather Conditions During Survey Period September 2021.

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
September 2021	We	-0.2	22.7	0	1.8		ENE	22	15:59	12.3	68	1	N	9	1029.8	22.1	27		ENE	9	1027.6
2	Th	-2.3	20.2	0	2.2		NE	39	12:01	12.9	83	0	N	2	1030.0	19.5	54		NE	28	1025.1
3	Fr	3.2	22.7	0	2.4		N	37	10:56	17.0	74	1	N	13	1025.2	21.7	49		NNW	22	1019.9
4	Sa	5.4	14.1	0.4	2.6		N	48	11:42	12.8	86	8	N	15	1019.7	13.3	92		N	13	1015.6
5	Su	5.8	9.2	15.8	1.6		N	63	09:27	7.2	82	6	N	28	1014.5	7.3	83		N	35	1015.6
6	Mo	3.3	15.2	0.2	1.0		NW	54	10:20	8.0	76	1	N	33	1024.6	14.7	26		SW	31	1025.4
7	Tu	0.5	15.0	0	2.6					8.9	70	1	NNW	31	1027.8	14.4	53		WNW	37	1025.6
8	We	-1.5	16.6	0	2.8		WNW	37	18:37	5.9	99	7	NNW	13	1032.1	16.4	51		W	26	1028.3
9	Th	3.4	17.9	0	2.4		W	59	10:20	10.9	80	2	WNW	28	1028.5	16.8	48		WNW	39	1024.1
10	Fr	6.9	20.9	0.2	2.4		WNW	54	02:23	14.3	50	1	WNW	24	1022.9	19.4	35		WNW	30	1021.2
11	Sa	-0.2	22.0	0	2.8		NW	61	10:38	18.1	36	1	NW	22	1017.1	21.0	32		NW	31	1012.8
12	Su	4.3	18.6	0	4.0		W	56	13:08	15.4	44	1	WNW	31	1006.9	15.2	58		W	31	1006.0
13	Mo	-0.5	12.8	0.8	3.4		SSE	35	17:53	5.6	99	8	WNW	4	1015.0	7.1	90		ENE	13	1015.8
14	Tu	-2.9	13.2	0.8	1.4		SSE	43	09:06	7.5	75	7	S	24	1024.2	11.6	53		SSE	17	1022.7
15	We	-2.9	13.9	0.2	1.2		ESE	24	11:06	4.3	99	0	SSE	4	1025.8	12.2	47		SE	9	1022.8
16	Th	1.5	15.3	0	1.6		ESE	26	09:46	10.2	70	3	E	13	1024.8	13.0	45		NE	6	1020.8
17	Fr	0.3	19.3	0	2.2		NW	43	23:22	7.7	99	0	Calm		1021.6	18.5	39		W	28	1017.8
18	Sa	7.5	16.9	0.2	3.0		W	54	16:57	15.4	66	6	W	31	1015.0	13.2	75		WNW	20	1015.0
19	Su	2.3	15.6	1.6	2.0		WNW	67	15:30	10.8	62	1	WNW	26	1023.2	14.4	44		WNW	43	1018.6
20	Mo	5.9	18.1	0	3.0		WNW	78	10:33	14.9	43	0	WNW	33	1013.1	10.4	72		WSW	39	1011.2
21	Tu	0.0	13.7	1.6	4.0		SSW	54	13:11	6.3	68	1	SW	20	1017.6	11.6	44		SSW	24	1018.9
22	We	-2.4	15.8	0	2.4		NW	33	14:12	10.1	63	0	W	11	1024.5	14.8	50		W	20	1022.3
23	Th	2.5	18.4	0	2.6		WNW	48	14:06	11.0	79	1	WNW	24	1022.0	17.3	54		WNW	33	1017.9
24	Fr	2.5	19.6	0	3.0		W	63	11:01	16.0	59	0	WNW	37	1014.6	18.9	40		WNW	41	1010.4
25	Sa	3.7	14.9	0	4.4		W	44	10:16	10.9	55	0	WNW	28	1016.0	14.1	42		W	22	1016.7
26	Su	3.8	14.3	0	3.4		ESE	37	15:14	8.9	56	1	ESE	19	1026.5	13.1	44		ESE	17	1024.8
27	Mo	1.4	16.7	0	2.8		NNE	46	08:58	11.1	62	1	NNE	26	1025.2	15.8	48		ENE	7	1020.0
28	Tu	1.9	19.7	0	2.6		WNW	33	12:24	13.8	69	1	NE	7	1021.2	18.2	54		NW	11	1017.1

29	We	5.1	14.7	0.4	1.8		N	41	16:15	11.0	99	7	Calm		1017.7	13.6	95		ENE 17	1013.8
30	Th	8.4	18.9	23.0	0.8		N	48	10:11	14.3	74	7	NNW	22	1012.4	17.9	62		NNW 24	1009.1
Statistics for September 2021																				
Mean		2.2	16.9		2.5					11.1	71	2	19		1021.3	15.2	53		24	1018.8
Lowest		-2.9	9.2	0	0.8					4.3	36	0	Calm		1006.9	7.1	26		NE 6	1006.0
Highest		8.4	22.7	23.0	4.4		WNW	78		18.1	99	8	WNW	37	1032.1	22.1	95		WNW 43	1028.3
Total				45.2	74.2															

Land Eco consulting

www.landeco.com.au