Preliminary Biodiversity Development Assessment Report

Lot 1 DP 622362 Associated with the Rosalind Park Planning Proposal, Menangle Park

Leda Holdings Pty Ltd

30 May 2023

Final

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The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Position:	Director
Signed:	
Date:	30 May, 2023

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Glossary

Term	Definition
Assessment area	Area of land within 1500m of the subject land as required by the BAM for non-linear developments
AHD	Australian Height Datum
BAAS	Biodiversity Assessor Accreditation System
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
°C	Degrees Celsius
CCKPOM	Campbelltown Comprehensive Koala Plan of Management
Client	Leda Holdings Pty Ltd
Council	Shoalhaven City Council
DA	Development Application
DP	Deposited Plan
DPE	NSW Department of Planning and Environment (formerly Department of Planning, Industry and Environment (DPIE)
DBH	Diameter at breast height
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
LEP	*Campbelltown Local Environment Plan 2015*
NSW	New South Wales
PCT	Plant Community Type
The Proposal	Rezoning of land located at 111 Menangle Road, Menangle Park NSW (Comprising Lot 1 DP 622362)
SAII	Serious and Irreversible Impact
Study area	The entirety of Lot 1 DP 622362
Subject land	The land subject to this BDAR assessment as required under the BAM, as shown in **Figure 1**.
TBDC	Threatened Biodiversity Database Collection

Term	Definition
TEC	Threatened Ecological Community
VI	Vegetation Integrity

1. Introduction

Cumberland Ecology was commissioned by Leda Holdings (the 'client') to prepare a preliminary Biodiversity Development Assessment Report (BDAR) to support a Planning Proposal (the 'proposal') to facilitate the future rezoning of land located at 111 Menangle Road, Menangle Park NSW (legally defined as Lot 1 in Deposited Plan (DP) 622362).

This BDAR will form part of the documentation submitted to Campbelltown City Council (Council) and then to the New South Wales (NSW) Department of Planning and Environment (DPE) for Gateway Determination.

1.1. Requirement for BDAR

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), all development that requires development consent under Part 4 of the EP&A Act that is likely to significantly affect threatened species or communities, as set out in Clause 7.2 of the BC Act and Clause 7.1 to 7.3 of the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation), triggers the Biodiversity Offset Scheme (BOS) and must be assessed using the Biodiversity Assessment Method (BAM) 2020 with the results presented in a BDAR.

As detailed in the Local Environmental Plan Making Guideline prepared by the former Department of Planning, Industry and Environment (DPIE 2022), a Planning Proposal does not strictly require a BDAR and instead requires a Biodiversity Assessment Report that addresses the following (as relevant):

- Maps and describe the ecological features and biodiversity value of the site (including ground truthing if relying on existing mapping) including threatened ecological communities, threatened species and their habitat including linkages to corridors beyond the site;
- Discuss the implications of occurrences of native flora and fauna for future development of the site;
- Demonstrate how the proposal has taken appropriate and sufficient steps, as a first step, to avoid or minimise impacts to native vegetation (if relevant);
- Make recommended mitigation of the ecological impacts of rezoning (if relevant);
- Make recommendations for biodiversity offsets to address any loss of native vegetation (if relevant); and
- Proposed ownership and management arrangements for residual land such as environmental land, open space and riparian corridors.

Although a BDAR is not formally required to support a Planning Proposal as identified in the Local Environmental Plan Making Guideline, it is understood that DPE has specifically requested a BDAR be prepared to support the proposal. As a result, this preliminary BDAR has been prepared to fulfill the 'Local Environmental Plan Making Guideline' requirements at the request of DPE. It is noted that a future development application (DA) for residential development within lands subject to this preliminary BDAR will likely require the preparation of a formal BDAR (instead of this preliminary BDAR) to support the DA as future development of areas proposed to be zoned R2 Residential would include clearing of up to approximately 24.46 ha of native vegetation. The lot subject to the proposal has a 100 ha minimum lot size under the Campbelltown Local Environment Plan (LEP) 2015. Clearing of up to or equal to 3 ha of native vegetation only could be undertaken before triggering the BOS for this minimum lot.

Appendix D includes a table demonstrating this BDAR's compliance with Appendix K of the BAM, comprising Tables 24 and 25, which detail the minimum requirements for a BDAR.

It is noted that this preliminary BDAR has been prepared at the request of DPE only. This preliminary BDAR does not constitute a formal BDAR and the associated BAM-C case is not anticipated to be formally submitted as BAM-C cases do not include 'Planning Proposal' as an 'Assessment Type'. The BAM-C case utilised in this BDAR for credit calculations has used 'Part 4 Developments (General)' as the 'Assessment Type' as this is considered most appropriate of the available choices.

1.2. Purpose

The purpose of this preliminary BDAR is to document the findings of an assessment undertaken for the proposal in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM in accordance with the requirements of Division 6.2 of the BC Regulation. Specifically, the objectives of this BDAR are to:

- Identify the landscape features and site context (native vegetation cover) within the subject land and assessment area;
- Assess native vegetation extent, plant community types (PCTs), threatened ecological communities (TECs) and vegetation integrity (site condition) within the subject land;
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Identify potential prescribed biodiversity impacts on threatened species;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during proposal planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;
- Identify the thresholds for the assessment and offsetting of impacts, including:
    - Impact assessment of potential entities of serious and irreversible impacts (SAII);
    - Impacts for which an offset is required;
    - Impacts for which no further assessment is required; and
- Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Project Description

1.3.1. Location

The land subject to the proposal is located at 111 Menangle Road, Menangle Park, New South Wales, also known as Lot 1 in DP 622362 (hereafter referred to as the 'study area'). The study area is approximately 28.32

ha in area and occurs in the Campbelltown City Council Local Government Area (LGA). The parts of the study area in which clearing of native vegetation is likely to occur in the future as an outcome of the proposal are hereafter referred to as the 'subject land'. These are the areas which are proposed to be rezoned to R2 – Low Density Residential under the proposal. The subject land is approximately 26.43 ha in area.

The entirety of the study area is currently zoned as RU2 – Rural Landscape under the Campbelltown LEP and is not mapped under the Cumberland Plain Conservation Plan (CPCP); however, adjacent areas are mapped under the CPCP. It is located in a generally rural area, although substantial residential development is currently being undertaken to the west, adjacent to the existing Menangle Park township. The study area is currently bound to the west by Medhurst road, and to the north, east, and south by existing rural land comprising mostly open grasslands, with some remnants of historical native vegetation mostly as scattered patches and linear patches following creek lines, and including rural residential dwellings. Within 600m of the southern boundary is a Gas Plant operated by AGL, and a soil and sand Quarry operated by Hi Quality Group is located within 300m to the south.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively. **Figure 3** identifies the existing zoning of the study area, as well as the land category mapping under the Cumberland Plain Conservation Plan (CPCP) (DPE 2022a), which applies to surrounding land.

1.3.2. Proposal Overview

The proposal proposes the rezoning of the study area to include an area of C2 - Environmental Conservation zoning in the central northern area, and the remaining area comprising the subject land will be rezoned as R2 – Low Density Residential. The proposed rezoning is shown in **Figure 4**. As a result of the proposed rezoning, all or most of the vegetation within the subject land is likely to be removed under future development applications for the construction of residential dwelling and ancillary development such as roads, drainage structures, and open space areas. The proposal is part of a larger rezoning proposal to redevelop a rural property formerly known as Rosalind Park. The larger rezoning proposal was assessed previously under a separate Biodiversity Assessment Report (BAR) prepared by Cumberland Ecology (our ref. 21170RP1, dated 12 September 2022). The BAR included assessment of the study area, as well as the surrounds which are largely mapped as either 'Certified – Urban Capable' or 'Avoided Land' under the CPCP. The larger rezoning proposal is shown in **Figure 5**. It is understood that the reason a BDAR is required to be prepared for the subject land, is that the study area has been excluded from the CPCP mapping, and as such DPE wants greater certainty of the potential impacts on biodiversity associated with the proposed rezoning.

1.3.3. Identification of the Subject Land

The layout of the proposal is shown in **Figure 4**. The subject land includes all areas within the study area to be rezoned as R2 and excludes areas to be rezoned as C2, which are to be retained and restored for conservation, and managed under a Vegetation Management Plan (VMP) in perpetuity. It is likely that during a proposed future DA, all temporary/ancillary construction facilities and infrastructure will be contained entirely within the development footprint (i.e. the 'subject land'). Therefore, for the purposes of this assessment, the subject land comprises both the construction footprint and the operational footprint of future development for the proposal. These details will be confirmed during any future DA/s lodged for the subject land.

1.3.4. General Description of the Subject Land

The subject land is flat in the central-west, and ascends to the south, east, and north to ridgelines half encircling the west and creating a landform comprising a natural amphitheatre. It has a topographic high of 165 m Australian Height Datum (AHD) in the south-east and topographic low of 108m AHD in the central-western area. No areas of the subject land or surrounds are mapped on the 'Acid sulfate soil risk mapping'.

Based on a review of historical aerial photography from 1969 (NSW Government Spatial Services 2023), the subject land was extensively cleared sometime prior to 1969, with most of the remaining remnant vegetation occurring along the northern ridgeline, extending along the eastern boundary, with very little remnant vegetation remaining elsewhere besides some scattered trees in the south. It does not appear that any substantial level of regrowth of native vegetation has regrown since then, with the majority of the area still remaining open and managed for agriculture (cattle grazing).

The central-western area of the subject land contains relatively low condition areas of grassland, with few native grass species remaining. Elsewhere grassland areas are a mix of native and exotic grass species, generally with low species richness. Woodland areas along the northern and eastern ridges of the study area contain remnant and regrowth canopy trees, and contain native species in the ground layer where gaps in the shrub layer allow for less shading of the ground. Generally the shrub layer in most of the woodland areas is densely dominated with exotic shrub species which preclude the development of a significant cover of ground species. Some native species persist in the shrub layer though are not dominant in any areas. Where a ground layer is present and not just comprising shaded bare earth, it is variously dominated by a mix of native and exotic species and lacks species richness.

Three mapped water courses are present; all consisting of first order streams running east to west, and a dam is present in the centre of the subject land. These water courses are all ephemeral drainage lines through paddock areas and are insubstantial to the extent they do not have defined banks or beds, and during dry periods are generally indistinguishable from surrounding grassland areas.

The majority of the subject land is mapped as the Luddenham soil landscape (DPE 2023a), which consists of undulating to rolling low hills of Wianamatta Group shales, and occasionally some areas of Minchinbury Sandstone. A small area in the central-western area is mapped as the Blacktown soil landscape, which also consists of Wianamatta Group shales, but has a gentler topography of small rises.

1.4. Information Sources

1.4.1. Databases

A number of databases were utilised during the preparation of this BDAR, including:

- Environment and Heritage Group (EHG) BioNet Atlas (EHG 2023a);
- EHG Threatened Biodiversity Data Collection (TBDC) (EHG 2023c);
- EHG BioNet Vegetation Classification database (EHG 2023b);

- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Species Profile and Threat Database (DCCEEW 2023c);
- DCCEW Protected Matters Search Tool (DCCEEW 2023b); and
- DCCEW Directory of Important Wetlands in Australia (DCCEEW 2023a).

1.4.2. Literature

This BDAR has utilised the results and/or spatial data from the following documents:

- Remnant Vegetation Mapping of the Cumberland Plain, 2013 Update (OEH 2013);
- Native vegetation of the southeast NSW: a revised classification and map for the coast and eastern tablelands (Tozer et al. 2010); and
- NSW State Vegetation Type Map (DPE 2023b).

Other sources of information have been referenced throughout this BDAR.

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 10/01/2023. Additional aerial images available on NearMap and SixMaps were also consulted.

1.5. Authorship and Personnel

This document has been certified by David Robertson (BAM Accredited Assessor No: BAAS17027) as being prepared in accordance with the BAM as at 23 May 2023.

This BDAR, and associated field surveys and Geographic Information Systems (GIS) mapping, was prepared with the assistance of additional personnel as outlined in **Table 1**.

Table 1 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Mikael Peck	Document Preparation, Credit Calculations, Field surveys	Master of Marine Science and Management. Macquarie University, 2013 Bachelor of Science. Washington State University, 2005 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19002
Cecilia Eriksson Pinatacan	Document Review	Master of Science (Major in Marine Science and Management). University of Technology, Sydney, 2013 Bachelor of Science (Honours) in Marine Biology. University of Technology, Sydney, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19052

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Dr David Robertson	Document Review	Doctor of Philosophy. Ecology, University of Melbourne, 1986 Bachelor of Science (Honours) in Ecology, University of Melbourne, 1980 BAM Accredited Assessor Training. Muddy Boots, 2017 BAM Re-accreditation Training, Muddy Boots, 2021	BAAS17027
Dr Rohan Mellick	Field surveys, PCT selection	Doctor of Philosophy, Evolutionary Ecology. The University of Adelaide, 2012 Bachelor of Applied Science (Honours) in Natural Resource Management, Southern Cross University, 2000. BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18075
Bryan Furchert	Field Surveys, PCT selection, Credit Calculations, Document Preparation	Bachelor of Biodiversity and Conservation. Macquarie University, 2012 Diploma of Conservation and Land Management. TAFE NSW, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18095
Jesse Luscombe	GIS mapping	Bachelor of Marine Science. Macquarie University, 2013 Certificate III in Conservation and Land Management. TAFE NSW, 2016 BAM Accredited Assessor Training. Muddy Boots, 2018	-

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area was reviewed, which includes:

- Vegetation mapping contained within the Native Vegetation of the Sydney Metropolitan Area (OEH 2016), the Map of Threatened Ecological Communities in Greater Sydney, and NSW State Vegetation Type Map (DPE 2023b);
- Species data that is held in the BioNet Atlas;
- PCT profiles in the BioNET Vegetation Classification Database; and
- Vegetation mapping contained within the BAR previously prepared by Cumberland Ecology (our ref. 21170RP1, dated 12 September 2022) as part of the larger rezoning proposal.

This existing information was considered and included, where appropriate, into survey design, vegetation mapping and reporting.

2.2. Landscape Features

2.2.1. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 28 April, and 1-2 May 2023 sought to verify the presence of the following landscape features:

- Rivers, streams and estuaries;
- Important and local wetlands;
- Karsts, caves, crevices, cliffs and areas of geological significance; and
- NSW BioNet Landscapes.

No amendments were required to be made to any of these landscape features following field surveys.

2.2.2. Native Vegetation Cover

The native vegetation cover within the assessment area was determined through the use of existing vegetation mapping data, review of recent aerial imagery and field surveys within the subject land. The existing vegetation mapping data utilised was done previously by Cumberland Ecology to support the previously submitted BAR (our ref. 21170RP1) prepared for the client. The polygons of native vegetation within this dataset were revised following review of aerial imagery from NearMap dated 10/01/2023. Revisions were primarily limited to removing areas of native vegetation as a result of development occurring since the existing vegetation mapping was completed. Amendments were also made within the study area following field surveys undertaken in April and May 2023 (see ***Section 2.3.1***).

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

Broad scale vegetation mapping prepared by OEH (2013), Tozer et al. (2010), and DPE (2023b) exists for the study area and surrounds and was reviewed prior to field surveys. Cumberland Ecology also prepared vegetation mapping of the study area to support the previously submitted BAR (our ref. 21170RP1) prepared for the client.

On 28 April, and 1-2 May 2023 Cumberland Ecology conducted further vegetation surveys to verify and update the vegetation extent and PCT mapping. The vegetation within the study area was ground-truthed to examine and verify the mapping of the condition and extent of the plant communities. Mapping of plant communities within the study area was undertaken by random meander surveys through all patches of vegetation, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these. Soils were also inspected.

Records of plant community boundaries were made using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs. The resultant information was synthesised using GIS to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the study area.

2.3.2. Plot-based Vegetation Survey and Vegetation Integrity Assessment

A plot-based vegetation survey and vegetation integrity assessment was undertaken concurrently within the subject land in accordance with the BAM (hereafter referred to as 'BAM plots'). These BAM plots were undertaken in accordance with Section 4.2.1 and Section 4.3.2 of the BAM.

A total of fourteen (14) BAM plots (P1-P14) were undertaken within the subject land, and an additional plot (P15) was undertaken within the study area outside the subject land within the future C2 zoning area. Plots were undertaken on the 11th April 2022, 1st December 2022, 28th April 2023, and 1st and 2nd May 2023, and their locations are shown in **Figure 6**. The BAM plots required the establishment of a 20 x 50 m plot with an internal 20 m x 20 m plot. The following data was collected within each of the plots:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m floristic plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within a 20 m x 20 m floristic plot;
- Assessment of function attributes within a 20 x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with stems <5 cm DBH;

- The total length in metres of fallen logs over 10 cm in diameter;

- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 x 50 m plot.

Table 2 summarises the plot requirements based on the size and number of vegetation zones in the subject land. As shown in this table, the minimum number of plots has been completed for each vegetation zone, apart from zone 3. Due to grassland remapping following analysis of survey data, there is a deficit of one plot for the LCG condition. As the BDAR is for a planning proposal and not a DA it was considered appropriate to replicate the LCG plot with this highest vegetation integrity (VI) score in the BAM-C to compensate for the lack of a plot.

Table 2 BAM plot survey requirements

Vegetation Zone	PCT	Condition Name	Area (ha)	Minimum Number of Plots Required	Number of Plots Completed	Plot Name
1	3319	Canopy	3.51	3	3	P6, P10, P11
2	3319	DNG	13.84	3	7	P2, P4, P5, P7, P9, P12, P14
3	3319	LCG	7.11	3	2	P1, P8

2.4. Threatened Flora Species Survey

2.4.1. Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit flora species.

2.4.2. Targeted Species Survey

Targeted threatened flora surveys were undertaken within the subject land by Cumberland Ecology for some of the species credit species that were assessed as candidate species credit species for further assessment (see ***Section 5.3***). **Table 3** provides a summary of the flora species credit species surveyed for within the subject land and the locations of the targeted flora species surveys are shown in **Figure 6**.

Targeted surveys included 'parallel field traverses' throughout the subject land for candidate species credit species in accordance with '*Surveying threatened plants and their habitats*' (NSW Government 2020b). The transect width established was between 5 - 10 m depending on the density of vegetation present, in accordance with the maximum width for parallel field traverses to identify all species (trees, shrubs, herbs and forbs, etc.) in dense and open vegetation. It is noted that woodland areas contained heavy African Boxthorn infestations making adhering to the maximum transect width difficult in areas. The location of the parallel field traverses within the subject land undertaken by Cumberland Ecology are shown in **Figure 6**.

Targeted 'parallel field traverses' were undertaken within the subject land by Cumberland Ecology on, the 1st and 2nd May 2023. The parallel field traverses were supplemented by the plot surveys undertaken by Cumberland Ecology on the 11th April 2022, 1st December 2022, 28th April 2023, and 1st and 2nd May 2023.

Species targeted included *Acacia pubescens* (Downy Wattle), *Eucalyptus benthamii (*Camden White Gum), *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea) and *Pimelea spicata* (Spiked Rice-flower), as outlined in **Table 3**.

Table 3 Threatened flora survey dates and methods

Scientific Name	Common Name	Survey Period*	Survey Dates	Survey Method
Acacia pubescens	Downy Wattle	All year	1st and 2nd May 2023	Parallel field traverses
Eucalyptus benthamii	Camden White Gum	All year	1st and 2nd May 2023	Parallel field traverses
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	All year	1st and 2nd May 2023	Parallel field traverses
Pimelea spicata	Spiked Rice-flower	All year **	1st and 2nd May 2023	Parallel field traverses

**Required survey period according to the TBDC, ** Survey was undertaken following suitable amount of rainfall as detailed in TBDC. Species was recorded to be in-flower within known reference site located approximately 8 km to the northwest of the study area.*

2.5. Threatened Fauna Species Survey

2.5.1. Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit fauna species. This included desktop assessment of proximity of the subject land to features such as caves and waterways and field inspection of microhabitats including leaf litter, stick nests and hollow-bearing trees.

2.5.2. Threatened Fauna Species Survey

A total of 10 species were assessed as candidate species credit species requiring further assessment (see ***Section 5.3***). These included:

- Bush Stone-curlew (*Burhinus grallarius*);
- Cumberland Plain Land Snail (*Meridolum corneovirens*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Eastern Pygmy-possum (*Cercartetus nanus*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Square-tailed Kite (*Lophoictinia isura*);
- Powerful Owl (*Ninox strenua*);

- Southern Greater Glider (*Petauroides volans*);
- Southern Myotis (*Myotis macropus*);
- Squirrel Glider (*Petaurus norfolcensis*);
- Koala (*Phascolarctos cinereus*); and
- Masked Owl (*Tyto novaehollandiae*).

Targeted threatened fauna surveys were not undertaken within the subject land by Cumberland Ecology for species credit species that were assessed as candidate species credit species for further assessment (see ***Section 5.3***), as this preliminary BDAR is a high-level assessment for a Planning Proposal. It is assumed that targeted threatened fauna surveys will be undertaken (if required) for any future formal BDARs required to accompany a DA submission.

2.6. Weather Conditions

Weather conditions during the field surveys were appropriate for detection of target species credit species. A summary of weather conditions in the wider locality of the study area during the field surveys is provided in **Table 4**. Rainfall data was taken at BOM Weather Station 068216 – Menangle Bridge (Nepean River), and temperature data was taken at BOM Weather Station 068257 – Campbelltown (Mount Annan).

Table 4 Weather conditions during field surveys

Date	Minimum Temperature (°C)	Maximum Temperature (°C)	Rainfall (mm)
11 April 2022	13.2	29.3	0.00
1 December 2022	14.0	22.8	0.00
28 April 2023	8.7	27.8	0.00
1 May 2023	5.1	20.7	0.00*
2 May 2023	5.9	21.6	0.00*

**72 mm of rainfall in month prior.*

3. Landscape Features

3.1. Assessment Area

The subject land is approximately 26.43 ha in size and is shown in **Figure 1** and **Figure 2**. As the proposal is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the subject land. The assessment area is approximately 1,053 ha in size and is shown in **Figure 2**.

3.2. Landscape Features

Landscape features identified within the subject land and assessment area are outlined below. The extent of these features within the subject land is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregions

The subject land and assessment area occur within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion. The subject land and assessment area both occur entirely within the Cumberland Plain Subregion.

3.2.2. Rivers, Streams and Estuaries

The subject land and assessment area occur within the Hawkesbury-Nepean catchment. Three mapped watercourses are present within the subject land; all of which are 1st order streams.

Several streams occur within the assessment area ranging from first to sixth order streams. In accordance with Appendix E of the BAM, a riparian corridor of 10 m, 20 m, 30 m, 40 m and 50 m on either side of the waterway applies to first, second, third, fourth and fifth, and sixth order streams, respectively.

3.2.3. Important Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia are present in the subject land and/or assessment area. One artificial dam is present that contains no fringing native vegetation and is regularly accessed by cattle.

3.2.4. Habitat Connectivity

The subject land does not form part of a regional biodiversity corridor, flyway for migratory species, or estuary. The native vegetation of the subject land has connectivity to areas of native and exotic vegetation in all directions surrounding the subject land for aerial fauna, with the subject land currently existing within a network of rural land consisting of open grasslands and scattered patches of remnant vegetation of varying sizes. It should be noted that mapping of adjoining areas under the CPCP as urban capable land will reduce connectivity through the broader Rosalind Park area, which will be limited to riparian corridors, and a corridor of native vegetation to be retained surrounding the outside of the broader proposal area as shown in **Figure 5.**

Habitat connectivity is limited to the west for ground-dwelling fauna due to the Hume Motorway and new residential development to the south of Menangle Road, and to the south by a quarry and gas plant (**Figure 2**).

3.2.5. Karsts, Caves, Crevices, Cliffs and Areas of Geological Significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the subject land; however, cliffs are identified in the south of the assessment area based on searches of available aerial imagery from NearMap, and topographic data available from SixMaps. Areas of cliffs within the assessment area are mapped by SixMaps along a highwall within the sand Quarry operated by Hi Quality Group located 300m to the south of the subject land. It is further noted that Menangle Creek to the south also contains sandstone cliffs that may contain crevices suitable for microchiropteran bats.

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value have been mapped within the subject land and/or assessment area.

3.2.7. NSW (Mitchell) Landscape

The subject land located entirely within the 'Cumberland Plain' NSW (Mitchell) Landscape, while the assessment area falls within the 'Cumberland Plain', 'Hawkesbury – Nepean Channels and Floodplains', 'Sydney Basin Diatremes' and 'Upper Nepean Gorges' NSW (Mitchell Landscapes (**Figure 2**).

3.2.8. Soil Hazard Features

Soil hazard features have not been identified as the proposal does not comprise a vegetation clearing proposal (i.e. it is a planning proposal).

3.3. Native Vegetation Cover

The native vegetation cover was determined through the use of GIS. To map native vegetation cover within the subject land and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with broadscale mapping prepared by DPE as part of the NSW State Vegetation Type Map (DPE 2023b). The native vegetation cover within the assessment area is shown in **Figure 2**. The assessment area is approximately 1052.82 ha in size, of which approximately 316 ha comprises native vegetation cover, which represents 30.01% of the assessment area. Therefore, the native vegetation cover value is assigned to the cover class of >30 – 70%.

The remaining land within the assessment area comprises cleared land, dams/lakes and exotic vegetation. No significant differences between the aerial photographs used in this assessment and the native vegetation cover shown in **Figure 2** have been identified.

4. Native Vegetation

4.1. Native Vegetation Extent

The native vegetation extent within the subject land is shown in **Figure 8**. Native vegetation extent has been calculated as occupying approximately 24.46 ha, which represents 93% of the subject land.

The remaining land within the subject land comprises a dam and exotic vegetation areas totalling an area of approximately 1.97 ha. In accordance with Section 5.1.1.5 of the BAM, the areas of exotic vegetation do not require further assessment, unless they provide habitat for species credit species.

No apparent visual differences between the aerial photographs used in this assessment and the native vegetation cover shown in **Figure 8** have been identified.

4.2. Plant Community Types

The vegetation analysis determined that the native vegetation within the subject land aligned with one PCT held within the BioNet Vegetation Classification database. **Table 5** provides a summary of the PCT identified within the subject land. The distribution of the PCT within the subject land is shown in **Figure 9**. Detailed descriptions of the PCT and the justification for PCT selection is provided in the sections below.

Table 5 Plant community types and extent within the subject land

PCT #	PCT Name	Subject Land (ha)
3319	Cumberland Shale Hills Woodland	24.46
-	Exotic Vegetation	1.82
-	Dam	0.14

4.2.1. PCT 3319 Cumberland Shale Hills Woodland

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 81.74%

TEC Status of PCT: Critically Endangered Ecological Community (CEEC)

TEC Status of onsite vegetation: Canopy and DNG zones of PCT 3319 are considered to conform to the TEC listing as detailed in ***Section 4.2.1.4*** and shown in **Figure 10**.

4.2.1.1. General Description

This community generally comprises a tall to very tall forest with an understorey of soft-leaved shrubs and small trees with a grassy ground layer. It occurs on rises and upper slopes of hills on shale clays between the south-west of the Cumberland Plain and to the west of Sydney, occurring most extensively in the Campbelltown, Camden , and Wollondilly LGAs. The canopy commonly includes *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum), and a sparse shrub to small tree layer, commonly including

Bursaria spinosa (Blackthorn) and *Acacia* spp., including *Acacia implexa* (Hickory Wattle) and *Acacia parramattensis* (Sydney Green Wattle).

4.2.1.2. Condition States

This PCT occurs as three condition classes (zones) within the subject land as detailed below.

i. Canopy Condition

This condition class occurs on the upper slopes of the subject land and includes all areas of the subject land with an intact canopy. The condition of the understorey varies across the subject land though in all areas is degraded and dominated by an exotic shrub layer. The ground layer is a mix of exotic and native forbs and grasses, with substantial areas with sparse cover due to dense shading from the exotic mid-storey.

The condition class occurs generally within the upper slopes of the subject land, and is limited to areas close to the northern and eastern boundaries, with the exception of two small patches in the south (**Figure 11**). The dominant canopy species are *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus moluccana*, with *Eucalyptus tereticornis* occurring less frequently. The community lacks a native shrub layer generally with the exception of some regrowth individuals of the canopy species and scattered occurrences of species such as *Acacia implexa* and *Bursaria spinosa*. Exotic species which dominate the layer include *Lantana camara* (Lantana), *Olea europaea* subsp. *cuspidata* (African Olive), and *Lycium ferocissimum* (African Boxthorn).

A native ground layer is present in many areas that includes the native grasses *Microlaena stipoides* var. *stipoides* (Weeping Grass) and *Sporobolus creber* (Slender Rat's Tail Grass), and native sedges *Carex inversa* (Knob Sedge) and *Cyperus gracilis* (Slender Flat-sedge),. Native forbs present in the ground layer include *Brunoniella australis* (Blue Trumpet), *Oxalis perennans*, *Dichondra repens* (Kidney Weed), and *Einadia nutans* subsp. *nutans*. Climbers found within this community include *Glycine tabacina* (Variable Glycine), *Glycine microphylla* (Small Glycine).

A high number of weeds occur within the ground layer which are common to dominant in some areas. Species include the grasses, *Ehrharta erecta* (Panic Veldtgrass), *Eragrostis curvula* (African Lovegrass), *Nassella neesiana* (Chilean Needle Grass), and *Paspalum dilatatum* (Paspalum), and forbs *Sida rhombifolia* (Paddys Lucerne) *Cirsium vulgare* (Spear Thistle), *Plantago lanceolata* (Lamb's Tongues), and *Senecio madagascariensis* (Fireweed).

An example of the canopy condition form of PCT 3319 is shown in **Photograph 1**.

Photograph 1 PCT 3319 canopy condition within the subject land

ii. DNG (Derived Native Grassland) Condition

This condition class occurs across the majority of the eastern half of the subject land, and as strips/patches in the north-west and north-east corners, and along the southern boundary (**Figure 11**). The class comprises open grassland areas in which native grass species are dominant or sub-dominant. Native species richness however is poor, due to past agricultural land use, and exotic grass species are either co-dominant or slightly dominant depending on the location.

This class lacks a canopy and native shrubs are generally absent with the exception of very scattered occurrences of *Acacia implexa* in areas adjacent to woodland patches comprising the Canopy class of the PCT. Native grasses present include *Themeda triandra* (Kangaroo Grass), *Panicum effusum* (Hairy Panic), *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Bothriochloa decipiens* var. *decipiens* (Pitted Bluegrass) and *Sporobolus creber* (Slender Rat's Tail Grass). Native herbs present include *Geranium solanderi* var. *solanderi* and *Rumex brownii* (Swamp Dock), as well as the native climber *Glycine tabacina* (Variable Glycine). Exotic species present include *Nassella neesiana* (Chilean Needle Grass), *Chloris gayana* (Rhodes Grass),*Setaria parviflora*, *Paspalum dilatatum* (Paspalum), *Eragrostis curviflora*, *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush), and *Verbena bonariensis* (Purpletop).

An example of the DNG condition form of PCT 3319 is shown in **Photograph 2**.

Photograph 2 DNG condition of PCT 3319

iii. LCG (Low Condition Grassland) Condition

These grassland areas are heavily dominated by exotic species due to intensive agricultural practices, however due to the presence of some scattered native grasses and forbs, including sporadic patches of grasses such as *Sporobolus creber* and *Microlaena stipoides* var. *stipoides*, these areas have been considered as a condition class/zone of PCT 3319 as a precautionary measure. Native forbs are generally absent from these areas and limited to sporadic occurrences of disturbance tolerant species such as *Geranium solanderi* and *Dichondra repens*, and small sedges such as *Carex inversa* also have scattered occurrences.

These open grassland areas are heavily grazed/slashed and dominated by exotic grasses including *Setaria parviflora*, *Paspalum dilatatum*, and *Cenchrus clandestinus* (Kikuyu). Other common exotic non-grass species present include *Verbena bonariensis* (Purpletop), *Sida rhombifolia* (Paddy's Lucerne), *Senecio madagascariensis* (Fireweed), and *Hypochaeris radicata* (Catsear).

An example of the LCG condition form of PCT 3319 is shown in **Photograph 3**.

Photograph 3 LCG condition PCT 3319 within the subject land

4.2.1.3. Justification of PCT Selection

Cumberland Ecology has extensive experience working in Western Sydney and botanical staff are familiar with TECs common in the area. As the vegetation occurs on shale soils and is dominated by *Eucalyptus crebra* and *Eucalyptus moluccana,* has a shrub layer including characteristic species such as *Bursaria spinosa,* and has a grassy ground layer comprising characteristic species such as *Themeda triandra*, *Chloris ventricosa* (Tall Windmill Grass), and *Aristida ramosa*, and is not within a floodplain, the vegetation present is consistent with the CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion (NSW Scientific Committee 2009b). This CEEC is only associated with two PCTs in the BioNet Vegetation Classification Database; PCT 3319 and PCT 3320.

PCT 3319 was selected due to the topography of the subject land where the PCT occurs comprising hills, whereas PCT 3320 is associated with low rises and flats of the shale plains of western Sydney. The species

Acacia implexa was further used to determine the presence of PCT 3319 over PCT 3320 which is associated more with other *Acacia* spp. such as *Acacia parramattensis* and *Acacia falcata* (Sickle Wattle).

4.2.1.4. Alignment with Threatened Ecological Communities

PCT 3319 is aligned with the CEEC Cumberland Plain Woodland. The occurrences of the Canopy and the DNG conditions of PCT 3319 are considered to conform to the listing of the CEEC under the BC Act due to their dominance or sub-dominance of characteristic species listed within the Final Determination for the community. The DNG condition has been determined to conform to the listed community as the Final Determination (ACT Government 1995, NSW Scientific Committee 2009b) has provision for a treeless form of the community, derived from past clearing of the woody component of the original woodland condition.

Areas which have been mapped as the LCG condition of PCT 3319 are not considered to conform to the listing of the community under the BC Act, however. The Final Determination states regarding the community that the *"ground cover is dominated by a diverse range of grasses including Aristida ramosa (Purple Wiregrass), A. vagans (Threeawn Speargrass), Cymbopogon refractus (Barbed Wire Grass), Dichelachne micrantha (Plumegrass), Echinopogon caespitosus (Forest Hedgehog Grass), Eragrostis leptostachya (Paddock Lovegrass), Microlaena stipoides (Weeping Grass), Paspalidium distans and Themeda australis (Kangaroo Grass), and with graminoids Carex inversa (Knob Sedge), Cyperus gracilis, Lomandra filiformis subsp. filiformis (Wattle Mat-rush) and L. multiflorus subsp. multiflorus (Many-flowered Mat-rush). The ground cover also includes a diversity of forbs such as Asperula conferta (Common Woodruff), Brunoniella australis (Blue Trumpet), Desmodium varians (Slender Tick Trefoil), Dianella longifolia (Blue Flax Lily), Dichondra repens (Kidney Weed), Opercularia diphylla, Oxalis perennans and Wahlenbergia gracilis (Australian Bluebell), as well as scramblers, Glycine spp. and Hardenbergia violacea (Native Sarsaparilla) and the fern Cheilanthes sieberi (Poison Rock Fern)"*. The areas mapped as the LCG condition are heavily dominated by exotic grass species, with few occurrences of native grasses, and only sporadic occurrences of native forbs. As such, it is not considered to conform to the description of a ground cover dominated by a diverse range of the native grasses listed as characteristic in the Final Determination.

4.2.2. Other Vegetation

Scattered within the east and west of the subject land are areas that are nearly completely dominated by the exotic grass *Cenchrus clandestinus* to the exclusion of nearly all other species (**Photograph 4**). There are also some areas along the eastern boundary that are heavily dominated by exotic woody species such as *Olea europaea* subsp. *cuspidata* and *Lantana camara* without occurrences of native species in the ground layer, and lacking a native canopy. These two different types of vegetation have been collectively mapped as Exotic Vegetation as shown in **Figure 9**.

The only other area not mapped as conforming to PCT 3319 is a dam in the centre of the subject land, which does not have any fringing native aquatic vegetation (**Photograph 5**).

Photograph 4 *Cenchrus clandestinus* dominated patch within the south of the subject land

Photograph 5 Dam in the centre of the subject land

4.3. Threatened Ecological Communities

The CEEC Cumberland Plain Woodland occurs within the subject land as described in ***Section 4.2.1.4***. The extent of this community is identified in **Table 6** below and shown in **Figure 10**.

Table 6 Threatened ecological communities within the subject land

TEC Name	BC Act Status	Associated PCT	Associated Vegetation Zone	Subject Land (ha)
Cumberland Plain Woodland in the Sydney Basin Bioregion	CEEC	3319: Cumberland shale hills woodland	1_Canopy	3.51
	CEEC	849: Cumberland shale plains woodland	2_DNG	13.84

4.4. Exotic Species

A total of 108 flora species were recorded from the subject land during the field surveys, of which 53 were native (49%) and 55 were exotic (51%).

Of the exotic species recorded from the subject land, 18 species are listed as High Threat Exotic species under the BAM, comprising 33% of all the exotic species recorded. High Threat Exotic species are defined in the BAM as vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.

A total of five (5) weeds recorded within the subject land are also listed under the *Biosecurity Act 2015*. This includes *Asparagus aethiopicus* (Asparagus Fern), *Nassella neesiana* (Chilean Needle Grass), *Lycium ferocissimum* (African Boxthorn), *Lantana camara*, and *Senecio madagascariensis* (Fireweed) which are all listed as State Priority weeds as well as Weeds of National Significance (WONS) (Department of the Environment 2014). An additional species is listed as a Regional Priority Weed under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022 (LLS: Greater Sydney 2021), and a further six are considered other weeds of regional concern.

4.5. Vegetation Integrity Assessment

The native vegetation identified within the subject land was assigned to vegetation zones based on PCTs and broad condition states. Patch sizes were subsequently assigned for each vegetation zone. The patch size for all vegetation zones is ≥100 ha. The extent of vegetation zones and patch size classes within the subject land are shown in **Figure 11**.

Each vegetation zone was assessed using survey plots/transects (see ***Section 2.3.2***) to determine the vegetation integrity score. Plot/transect data utilised within the BAM-C to determine the vegetation integrity score is provided in **Appendix A**. The vegetation integrity assessment utilised the benchmark data Version 1.2 held within the BAM-C (as derived from the BioNet Vegetation Classification). **Table 7** includes the vegetation integrity score of each condition of PCT 3319, as well as the associated area of impact and patch size class.

Table 7 Vegetation zones within the subject land

Vegetation Zone	PCT #	Management Zone	Condition Name	Area (ha)	Hollow-bearing Trees Present	Patch Size Class (ha)	Vegetation Integrity Score
1	3319	Complete Clearance	Canopy	3.51	Yes	>100	40.1 (Composition: 36.9 Structure: 55.6 Function: 31.5)
2	3319	Complete Clearance	DNG	13.84	No	>100	5.4 (Composition: 25.7 Structure: 42.2 Function: 0.1)
3	3319	Complete Clearance	LCG	7.11	No	>100	3.9 (Composition: 10.1 Structure: 28.7 Function: 0.2)

5. Threatened Species

5.1. Identifying Threatened Species for Assessment

The BAM-C generates a list of threatened species requiring assessment utilising a number of variables. The following criteria have been utilised to predict the threatened species requiring further assessment:

- IBRA subregion: Sydney Basin;
- Associated PCTs: 3319;
- Percent native vegetation cover in the assessment area: 30%;
- Patch size: ≥100 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAM-C generated a list of 29 ecosystem credit species and 29 species credit species. Ecosystem credit species and species credit species are assessed further in ***Section 5.2*** and ***Section 5.3***, respectively.

5.2. Ecosystem Credit Species

5.2.1. Overview

A total of 29 ecosystem credit species are predicted, including 14 dual credit species which are considered as ecosystem credit species for their foraging habitat.

Table 8 lists the predicted ecosystem credit species for the vegetation zones within the subject land, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. All but one ecosystem species have been retained in the assessment. The Glossy Black-Cockatoo was removed from further assessment due to a lack of habitat constraints present (refer to ***Section 5.2.2***).

Table 8 Ecosystem credit species

Common Name	Scientific Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment
Barking Owl (foraging)	*Ninox connivens*	3319	High	Yes
Black Falcon	*Falco subniger*	3319	Moderate	Yes
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	3319	Moderate	Yes
Black-necked Stork	*Ephippiorhynchus asiaticus*	3319	Moderate	Yes
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	3319	High	Yes
Diamond Firetail	*Stagonopleura guttata*	3319	Moderate	Yes
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	3319	Moderate	Yes

Common Name	Scientific Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	3319	High	Yes
Eastern Osprey (foraging)	*Pandion cristatus*	3319	Moderate	Yes
Gang-gang Cockatoo (foraging)	*Callocephalon fimbriatum*	3319	Moderate	Yes
Glossy Black-Cockatoo (foraging)	*Calyptorhynchus lathami*	3319	High	No
Grey-headed Flying-fox (foraging)	*Pteropus poliocephalus*	3319	High	Yes
Large Bent-winged Bat (foraging)	*Miniopterus orianae oceanensis*	3319	High	Yes
Little Bent-winged Bat (foraging)	*Miniopterus australis*	3319	High	Yes
Little Eagle (foraging)	*Hieraaetus morphnoides*	3319	Moderate	Yes
Little Lorikeet	*Glossopsitta pusilla*	3319	High	Yes
Masked Owl (foraging)	*Tyto novaehollandiae*	3319	High	Yes
Powerful Owl (foraging)	*Ninox strenua*	3319	High	Yes
Regent Honeyeater (foraging)	*Anthochaera phrygia*	3319	High	Yes
Scarlet Robin	*Petroica boodang*	3319	Moderate	Yes
Speckled Warbler	*Chthonicola sagittata*	3319	High	Yes
Spotted Harrier	*Circus assimilis*	3319	Moderate	Yes
Spotted-tailed Quoll	*Dasyurus maculatus*	3319	High	Yes
Square-tailed Kite (foraging)	*Lophoictinia isura*	3319	Moderate	Yes
Swift Parrot (foraging)	*Lathamus discolor*	3319	Moderate	Yes
Varied Sittella	*Daphoenositta chrysoptera*	3319	Moderate	Yes
White-bellied Sea-Eagle (foraging)	*Haliaeetus leucogaster*	3319	High	Yes
White-throated Needletail	*Hirundapus caudacutus*	3319	High	Yes
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	3319	High	Yes

5.2.2. Justification for Removal

The Glossy Black-Cockatoo is the only ecosystem credit species removed from the assessment. This species has been removed due to a lack of habitat constraints identified in the TBDC and BAM-C being present within the subject land. The BAM-C and TBDC identifies the species' habitat constraint as the presence of Allocasuarina and Casuarina species. No Casuarina or Allocasuarina species are present within the subject land and therefore this species has been appropriately removed from further assessment.

5.3. Species Credit Species

5.3.1. Overview

A total of 29 species credit species are predicted, including 12 dual credit species which are considered as species credit species for their breeding or important habitat.

Table 9 lists the predicted species credit species for the vegetation zones within the subject land, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. Justification is provided within this table for species that have been removed from the assessment in accordance with Steps 1-3 of Section 5.2 of the BAM. All species not removed from consideration (i.e. retained in the assessment) are by default candidate species credit species that require further assessment.

Of the assessed predicted species, 13 species credit species have been retained for further assessment.

Table 9 Predicted species credit species

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
Flora					
Acacia pubescens	Downy Wattle	3319	High	Yes	-
Dillwynia tenuifolia		3319	Moderate	No	The distribution of this species is from Windsor and Penrith east to Dean Park. Species has also been recorded in the Liverpool, Baulkham Hills and Blue Mountains LGAs. Species prefers scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays (EHG 2019a). The subject land has been highly modified as a result of past land uses and vegetation present is not preferred by the species. The subject land is also not within any of the LGAs of known populations. Therefore, the microhabitats within the subject land are considered too degraded for this species to occur.
Eucalyptus benthamii	Camden White Gum	3319	High	Yes	-
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	3319	Moderate	Yes	-
Marsdenia viridiflora subsp. viridiflora - endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown,	3319	Moderate	Yes	-

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
	Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas				
Pultenaea parviflora		3319	Moderate	No	The distribution of this species is from Windsor and Penrith east to Dean Park. Species has also been recorded in Kemps Creek and Wilberforce. Species prefers scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays (EHG 2019b). The subject land has been highly modified as a result of past land uses and vegetation present is not preferred by the species. The subject land is also not within the vicinity of known populations. Therefore, the microhabitats within the subject land are considered too degraded for this species to occur.
Pimelea spicata	Spiked Rice-flower	3319	High	Yes	-
Fauna					
Anthochaera phrygia	Regent Honeyeater	3319	High	No	Habitat constraint is absent from the subject land - i.e. the subject land does not lie within Mapped Important Areas for this species. In NSW this species is known to breed in only two locations; at Capertee Valley and the Bundarra-Barraba region (NSW Government 2020a). In NSW, the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. The subject land is remote from these two locations and the likelihood of this species occurring is low.

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
Burhinus grallarius	Bush Stone-curlew	3319	High	No	This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber (NSW Government 2017a). Potential habitat within the subject land is limited to degraded areas of PCT 3319 that lack a sparse grassy ground layer due to heavy infestations of Boxthorn, African Olive and Lantana. As such, the habitat present is not considered suitable for this species as the microhabitats within the subject land are considered to be too degraded. It is also worth noting that the species has not been recorded in the LGA in the last 30 years.
Callocephalon fimbriatum	Gang-gang Cockatoo	3319	High	No	The subject land does not constitute breeding habitat for this species as it breeds in high tree-hollows in the moist eucalyptus forests of the mountainous Great Divide (BirdLife Australia 2015). Although the subject land contains suitable tree hollows, the subject land does not include moist eucalyptus forests nor is it within mountainous areas of the Great Divide. The potential non-breeding habitat within the subject land occurs in a highly cleared rural landscape and is highly fragmented and disturbed. Therefore, the microhabitats within the subject land are considered to be too degraded for this species to occur.
Calyptorhynchus lathami	Glossy Black-Cockatoo	3319	High	No	Although the subject land contains suitable tree hollows for this species, the Glossy Black-Cockatoo prefers more rugged areas where extensive clearing has not occurred (DPE 2022b). The subject land and surrounding areas have been extensively cleared and therefore the microhabitats within the subject land are considered to be too degraded for this species to occur.
Cercartetus nanus	Eastern Pygmy-possum	3319	High	No	This species relies on a shrubby understorey and feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes (NSW Government 2017b). The subject land does not contain bottlebrushes or

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
					banksias, and only eucalypts are present. The subject land contains a shrubby understorey; however, this understorey has only small numbers of eucalypts amongst a weed dominated shrub layer comprised mainly of Lantana, Boxthorn and African Olive. The subject land occurs in a highly cleared rural landscape that has undergone extensive disturbance and the microhabitats within the subject land are considered to be too degraded for this species to occur. It is also noted that the species' nearest record to the subject land since 1980 is approximately 4.5 km to the southeast along the edges of Dharawal National Park (EHG 2023a), which the subject land has very limited connectivity to.
Chalinolobus dwyeri	Large-eared Pied Bat	3319	Very High	Yes	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	3319	High	No	Breeding habitat for this species is defined by the TBDC as "live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period. Due to the similarities in nest structure and use of the same nests by White-bellied Sea Eagles and Wedge-tailed Eagles, where a nest is observed without a bird present, searches for prey remains/feathers below the structure should be undertaken." No suitable trees have a large stick nests present within the subject land, based on the habitat assessment undertaken in the subject land. As such, the microhabitats present are considered too degraded.
Hieraaetus morphnoides	Little Eagle	3319	Moderate	No	Breeding habitat for this species is defined by the TBDC as "live (occasionally dead) large old trees within suitable vegetation AND the

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
					presence of a male and female; or any adult with nesting material; or an individual on a large stick nest in the top half of the tree canopy; or pairs displaying (soaring, diving, engaging in chases, or a male observed calling in flight with a female begging from tree)." No individuals were observed and no trees contain large stick nests. As such, the microhabitats present are considered too degraded.
Lathamus discolor	Swift Parrot	3319	Moderate	No	Habitat constraint absent from the subject land - i.e. subject land does not lie within Mapped Important Areas.
Litoria aurea	Green and Golden Bell Frog	3319	High	No	Microhabitats within the subject land are degraded, such that the species is unlikely to use the habitat. The only dam present within the subject land occurs in a highly cleared agricultural landscape that has undergone disturbance. No native fringing vegetation occurs around the farm dam, thereby rendering it unsuitable as habitat.
Lophoictinia isura	Square-tailed Kite	3319	Moderate	No	The TBDC defines breeding habitat for this species as large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. No large stick nests were observed in the subject land. The subject land occurs in a highly cleared rural landscape and the majority of the potentially suitable habitat has undergone large degrees of disturbance. This species Is a specialist hunter of passerine birds, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage (NSW Government 2017c). Due to the high degree of degradation and general lack of a native shrub layer, the subject land is unlikely to support prey populations that would support this species and it is unlikely to occur. Therefore, the microhabitats within the

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
					subject land are considered to be too degraded for this species to occur.
Meridolum corneovirens	Cumberland Plain Land Snail	3319	High	Yes	-
Miniopterus australis	Little Bent-winged Bat	3319	Very High	No	Habitat constraint absent from the subject land - i.e. subject land does not contain caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding.
Miniopterus orianae oceanensis	Large Bent-winged Bat	3319	Very High	No	Habitat constraint absent from the subject land - i.e. subject land does not contain caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding.
Myotis macropus	Southern Myotis	3319	High	Yes	-
Ninox connivens	Barking Owl	3319	High	Yes	-
Ninox strenua	Powerful Owl	3319	High	Yes	-
Pandion cristatus	Eastern Osprey	3319	Moderate	No	Habitat constraint for this species as defined by the TBDC is the presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting. No stick-nests

Scientific Name	Common Name	Relevant PCT	Sensitivity to Gain Class	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of BAM
					suitable for this species are present within the subject land, therefore the species' habitat constraint is not present.
Petaurus norfolcensis	Squirrel Glider	3319	High	Yes	
Phascolarctos cinereus	Koala	3319	High	Yes	
Pteropus poliocephalus	Grey-headed Flying-fox	3319	High	No	Habitat constraints constraint absent from the subject land - i.e. no breeding camps are present within or adjacent to the subject land.
Tyto novaehollandiae	Masked Owl	3319	High	Yes	

5.3.2. Presence of Candidate Species Credit Species

5.3.2.1. Surveys

A list of the candidate species credit species retained in this assessment and surveyed for within the subject land, including an identification of whether they were recorded in the subject land, is provided in **Table 10** below.

Details on the methodology of targeted surveys undertaken for the candidate species credit species for assessment are included in ***Section 2.4.2*** (flora) and ***Section 2.5.2*** (fauna).

Table 10 Species credit species surveyed for within the subject land

Species	Present in Subject Land	Method of Identification	Biodiversity Risk Weighting
Acacia pubescens	No	Survey	2
Eucalyptus benthamii	No	Survey	2
Grevillea juniperina subsp. *juniperina*	No	Survey	1.5
Pimelea spicata	No	Survey	2

5.3.2.2. Expert Report

This assessment has not utilised any expert reports.

5.3.2.3. Candidate Species Occurrence

Table 11 lists the species credit species assessed as present within the subject land for this assessment, based on species being assumed present due to the presence of habitat constraints recorded during surveys. Although the species listed below have been assumed as present for this preliminary BDAR, targeted surveys can be undertaken in the future for a formal BDAR which may result in their removal from further consideration if a species is not detected.

Table 11 Candidate species within the subject land

Species	Method of Identification	Biodiversity Risk Weighting
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Assumed present	3.00
Marsdenia viridiflora subsp. *viridiflora* – endangered population	Assumed present	2.00
Cumberland Plain Land Snail (*Meridolum corneovirens)*	Assumed present	2.00
Southern Myotis (*Myotis macropus)*	Assumed present	2.00
Barking Owl (*Ninox connivens*)	Assumed present	2.00
Powerful Owl (*Ninox strenua*)	Assumed present	2.00
Squirrel Glider (*Petaurus norfolcensis*)	Assumed present	2.00

Species	Method of Identification	Biodiversity Risk Weighting
Koala (*Phascolarctos cinereus*)	Assumed present	2.00
Masked Owl (*Tyto novaehollandiae*)	Assumed present	2.00

5.3.2.4. Extent of Habitat

The following section outlines the extent and condition of habitat used for the creation of species polygons for candidate species assumed present or recorded within the subject land. The habitat condition and area for the species polygons is provided in **Table 12** below, whilst the species polygons area shown in **Figure 12.**

i. Large-eared Pied Bat

The Large-eared Pied Bat has been assumed as present within the subject land. Habitat for the Large-eared Pied Bat is noted in the TBDC as "*within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels*". Cliffs have been mapped within 2 kms of the subject land.

Nevertheless, it is also noted in the TBDC that:

"*The species is a full species credit because it cannot be reliably predicted to occur on a site based on vegetation and other landscape features (either foraging or breeding*").

Subsequently, as the species has been assumed as present within the subject land due to cliffs being present within 2 kms, it has been assessed as a species credit species, but would only be considered to use the woodland habitat (PCT 3319_Canopy) within the subject land only for foraging purposes as the breeding habitat for the Large-eared Pied Bat is restricted to PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. None of these features are within the subject land, or within 100m of the subject land.

The species polygon for the Large-eared Pied Bat has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Large-eared Pied Bat in the TBDC; and
- Create a shape file for the relevant vegetation zones (using GIS) to create the extent of the final species polygon.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

ii. Marsdenia viridiflora subsp. viridiflora – endangered population

Marsdenia viridiflora subsp. *viridiflora* – endangered population has been assumed as present within the subject land. The TBDC does not identify any habitat constraints for the species; however, the species' profile identifies that the species grows in vine thickets and open shale woodland. As such, suitable habitat for this species is restricted areas of open shale woodland that could support vine thickets (i.e. PCT 3319_Canopy).

The species polygon for this species has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with *Marsdenia viridiflora* subsp. *viridiflora* in the TBDC; and
- Create a shape file for the relevant vegetation zones (using GIS) to create the extent of the final species polygon.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

iii. Cumberland Plain Land Snail

The Cumberland Plain Land Snail has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Cumberland Plain Land Snail has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Cumberland Plain Land Snail in the TBDC;
- Create a shape file for the relevant vegetation zones (using GIS) to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Cumberland Plain Land Snail. It should be noted that only vegetation zone 1 (PCT 3319_Canopy) is considered to comprise suitable habitat for the species as all other vegetation zones comprise grassland forms of PCT 3319 that lack leaf litter and regularly slashed, and are not suitable for the species.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

iv. Southern Myotis

The Southern Myotis has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Southern Myotis has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Creating a 200 m buffer around a medium to large permanent creeks, rivers, lakes or other waterways (i.e. with pools/stretches 3 m or wider);
- Identify the PCTs/vegetation zones associated with the Southern Myotis in the TBDC; and

- Clip the polygons for the relevant vegetation zones (using GIS) to the buffer polygons to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Southern Myotis.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon for Southern Myotis is shown in **Figure 12.**

v. Barking Owl

The Barking Owl has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Barking Owl has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Barking Owl in the TBDC;
- Creating a 100m buffer around known nest trees; and
- Clip the polygons for the relevant vegetation zones (using GIS) to the buffer polygons to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Barking Owl. It should be noted that the species was not surveyed for and therefore no known nests trees have been identified. As a precaution, all areas of vegetation zone 1 (PCT 3319_Canopy) were assumed to comprise 'known nest trees' for the species and a 100m buffer was place around the entire vegetation zone.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

vi. Powerful Owl

The Powerful Owl has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Powerful Owl has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Powerful Owl in the TBDC;
- Creating a 100m buffer around known nest trees; and
- Clip the polygons for the relevant vegetation zones (using GIS) to the buffer polygons to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Powerful Owl. It should be noted that the species was not surveyed for and therefore no known nests trees have been identified. As a precaution, all areas of vegetation zone 1 (PCT 3319_Canopy) were assumed to comprise 'known nest trees' for the species and a 100m buffer was place around the entire vegetation zone.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

vii. Squirrel Glider

The Squirrel Glider has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Squirrel Glider has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Squirrel Glider in the TBDC;
- Create a shape file for the relevant vegetation zones (using GIS) to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Squirrel Glider. It should be noted that only vegetation zone 1 (PCT 3319_Canopy) is considered to comprise suitable habitat for the species as all other vegetation zones comprise grassland forms of PCT 3319 that lack large old trees containing hollows, and are not suitable for the species.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

viii. Koala

The Koala has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Koala has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Koala in the TBDC;
- Create a shape file for the relevant vegetation zones (using GIS) to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Koala. It should be noted that only vegetation zone 1 (PCT

3319_Canopy) is considered to comprise suitable habitat for the species as all other vegetation zones comprise grassland forms of PCT 3319 that lack feed trees and suitable refuge, and are not suitable for the species.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

ix. Masked Owl

The Masked Owl has been assumed as present within the subject land. Therefore, a species polygon has been created for this assessment for the purposes of calculating the impacts on the species in terms of species credits.

The species polygon for the Masked Owl has been created in accordance with the habitat constraints held within the TBDC, and includes the following steps:

- Identify the PCTs/vegetation zones associated with the Masked Owl in the TBDC;
- Creating a 100m buffer around known nest trees; and
- Clip the polygons for the relevant vegetation zones (using GIS) to the buffer polygons to create the extent of the final species polygon.

The species polygon was then used to calculate the area of each of the vegetation zones impacted for the purpose of calculating species credits for the Masked Owl. It should be noted that the species was not surveyed for and therefore no known nests trees have been identified. As a precaution, all areas of vegetation zone 1 (PCT 3319_Canopy) were assumed to comprise 'known nest trees' for the species and a 100m buffer was place around the entire vegetation zone.

The habitat condition and area for the species polygon is provided in **Table 12**, whilst the species polygon area is shown in **Figure 12.**

Table 12 Details of species polygons for candidate species credit species

Species Credit Species	Vegetation Zone	Habitat Condition (Vegetation Integrity Loss)	Approximate Area of Habitat Loss (ha)
Large-eared Pied Bat	1. 3319_Canopy	40.1	3.51
Marsdenia viridiflora subsp. viridiflora	1. 3319_Canopy	40.1	3.51
Cumberland Plain Land Snail	1. 3319_Canopy	40.1	3.51
Southern Myotis	1. 3319_Canopy	40.1	0.33
	2. 3319_DNG	5.4	8.41
	3. 3319_LCG	3.9	5.28
Barking Owl	1. 3319_Canopy	40.1	3.51
	2. 3319_DNG	5.4	9.54
	3. 3319_LCG	3.9	3.21

Species Credit Species	Vegetation Zone	Habitat Condition (Vegetation Integrity Loss)	Approximate Area of Habitat Loss (ha)
Powerful Owl	1. 3319_Canopy	40.1	3.51
	2. 3319_DNG	5.4	9.54
	3. 3319_LCG	3.9	3.21
Squirrel Glider	1. 3319_Canopy	40.1	3.51
Koala	1. 3319_Canopy	40.1	3.51
Masked Owl	1. 3319_Canopy	40.1	3.51
	2. 3319_DNG	5.4	9.54
	3. 3319_LCG	3.9	3.21

5.4. Prescribed Impacts

Prescribed impacts are identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017* (BC Regulation). Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development on the habitat of threatened species or ecological communities associated with:
    - karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
    - human-made structures;
    - non-native vegetation;
- Development on areas connecting threatened species habitat, such as movement corridors;
- Development on water quality, water bodies and hydrological processes that sustain threatened species and TECs (including from subsidence or upsidence from underground mining);
- Wind turbine strikes on protected animals; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

An assessment of the relevance of these prescribed impacts to the proposal is provided in **Table 13**. The location of prescribed impacts is shown in **Figure 13**.

Table 13 Relevance of prescribed impacts

Prescribed Impact	Relevance to the Proposal	Associated Threatened Entities
Habitat associated with karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	Not relevant. Features are not present within the subject land.	-

Prescribed Impact	Relevance to the Proposal	Associated Threatened Entities
Habitat associated with human-made structures	Not relevant. Features are not present within the subject land.	-
Habitat associated with non-native vegetation	Not relevant. Non-native vegetation occurring within the subject land is in the form of exotic grassland and patches of exotic shrubs generally lacking suitable habitat features for threatened fauna utilisation. All areas of non-native vegetation have been assigned to a PCT and will be offset as required by the BAM-C.	-
Habitat connectivity	Relevant. The subject land contains vegetation that has connectivity to vegetation that extends beyond the subject land. Although all of the subject land will be entirely cleared, an area of Shale Hills Woodland will be retained within the study area that will be conserved. This areas has connectivity to the north. As such, the proposal will further reduce habitat available, but is not considered likely to significantly impact habitat connectivity due to the vegetation proposed to be retained as well as the highly fragmented nature of the vegetation currently present. Further to this, nearly all threatened fauna species that may potentially utilise the subject land are highly mobile and able to access fragmented habitats.	Cumberland Plain Woodland, ecosystem credit species and species credit species
Waterbodies, water quality and hydrological processes	Relevant. The subject land contains a dam as well as three mapped unnamed waterways that lack a defined top-of-bank. The unnamed waterways are generally indistinguishable from surrounding grassland and only have water after periods of heavy rain. The Dam present lacks fringing native vegetation and is highly degraded as a result of frequent cattle access. None of these waterbodies are considered suitable for threatened species. Therefore, the proposal is unlikely to impact on waterbodies that provide habitat for threatened species and any future development the proposal facilitates will include a water management strategy to ensure the engineered	Southern Myotis

Prescribed Impact	Relevance to the Proposal	Associated Threatened Entities
	hydrological processes are consistent with the relevant standards. All native vegetation around the waterbodies will be offset appropriately as required by the BAM. Further to this, a Dewatering Plan will be prepared for any future DA (as a condition of consent) that removes the dam present (see ***Section 7.3.7***), to ensure that any relocated fauna (non-threatened) to nearby habitat that has similar (or better) water quality to what they were captured from.	
Wind turbine strikes	Not relevant. Proposal does not comprise a wind farm development.	-
Vehicle strikes	Relevant. The proposal will result in the creation of access roads, thereby increasing future vehicle use within the development footprint and thereby increasing the potential of vehicle strike. No relevant literature is available to enable a prediction of the increase in vehicle strikes that may occur, nevertheless, the impacts of vehicle strike are considered likely to be minor and are unlikely to significantly impact on any threatened species.	Ecosystem credit species and species credit species

5.5. Koala Assessment

The approved Campbelltown Comprehensive Koala Plan of Management (CCKPoM) applies to the subject land. As required by Section 6.3.1 of the CCKPoM, a Vegetation Assessment Report (VAR) will need to be prepared and submitted to Council to support the proposal to facilitate the rezoning of the study area. A VAR has not been completed to date, but is anticipated to be submitted to Council in 2023.

It is noted that the subject land includes areas mapped as 'Potential Koala Habitat' under the CCKPoM; however, the subject land does not form part of a Koala Corridor proposed for the larger Rosalind Park area, nor is it mapped as Koala Habitat under the CPCP. Assuming that the Koala Corridor proposed for the larger Rosalind Park area is adopted and implemented generally in accordance with the recommendations of the CCKPoM and *Advice on the protection of the Campbelltown Koala population: Koala Independent Expert Panel* (Chief Scientist & Engineer 2020) (the 'Chief Scientist & Engineer Report'), then koalas would be restricted from accessing the subject land as the Koala Corridor would be entirely fenced.

6. Avoid and Minimise Impacts

6.1. Avoid and Minimise Direct and Indirect Impacts on Native Vegetation and Habitat

This section includes demonstration of efforts to avoid and minimise impacts on biodiversity values identified within the subject land, study area and wider Rosalind Park site, which includes assessment of direct, indirect and prescribed impacts. Any mentioning of the development footprint within this chapter is synonymous with the subject land.

Section 7.1.1 of the BAM states that knowledge of biodiversity values should inform the decision-making process relating to the location of a project, as well as the project's design. Measures to avoid or minimise impacts from clearing native vegetation and threatened species habitat can include locating the project in areas lacking or with low biodiversity values, avoiding areas mapped on the important habitat map, or avoiding native vegetation that is a TEC.

6.1.1. Wider Rosalind Park Planning Proposal

The overall rezoning strategy for the wider Rosalind Park site (refer to **Figure 5**) was largely constrained by the draft and final CPCP mapping, that identified areas of land that would become Certified – Urban Capable (i.e. developable land) and Avoided Land (i.e. conservation land). In order for the overall rezoning strategy to be consistent with the final CPCP mapping, the largest areas of native vegetation with the most connectivity to offsite habitat are proposed to be zoned (or are already zoned) for conservation. This includes a dedicated Koala Corridor along Menangle Creek to the east and south that will result in a 40 ha corridor that has a minimum overall width of 402 m in accordance with the recommendations of the CKPOM and the Chief Scientist & Engineer Report. In addition to the Koala Corridor, additional areas of TEC vegetation and threatened species habitat are proposed to be zoned for conservation, including areas mapped as 'Certified – Urban Capable Land' under the CPCP, which could otherwise be developed. With consideration of the above, the proposed rezoning of the wider Rosalind Park area is considered to be consistent with Section 7.1.1 of the BAM as areas proposed to be zoned for development have attempted to avoid areas of highest biodiversity as far as practicable while still achieving an overall development that meets the needs of the region. The proposed rezoning of the wider Rosalind Park area is shown in **Figure 5**.

6.1.2. Zoning of the Study Area and Subject Land

The study area and subject land make up a relatively small portion of the larger Rosalind Park site currently proposed to be rezoned. No areas of the study area are mapped under the final CPCP, hence the reason for a separate BDAR for this area. In order for the proposed re-zoning of the study area to be consistent with Section 7.1.1 of the BAM, a relatively large portion of the woodland condition TEC – which is the condition associated with the highest biodiversity value - within the study area is proposed to be avoided and zoned for environmental conservation. The area to be conserved is located in the north of the study area which includes 1.59 ha of PCT 3319_Canopy that conforms to the BC Act listed CEEC Cumberland Plain Woodland. An additional 0.31 ha of PCT 3319_DNG will also be rezoned for conservation. **Table 14** below demonstrates the total area of the CEEC Cumberland Plain Woodland within the study area to be impacted, avoided and % avoided by the proposal.

Additional areas for avoidance/retention were investigated; however, opportunities for further avoidance are highly constrained by the topography of the study area, in that significant cut and fill works are required in order to facilitate future development that is consistent with the overall Rosaland Park Structure Plan (**Figure 5**). All areas of the study area proposed to be zoned for conservation will be managed under a VMP in perpetuity (see ***Section 7.3.9***).

Table 14 Total area of vegetation proposed to be retained vs impacted

PCT	Total Area in Study Area (ha)	Total Area Cleared in the Study Area (ha)	Total Area Avoided in the Study Area (ha)	% Avoided in the Study Area
3319_Canopy	5.10	3.51	1.59	31
3319_DNG	14.15	13.84	0.31	2

6.2. Avoid and Minimise Prescribed Impacts

Three prescribed impacts have been identified for the proposal: "Habitat connectivity", "Water quality, water bodies and hydrological processes", and "Vehicle strike". Measures to avoid and minimise these prescribed impacts are considered individually below and a summary table is provided in **Table 15**.

6.2.1. Habitat Connectivity

The vegetation in the subject land consists of woodland areas amongst a rural landscape that has been subject to significant historical clearing. The woodland areas provide connectivity to areas off-site, primarily to the north, that are around existing homesteads that largely comprise remnant trees and planted vegetation that lack a native shrub or ground layer. Within the wider landscape, the habitat connectivity of the subject land is considered to be minor due to its generally degraded condition and isolation from other significant tracts of vegetation. It is considered that the vegetation forms more of a 'stepping stone' habitat connectivity for mobile species accessing areas between Menangle Creek to the east and areas of the Nepean River to the west that are separated by the Hume Motorway. As such, the removal of all vegetation within the subject land is not considered likely to significantly limit connectivity for threatened species, but does reduce the total area of habitat available in the region.

As identified in ***Section 6.1.2***, areas of woodland vegetation within the study area will be retained, zoned for conservation and managed in perpetuity under a VMP. The retention and ongoing management of this area ensures that 'stepping stone' habitat for any mobile threatened species considered to have the potential to occur will still be present. Therefore, the removal of vegetation within the subject land is not considered to significantly reduce habitat connectivity for threatened species known to occur within the region, but will rather result in a reduction of 'stepping stone' habitat available.

6.2.2. Water Quality, Water Bodies and Hydrological Processes

The subject land contains a dam as well as three mapped unnamed waterways that lack a defined top-of-bank. The unnamed waterways are generally indistinguishable from surrounding grassland and only have water after

periods of heavy rain that drains underneath Medhurst Road. The Dam present lacks fringing native vegetation and is highly degraded as a result of frequent cattle access. None of these waterbodies are considered suitable for threatened species.

As identified in ***Section 6.1.2***, opportunities to avoid impacts is limited due the topography of the subject land and the required cut and fill works needed to provide a development consistent with the Rosalind Park Structure Plan. Although all waterbodies will be removed and the hydrological processes of the subject land will be altered, the current hydrological processes have already been altered as a result of past land clearing and agricultural uses (including the construction of an artificial dam). Further to this, any future development the proposal facilitates will include a water management strategy to ensure the engineered hydrological processes are consistent with the relevant standards, including any water quality standards.

All native vegetation around the waterbodies will be offset appropriately as required by the BAM. Further to this, a Dewatering Plan will be prepared for any future DA (as a condition of consent) that removes the dam present (see ***Section 7.3.7***). The Dewatering Plan will ensure that any relocated fauna (non-threatened) to nearby habitat that has similar (or better) water quality to what they were captured from

With consideration of the above, the proposal is unlikely to impact on water quality, waterbodies or hydrological processes such that a threatened species would be significantly impacted.

6.2.3. Vehicle Strike

There is limited scope to limit the prescribed impact of vehicle strike, however the anticipated residential area speed limit of 50 km/hr is expected to appropriately minimise the potential impacts of vehicle strike. Any vehicle strikes on native fauna, in particular threatened species, associated with proposal are considered to be minimal, especially when considering that the existing Hume Motorway located to the west currently poses the biggest vehicle strike risk.

Table 15 Summary of options considered for the project to avoid and minimise impacts on biodiversity

Action	Adopted (Yes/No/ In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
Implementation of a suite of mitigation measures	Yes	To minimise the impacts on biodiversity, a suite of mitigation measures will be implemented such as weed management, tree protection measures, pre-clearance surveys, and implementation of a VMP.	Pre and post construction and during operation phase	Proponent and consultant team	Minimise impacts on biodiversity, including areas of avoidance/ retention
Partial development of the study area to avoid/ minimise	Yes	To avoid/minimise impacts on high biodiversity values, such as areas comprising TECs, the development footprint	Pre and post construction and during operation phase	Proponent and consultant team	Increased retention of TECs, to minimise impacts on

Action	Adopted (Yes/No/ In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
impacts on biodiversity and achieve greater tree retention		has been modified to retain an area of native vegetation, comprising Cumberland Plain Woodland.			areas of high biodiversity values
'Do-nothing' option to avoid all impacts on biodiversity	No	The do-nothing option for would maintain current native vegetation cover present but would not enable development of the subject land as per the Rosalind Park Structure Plan. Under a no-go option, the current vegetation would remain. However, there would be no obligation to manage and improve the vegetation on site and the housing needs of the area would not be met. Therefore, over time, there is potential for the existing extent of the TECs to be reduced and for the native vegetation to be degraded further than its currently degraded condition.	-	-	-
Consideration of alternative sites and layouts for the project within the study area	Yes	Several layout options and alternative locations within the study area and wider Rosalind Park area have been considered as part of the design phase. The final layout has been selected to maximise the retention of TECs, whilst still achieving a feasible development with consideration of the cut-and-fill works required.	During design and approval	Proponent and consultant team	Maximise retention of TECs in the study area, whilst achieving a feasible project design.

7. Assessment of Impacts

7.1. Impacts on Native Vegetation and Habitat

7.1.1. Direct Impacts

The direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the subject land, including the removal of 69 hollow-bearing trees. **Table 16** and **Table 17** identify the extent of impacts to vegetation and threatened species within the subject land. The extent of direct impacts to vegetation is anticipated to be restricted to the subject land and no direct impacts on adjoining areas of vegetation located outside of the subject land are considered likely to occur.

Table 16 Extent of vegetation impacts within the subject land

Vegetation Zone	PCT #	PCT Name	BC Act Status	Area in the Subject Land (ha)
3319_Canopy	3319	Cumberland Shale Hills Woodland	CEEC	3.51
3319_DNG	3319	Cumberland Shale Hills Woodland	CEEC	13.84
3319_LCG	3319	Cumberland Shale Hills Woodland	Not listed	7.11
Exotic Vegetation	-	-	Not listed	1.82
Dams	-	-	Not listed	0.14

Table 17 Extent of threatened species impacts within the subject land

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Area (ha)
Marsdenia viridiflora subsp. viridiflora - endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E	-	3.51
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	3.51
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	3.51
Myotis macropus	Southern Myotis	V	-	3.51
Ninox connivens	Barking Owl	V	-	3.51
Ninox strenua	Powerful Owl	V	-	3.51
Petaurus norfolcensis	Squirrel Glider	V	-	3.51
Phascolarctos cinereus	Koala	E	E	3.51
Tyto novaehollandiae	Masked Owl	V	-	3.51

E=Endangered, V = Vulnerable

7.1.2. Change in Vegetation Integrity Score

Table 18 details the change in vegetation integrity score for each of the native vegetation zones within the subject land.

Table 18 Changes in vegetation integrity score

Vegetation Zone	PCT#	Management Zone	Area (ha)	Current VI Score	Future VI Score	Change in VI Score
3319_Canopy	3319	Complete Clearance	3.51	40.1	0	-40.1
3319_DNG	3319	Complete Clearance	13.84	5.4	0	-5.4
3319_LCG	3319	Complete Clearance	7.11	3.9	0	-3.9

7.1.3. Indirect Impacts

Table 19 outlines the indirect impacts to native vegetation and habitat. No limitations to the assessment of indirect impacts have been identified. As all vegetation within the subject land is proposed to be removed, the indirect impacts of the proposal are not considered likely to be significant and are likely to be able to be managed appropriately. It is further noted that all areas of vegetation within the study area proposed to be retained are proposed to be managed under a VMP in perpetuity.

Mitigation measures to be implemented to manage the indirect impacts of the proposal identified below are presented in ***Section 7.3***. No indirect impact zones have been identified for the purpose of this assessment.

Table 19 Indirect impacts of the proposal

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Construction activities may result in inadvertent impacts on retained vegetation located outside of the subject land, such as increase sedimentation.	Retained vegetation adjacent to the subject land.	Short term (during construction)	Ecosystem credit species and species credit species	Reduction in the condition of available habitat retained in areas adjacent to the subject land.
Reduced viability of adjacent	Modification of vegetation extent within the subject land will increase edge effects on	Retained vegetation adjacent to	Potential long-term	Ecosystem credit species and species credit species	Reduction in the condition of available habitat retained in

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
habitat due to edge effects	retained vegetation in the study area.	the subject land.			areas adjacent to the subject land.
Reduced viability of adjacent habitat due to noise, dust or light spill	The construction activities associated with the proposal are likely to increase the noise, dust and light above current levels within the subject land. These impacts will reduce after construction is complete, however ongoing use of the facility, lighting and vehicle traffic will result in a long term increase in noise and light relative to current levels.	Retained vegetation adjacent to the subject land.	Short term (during construction) and long term	Ecosystem credit species and species credit species	Disruption of fauna habitat usage during construction and in the long term.
Transport of weeds and pathogens from the site to adjacent vegetation	A number of weeds are known to occur within the subject land and may be inadvertently spread to retained vegetation outside of the subject land.	Retained vegetation adjacent to the subject land.	Potential long-term	Ecosystem credit species and species credit species	Disruption of fauna habitat usage during construction and in the long term.
Increased risk of starvation or exposure, and loss of shade or shelter	The proposal will result in the removal of vegetation that provides foraging and sheltering habitat	Retained vegetation adjacent to the subject land	Long-term	Ecosystem credit species and species credit species	Disruption of fauna habitat usage during construction and in the long term.
Loss of breeding habitats	The proposal will result in the removal of 69 hollow-bearing trees. It is noted	Vegetation Zone 3319_Canopy.	Long-term	Hollow-dependent ecosystem credit species and species credit	Reduction in available breeding habitat for native fauna.

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	that a total of 32 hollow-bearing trees will be retained within the study area.			species (e.g. microchiropteran bats and owls)	
Trampling of threatened flora species	NA – no threatened species present	NA	NA	NA	NA
Inhibition of nitrogen fixation and increased soil salinity	NA – all vegetation will be cleared and no increase to soil salinity expected that would impact on threatened species	NA	NA	NA	NA
Fertiliser drift	NA – no use of fertiliser anticipated	NA	NA	NA	NA
Rubbish dumping	The future development may result in an increase in rubbish dumping in areas of retained native vegetation within the study area.	Retained vegetation adjacent to the subject land.	Long-term	Ecosystem credit species and species credit species	Reduction in the condition of available habitat retained in areas adjacent to the subject land.
Wood collection	NA – no wood collection anticipated	NA	NA	NA	NA
Removal and disturbance of rocks, including bush rock	NA – no removal of bush rock in retained vegetation is anticipated	NA	NA	NA	NA
Increase in predators	The future development may result in an increase in predatory species such as cats.	Retained vegetation adjacent to the subject land.	Long-term	Ecosystem credit species and species credit species	Increased predation on native fauna species
Increase in pest animal populations	The future development may result in an increase	Retained vegetation adjacent to	Long-term	Ecosystem credit species and	Increased predation on

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	in predatory species such as cats and dogs	the subject land.		species credit species	native fauna species
Changed fire regimes	The future development may result in an increased chance of bushfire	Retained vegetation adjacent to the subject land.	Long-term	Ecosystem credit species and species credit species	Reduction in the condition of available habitat retained in areas adjacent to the subject land.
Disturbance to specialist breeding and foraging habitat	NA – no specialist breeding or foraging habitat is present	NA	NA	NA	NA
Unauthorised use and access of adjoining areas of retained native vegetation	The future development may result in an increase in unauthorised use and access of adjoining native vegetation	Retained vegetation adjacent to the subject land.	Long-term	Ecosystem credit species and species credit species	Reduction in the condition of available habitat retained in areas adjacent to the subject land.

7.2. Prescribed Impacts

The proposal has been assessed as resulting in three prescribed impacts (see ***Section 5.4***). An assessment of these prescribed impacts is provided below in accordance with Section 9.2 of the BAM.

7.2.1. Habitat Connectivity

7.2.1.1. Threatened Entities Affected

The habitat to be removed provides habitat connectivity for the TEC Cumberland Plain Woodland, as well as potential connectivity for the ecosystem credit species identified in **Table 8** (except for the Glossy Black-Cockatoo) and the species credit species identified in **Table 11**.

7.2.1.2. Nature

The vegetation in the subject land consists of woodland areas amongst a rural landscape that has been subject to significant historical clearing. The woodland areas provide connectivity to areas off-site, primarily to the north, that are around existing homesteads that largely comprise remnant trees and planted vegetation that

lack a native shrub or ground layer (see **Figure 1** and **Figure 2**). Within the wider landscape, the habitat connectivity of the subject land is considered to be minor due to its generally degraded condition and isolation from other significant tracts of vegetation. It is considered that the vegetation forms more of a 'stepping stone' habitat connectivity for mobile species accessing areas between Menangle Creek to the east and areas of the Nepean River to the west that are separated by the Hume Motorway.

As most threatened species considered to have potential to utilise the subject land are highly mobile and able to access fragmented habitats over a large area, the removal of vegetation within the subject land is considered unlikely to significantly reduce habitat connectivity within the region, but will result in the reduction of 'stepping stone' habitat available.

7.2.1.3. Extent

The future development the proposal may facilitate would result in the removal of 24.46 ha of native vegetation from the subject land; however, the majority of this does not provide habitat connectivity for threatened species as it is mostly previously cleared grassland areas. Areas considered to provide habitat connectivity for threatened species is limited to 3.51 ha of PCT 3319_Canopy that requires offsetting under the BAM. The remaining 13.84 ha of PCT 3319_DNG and 7.11 ha of PCT_LCG are not considered to provide habitat connectivity for threatened species and the areas are too degraded to require offsetting under BAM.

7.2.1.4. Duration

The reduction of habitat connectivity will be a long-term impact.

7.2.1.5. Consequences

Future development the proposal may facilitate will result in the reduction of 3.51 ha of woodland that provides potential 'stepping stone' habitat connectivity for a number of threatened species. Although the habitat will be removed, the proposal has avoided 1.59 ha of woodland in the study area that will ensure 'stepping stone' habitat is maintained in the area in the long-term as the avoided woodland will be managed under a VMP in perpetuity.

With consideration of the above, the proposal is not considered to facilitate the further isolation of habitat, but will rather reduce the extent of habitat present. The reduction of this area of habitat is not considered to significantly impact the movement of threatened species as the vast majority of threatened species considered to have the potential to utilise the subject land are highly mobile. For example, the Grey-headed Flying-fox forages opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources (NSW Scientific Committee 2004). Birds, owls and microchiropteran bats are also highly mobile and are unlikely to be restricted in movement by the removal of the native vegetation from within the subject land. Habitat connectivity for species such as the Cumberland Plain Land Snail and *Marsdenia viridiflora* subsp. *viridiflora* may be significantly impacted by future development, but only if local populations of each are present within the subject land. Targeted surveys for each of these species (as well as all other species credit species) would be carried out at the DA stage to confirm their presence/absence. Assuming that no threatened species were recorded within the subject land, it is considered unlikely that any threatened species would be solely reliant on the habitat within the subject land for movement between different areas of habitat.

7.2.2. Waterbodies, water quality and hydrological processes

7.2.2.1. Threatened Entities Affected

The subject land contains a dam as well as three mapped unnamed waterways that lack a defined top-of-bank. The unnamed waterways are generally indistinguishable from surrounding grassland and only have water after periods of heavy rain that drains underneath Medhurst Road. The Dam present lacks fringing native vegetation and is highly degraded as a result of frequent cattle access. None of these waterbodies are considered suitable for threatened species other than a small area of habitat for the Southern Myotis. None of these waterbodies conform to a TEC.

7.2.2.2. Nature

The proposal will result in the removal of a dam as well as three mapped unnamed waterways that lack a defined top-of-bank. This will impact on hydrological processes; however, the impacts are anticipated to be entirely localised to the subject land.

7.2.2.3. Extent

Changes to drainage and hydrology are likely to occur because of vegetation and drainage line removal and development of hardstand areas across the subject land comprising an area of approximately 26.43 ha (i.e. the entire subject land).

7.2.2.4. Duration

The alterations to hydrological processes will be a long-term impact.

7.2.2.5. Consequences

Future development the proposal will facilitate will result in the removal of the dam as well as three mapped unnamed waterways that lack a defined top-of-bank. This will alter the hydrological processes within the subject land. In addition, the change from vegetated areas to handstand areas can potentially increase the velocity of flows as well as impact quality of water. The proposal has been designed to align with the larger Rosalind Park Structure Plan, which will include a water management strategy to ensure the engineered hydrological processes are consistent with the relevant standards, including any water quality standards.

All native vegetation around the waterbodies will be offset appropriately as required by the BAM. Further to this, a Dewatering Plan will be prepared for any future DA (as a condition of consent) that removes the dam present (see ***Section 7.3.7***). The Dewatering Plan will ensure that any relocated fauna (non-threatened) to nearby habitat that has similar (or better) water quality to what they were captured from

Erosion and sediment control measures will be implemented throughout the construction periods as the "Blue Book" guidelines (Landcom 2004) in order to minimise potential impacts to the existing hydrological processes of the subject land.

With consideration of the above, the changes to waterbodies, water quality and hydrological processes the proposal may facilitate are considered unlikely to significantly impact any threatened species, although a small area of habitat for the Southern Myotis will be removed..

7.2.3. Vehicle Strike

7.2.3.1. Threatened Entities Affected

Vehicle strike has the potential to impact on the ecosystem credit species identified in **Table 8** (except for the Glossy Black-Cockatoo) and the species credit species identified in **Table 11**. However, as the subject land is located in an extensively cleared and rural area, and the majority of threatened species assessed are highly mobile, the risk of vehicle strikes significantly impacting threatened species is considered to be low.

7.2.3.2. Nature

The construction of a road network and associated housing the proposal may facilitate will significantly increase the total number of vehicles driving through the subject land. However, the anticipated residential area speed limit of 50 km/hr is expected to appropriately minimise the potential impacts of vehicle strike. Any vehicle strikes on native fauna, in particular threatened species, associated with proposal are considered to be minimal, especially when considering that the existing Hume Motorway located to the west currently poses the biggest vehicle strike risk.

7.2.3.3. Extent

The risk of vehicle strike will only occur within the proposed road network.

7.2.3.4. Duration

The risk of vehicle strike is considered to be a long-term potential impact.

7.2.3.5. Consequences

There is no data or relevant literature available to enable an estimate of vehicle strikes; however, the consequence of increased vehicle strike on native species known to occur in the locality and bioregion is not considered likely to be significant as it is expected that the numbers of wildlife struck by cars will be very low. The Hume Motorway to the west already serves as a significant barrier to the dispersal of terrestrial species and all other significant patches of retained vegetation within the Rosalind Park Structure Plan will be fenced. This means that species most likely to be accessing the subject land and surrounds will be highly mobile species, which are at a reduced risk of vehicle strikes compared to terrestrial species such as the koala. Accordingly, the consequences of vehicle strike on the local and bioregional persistence of any species that currently has the potential to utilise the subject land is very low.

7.3. Mitigation of Impacts to Native Vegetation and Habitat

A range of mitigation measures have been developed for the proposal to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before, during and after construction to limit the impact of future development the proposal will facilitate. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 20**.

7.3.1. Delineation of Clearing Limits

The current limits of clearing will be marked either by high visibility tape on trees or metal/wooden pickets, fencing or an equivalent boundary marker that will be installed prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal or impacts on fauna, disturbance must be restricted to the

delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

7.3.2. Weed Management

To minimise the spread of weeds throughout the subject land and adjoining areas, all weeds removed from the subject land will need to be done so in accordance with the Greater Sydney Local Land Services Area and the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019) under the NSW *Biosecurity Act 2015*.

The *Biosecurity Act 2015* and regulations provide legal requirements for state level priority weeds and high risk activities, as provided in the Appendices of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019). The priority weeds and High Threat Exotic weed species recorded from the subject land have been identified in ***Section 4.4***.

7.3.3. Tree Protection Measures

It is recommended that a suitably qualified arborist prepare a 'Tree Protection Plan' for any future DA within the subject land. The Tree Protection Plan is to include tree protection measures to avoid inadvertent impacts to trees located outside of the subject land to be retained. These measures should include (but are not necessarily limited to) the implementation of tree protection fencing, suitable tree protection zones, and temporary ground protection where relevant.

7.3.4. Pre-clearance Surveys

To minimise impacts to fauna species during construction, pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared. Pre-clearing surveys will be undertaken within two weeks of clearing activities by a qualified ecologist.

Habitat features to be identified include:

- Hollow-bearing trees;
- Hollow-bearing logs; and
- Nests within tree canopy or shrubs.

Such features have the potential to contain native species. All habitat features will be identified, recorded and flagged with fluorescent marking tape and trees will have an "H" spray painted with marking paint on two sides of the tree.

7.3.5. Staging of Clearing

The clearing will be conducted under the supervision of an ecologist using a two-stage clearing process as follows:

Stage 1: Clearing will commence following the identification of potential habitat features by a qualified ecologist. Hollow-bearing trees marked during pre-clearing will not be cleared during the first stage. However, all vegetation around these trees will be cleared to enable isolation of the feature. Other habitat features, such

as hollow-bearing logs, can be removed during Stage 1 only if done under supervision by a qualified ecologist. Identified hollow-bearing trees will be left at a minimum overnight after Stage 1 clearing to allow resident fauna to voluntarily move from the area.

Stage 2: After hollow-bearing trees have been left overnight, the trees will be cleared using the following protocols:

- Trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on;
- Use a bulldozer or excavator to start pushing the tree over. Move the bulldozer over the roots and continue gently pushing the tree over;
- Remove branches with hollows and sections of trunk and set aside for immediate transfer to a storage area for placement within retained vegetation; and
- All hollows will be investigated by an ecologist for the presence of fauna following felling of the tree.

The felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on.

The two-stage clearing process enables fauna a chance to self-relocate upon nightfall, when foraging typically occurs.

Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised).

Provision of a report following the completion of clearing works will be provided detailing the total number and species of individuals recorded and details of their release/health.

7.3.6. Sedimentation Control Measures

Future development the proposal facilitates may result in erosion and transport of sediments because of soil disturbance during construction. In order to prevent this impact, construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures:

- Installation of sediment control fences;
- Covering soil stockpiles; and

- Avoiding soil disturbance prior to heavy rainfall.

7.3.7. Dewatering Plan

The dam within the subject land will need to be dewatered under the supervision of a qualified ecologist as the areas have the potential contain native aquatic species (most likely commonly occurring frog, turtle and eel species). Prior to the dewatering of the drainage lines, a Dewatering Plan will be prepared that includes:

- A review of existing data for the subject land and wider locality, including previous records of aquatic species;
- Details of a proposed aquatic survey methodology;
- Identification of a relocation site for species encountered during dewatering activities;
- Details of a staged dewatering program where water levels are lowered initially so that aquatic fauna can be captured and relocated; and
- Survey and reporting requirements.

The Dewatering Plan will be submitted to Council for approval and will be finalised at least two weeks prior to the commencement of dewatering works commencing.

7.3.8. Construction Environment Management Plan

A Construction Environment Management Plan (CEMP) will be developed post approval to describe how activities undertaken during the construction phase of development will be managed to avoid or mitigate environmental impacts, and how those environmental management requirements will be implemented. This will include staff training and site briefings to communicate environmental features to be protected and measures to be implemented to minimise impacts to biodiversity.

7.3.9. Vegetation Management Plan

Following approval of a DA for the subject land, a VMP will be prepared for areas of vegetation within the study area proposed to be rezoned for conservation. The purpose of the VMP will be to provide in-perpetuity management of the retained vegetation in order to improve the biodiversity values present. The VMP will include, but not be limited to the following:

- Details of fencing requirements;
- Measures for weed management and rubbish removal (as required);
- Measures for revegetation works;
- Erosion, sediment and stormwater runoff controls;
- Monitoring, reporting and review requirements;
- Identification of key performance indicators; and

- Supporting figures.

7.3.10. Mitigation Measures for Indirect Impacts

As identified in ***Section 7.1.3***, the future development the proposal has the potential to facilitate may result in a range of indirect impacts to areas of native vegetation to be retained in areas adjoining the subject land. Mitigation measures proposed to address these indirect impacts are presented in **Table 20** below.

Table 20 Mitigation measures to address indirect impacts

Indirect Impact	Mitigation Measures
Inadvertent impacts on adjacent habitat or vegetation	Clearing limits will be delineated as specified in ***Section 7.3.1***.
Indirect impacts on retained vegetation	Clearing limits will be delineated as specified in ***Section 7.3.1***. All areas of retained vegetation within the study area will be fenced and managed under a VMP (***Section 7.3.9***).
Reduced viability of adjacent habitat due to edge effects	Edge effects will be managed by the implementation of weed control measures to avoid weed invasion in areas of retained vegetation, the installation of sediment fences to avoid encroachment of sediment and nutrients and appropriate fencing during construction. All areas of retained vegetation within the study area will be fenced and managed under a VMP (***Section 7.3.9***).
Reduced viability of adjacent habitat due to noise, dust or light spill	A noise management plan will be implemented to minimise noise levels to limit impacts to fauna species in areas of retained native vegetation. Standard dust management measures will be implemented to minimise levels of dust generated to limit the impacts to areas of retained native vegetation and habitat quality. These include the use of dust suppressant water sprays when required. Light management measures will be implemented to avoid unnecessary light spill into areas of retained native vegetation. Construction will only be undertaken during daylight hours to minimise the impacts of light on the surrounding environment.
Transport of weeds and pathogens from the site to adjacent vegetation	Weed management will be conducted in accordance with the measures outlined in ***Section 7.3.2***
Loss of breeding habitats	All impacts to native vegetation will be offset for as required by the BAM.
Rubbish dumping	All areas of retained vegetation within the study area will be fenced and managed under a VMP (***Section 7.3.9***).
Increase in predatory species	Areas of retained native vegetation will be appropriately fenced to prevent access by dogs.
Increased risk of fire	Implementation of bushfire asset protection approved by the NSW rural fire service.

Indirect Impact	Mitigation Measures
Unauthorised use and access of adjoining areas of retained native vegetation	Areas of retained native vegetation will be appropriately fenced to prevent unauthorised access and managed under a VMP (***Section 7.3.9***).

7.3.11. Risk Assessment of Mitigation Measures

A risk assessment of the mitigation measures outlined previously is presented overleaf in **Table 21**. This includes a summary of the mitigation measures proposed, and details of the timing, frequency, responsibility for implementation, risk of failure and risk and consequences of residual impacts.

Table 21 Summary of mitigation measures

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
Delineation of clearing limits	Indirect, prescribed	Clearing limits marked either by high visibility tape on trees of metal/wooden pickets, fencing or an equivalent boundary marker. Disturbance, including stockpiling, restricted to clearing limits.	Construction	Once	Contractor	Low	Unnecessary damage to adjoining vegetation.
Weed management	Direct, indirect	All weedy vegetation removed from the subject land must be done in accordance with the Greater Sydney Regional Strategic Weed Management Plan.	Construction	Once	Contractor	Low	Further spread of weeds throughout the adjacent vegetation.
Tree Protection Measures	Indirect, prescribed	Implementation of tree protection measures such as tree protection fencing, suitable tree protection zones, and temporary ground protection.	Construction	Prior to construction and vegetation clearing	Project arborist	Low	Unnecessary damage to adjacent vegetation.
Pre-clearance survey	Direct, prescribed	Pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared. Pre-clearing surveys will be undertaken within two weeks of clearing.	Construction	Once	Contractor/ project ecologist	Low	Increased and unnecessary mortality of native fauna.

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
		Habitat features will be marked during the pre-clearing survey.					
Staging of clearing	Direct, prescribed	Vegetation clearing will be conducted using a two-stage clearing process. Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised)	Construction	Once	Contractor/ project ecologist	Low	Increased and unnecessary mortality of native fauna.
Sedimentation control	Indirect, prescribed	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures: Installation of sediment control fences; Covering soil stockpiles; and Avoiding soil disturbance prior to heavy rainfall	Construction	Throughout construction period	Contractor	Moderate	Sedimentation into adjoining vegetation.

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
Dewatering Plan	Direct, prescribed	Dewater dam in accordance with a dewatering plan to be approved by Council.	During dewatering	Once	Contractor/ project ecologist	Low	Increased and unnecessary mortality of native aquatic fauna.
Vegetation Management Plan	Indirect, prescribed	Implementation of a Council approved VMP.	Construction	In perpetuity	Contractor/ Bush Regenerator	Low	Unnecessary damage to adjacent vegetation. Further spread of weeds throughout the adjacent vegetation.

7.4. Mitigation of Prescribed Impacts

The following mitigation measures, described in ***Section 7.3***, are relevant to the prescribed impacts relevant to the proposal:

- Delineation of clearing limits;
- Tree protection measures;
- Pre-clearance survey;
- Staging of clearing;
- Sedimentation control measures;
- Dewatering; and
- Implementation of a VMP.

No additional mitigation measures are proposed for prescribed impacts.

7.5. Adaptive Management for Uncertain Impacts

The proposal is considered unlikely to result in any uncertain impacts that require adaptive management.

7.6. Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts

Due to the small scale of indirect and prescribed impacts, the proposal does not propose to use additional biodiversity credits to mitigate or offset these impacts for the purpose of this preliminary BDAR.

8. Thresholds of Assessment

8.1. Introduction

The assessment thresholds that must be considered include the following:

- Impacts on an entity that is at risk of a serious and irreversible impact;
- Impacts for which the assessor is required to determine an offset requirement;
- Impacts for which the assessor is not required to determine an offset requirement; and
- Impacts that do not require further assessment by the assessor.

The following sections outline these assessment thresholds and their relevance to the proposal.

8.2. Impacts on Serious and Irreversible Impact Entities

8.2.1. Large-eared Pied Bat

The Large-eared Pied Bat is only an SAII entity for breeding habitat. The Large-eared Pied Bat has been assumed as present within the subject land and has been assessed as a species credit species that would only be considered to use the woodland habitat within the subject land for foraging purposes. No breeding habitat is considered to be present for the Large-eared Pied Bat as breeding habitat is restricted to PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. The subject land does not include or is within 100m of such features. Therefore, the subject land does not include any potential breeding habitat for the Large Bent-winged Bat and this species is not assessed further as a candidate SAII entity.

8.2.2. Cumberland Plain Woodland

One SAII entity, Cumberland Plain Woodland, will be impacted by the proposal. The location of the Cumberland Plain Woodland in relation to the subject land is shown in **Figure 14**.

Approximately 17.35 ha of vegetation that conforms to the CEEC Cumberland Plain Woodland listed under the BC Act will be removed within the subject land, while approximately 1.9 ha of the CEEC will be retained within the study area. The 17.35 ha of the CEEC to be impacted is comprised of 13.84 ha of grassland and 3.51 ha of woodland. The information presented below indicates that the proposal is unlikely to result in a significant and irreversibly impact to Cumberland Plain Woodland as the majority of the impact is associated with a grassland form and areas of the CEEC within the study area will be retained and managed in perpetuity.

Section 9.1.1 of the BAM requires the provision of additional information regarding SAII entities that are TECs. The additional information is to assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact. The additional information requirements are provided in **Table 22**.

Table 22 Additional impact assessment provision for Cumberland Plain Woodland

Criteria	Additional Impact Assessment Provisions	Response
1	The assessor is required to provide further information in the BDAR or BCAR regarding the impacts on each TEC at risk of an SAII. This must include the action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR and BCAR.	Avoidance of impacts to Cumberland Plain Woodland is addressed in **Chapter 6**.
2	The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:	-
(a)	Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	The current total geographic extent of Cumberland Plain Woodland varies depending on the source interrogated. The current extent of Cumberland Plain Woodland in the TBDC is described as only less than 9% of the original extent remaining and does not include a conclusive total area for the community. BioNet Vegetation Classification Database estimates the current area of occupancy of the community based on the two PCTs (3319 and 3320) conforming to Cumberland Plain Woodland with available data as approximately 11,153 ha of the original 'Pre-European Extent' published on the database of 139,605 ha. Cumberland Plain Woodland is also associated with a targeted recovery plan for the Cumberland Plain that was prepared by the Department of Environment, Climate Change and Water in 2011 (DECCW 2011). This document is the currently accepted standard for the retention and recovery of TECs in the Cumberland Plain. Table 2 of the recovery plan displays an estimated current total of Cumberland Plain Woodland of 24,530 ha, however, it is reported that a small portion of this total does not meet the listing criteria for the TEC. The same table also estimates the 'Pre-1750 (ha)' total of the community at 125,449 ha being a reduction in area to current levels of approximately 20%. Of

Criteria	Additional Impact Assessment Provisions	Response
		the current total area, the recovery plan reports approximately 967 ha identified as occurring within reserves. The Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2009a) identifies that the TEC is restricted in geographic distribution to the Sydney Basin Bioregion and was estimated to have an extant area of approximately 11,054 ha (±1,564 ha) according to mapping by Tozer (2003), which covered the Cumberland Plain. This is reported by the final determination as being a reduction from the 'Pre-European distribution' by 8.8% (±1.2%) suggesting the Pre-European distribution of the community to cover approximately 125,613 ha. Following a review of the above information for the extent of Cumberland Plain Woodland, both current and prior to European settlement, it is clear there is some variation in area calculations. It is noted however, that it is unanimously accepted by all sources that the community has suffered extensive clearing to a level that the community requires significant external intervention to maintain and recover the community within the Sydney Basin Bioregion. The estimated reduction in the geographic extent of Cumberland Plain Woodland since 1970 is not available in the TBDC, BioNet Vegetation Classification Database, the final determination or the recovery plan, and was not identified from a search of available literature. Nonetheless, the pre-European extent of Cumberland Plain Woodland is listed as approximately 125,449 ha within the Cumberland Plain Recovery Plan (DECCW 2011) or estimated to be 139,605 ha based on BioNet Vegetation Classification Database estimates. No published data was found in the literature on the 1970 extent of Cumberland Plain Woodland and an accurate estimate of the reduction in distribution between the current extent and the 1970 geographic extent cannot be provided.
(b)	The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2,	According to the final determination for Cumberland Plain Woodland (NSW Scientific Committee 2011), there has been a very large reduction in the ecological function of the community through processes such as: • Extensive removal of large old trees;

Criteria	Additional Impact Assessment Provisions	Response
	clause 6.7(2)(b) BC Regulation) indicated by: • Change in community structure • Change in species composition • Disruption of ecological processes • Invasion and establishment of exotic species • Degradation of habitat; and • Fragmentation of habitat	• Tree-felling for crops and pastures; • Fragmentation of habitat; • Grazing by livestock and rabbits; • Modification of understory, to be dominated by woody exotic species; • Soil chemical and structural modification associated with agricultural uses; • Changes in frequency of fire regimes; • Prevention of recruitment of species, through continued under-scrubbing and mowing; and • Reduction of understorey complexity, through the reduction of native shrub cover, resulting in degradation of habitat.
(c)	Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the: • extent of occurrence • area of occupancy, and • number of threat defined locations	Paragraph 11 of the Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2009a) identifies that the community is restricted in geographic distribution to the Sydney Basin Bioregion, however it is noted that this is based on an estimated extant area of 2,810 km^2, which was established from outdated mapping undertaken by Tozer (2003). Based on current BioNet Vegetation Classification Database estimates, it is estimated that the current area of occupancy is 11,153 ha as described for Criteria 2(a). No threat defined locations are specifically identified in the TBDC, however the ecological community is critically endangered across its range. According to the Final Determination (NSW Scientific Committee 2009a), small, protected areas of the community exist in reserves such as Kemps Creek, Mulgoa and Windsor Downs, Scheyville National Park, and Leacock, Rouse Hill and Western Sydney Regional Parks.
(d)	Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	This principle is not identified as applicable to BDARs. It is noted that the TEC does respond to management, with several successful management measures outlined in the Best Practice Guidelines for Cumberland Plain Woodland (DEC 2005).
3	Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the	Not applicable.

Criteria	Additional Impact Assessment Provisions	Response
	assessor must record this in the BDAR.	
4 (a)	The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: • in hectares; and • as a percentage of the current geographic extent of the TEC in NSW	The proposal will remove approximately 17.35 ha of Cumberland Plain Woodland in the subject land. 3.51 ha of this (or ~20%) is woodland that requires offsetting under the BAM and 13.84 ha of this (or ~80%) includes degraded grasslands that have a vegetation integrity score of 5.4 that do not require offsetting under the BAM. An additional 1.59 ha of woodland and 0.31 ha of grassland Cumberland Plain Woodland will be retained within the study area. The extent of the TEC in NSW differs depending on the information source. Based on current BioNet Vegetation Classification Database estimates, it is estimated that the current area of occupancy is 11,153 ha. Based on the above estimate, the extent of Cumberland Plain Woodland to be impacted by the proposal is less than 0.01% of the current geographic extent of the TEC in NSW. It is noted that the majority of impacts on Cumberland Plain Woodland are associated with degraded grassland areas that meet the listing criteria for the community as per its Final Determination. It is also worth noting that substantially greater areas of the grassland form of the community are likely to be present in NSW that are not included in the BioNet Vegetation Classification Database estimates as mapping of such grasslands as part of a Broad-scale doesn't include such areas.
(b)	The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:	-
	• Estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of the development footprint or equivalent area for other types of proposals	There is one patch of the TEC within the subject land. The total area of the patch is approximately 17.35 ha, comprised of 3.51 ha or woodland and 13.84 ha of grassland. The woodland areas of the TEC present within the subject land occur on the upper slopes of the subject land and are generally narrow and surrounded be previously cleared areas. The grassland areas of the TEC present are located in areas adjacent to woodland areas that have likely been exposed to less grazing pressure than lower lying areas of grassland that are not considered to be the TEC. The

Criteria	Additional Impact Assessment Provisions	Response
		grassland areas conforming to the TEC are highly degraded and have a vegetation integrity score of only 5.4. The total are of the TEC to be retained within the study area is 1.9 ha, which includes 1.59 ha of woodland and 0.31 ha of grassland that will be managed under a VMP in perpetuity. The total area of the TEC within 500 m of the subject land (excluding the subject land itself) is approximately 27 ha, which is comprised of several separate patches ranging from small to large in size (**Figure 14**). The majority of the 27 ha located outside of the subject land is proposed to be retained and managed in perpetuity under the Rosalind Park Structure Plan. Additionally, the 27 ha of the TEC located outside of the subject land has limited connectivity to other areas of the community as a result of past land uses and the presence of infrastructure including roads and power easements.
	• Describing the impacts on connectivity and fragmentation of the remaining areas of the TEC measures by:	-
	○ Distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and	The average distance between isolated areas of Cumberland Plain Woodland if all areas were avoided is ~247m. The average distance between isolated areas of Cumberland Plain Woodland if all areas proposed to be removed are removed (and assuming development occurs as per the Rosalind Park Structure Plan) is ~470 m. This increase is largely a result of grassland areas of the TEC proposed to be cleared. Such areas are regularly slashed and offer minimal actual connectivity value for the TEC. The removal of Cumberland Plain Woodland within the subject land will reduce the extent of the community present as well as slightly increase fragmentation of already fragmented areas.
	○ Estimated maximum dispersal distance for native flora species characteristic of the TEC, and	The main dispersal mechanisms for flora species associated with Cumberland Plain Woodland include one or a combination of the following: • animals, • wind, • water runoff, and • gravity.

Criteria	Additional Impact Assessment Provisions	Response
		Eucalypts within the community are likely to rely on animal assisted dispersal by highly mobile vertebrate pollinators (birds and bats) which disperse pollen over large areas when foraging (Southerton S.G. 2003). The maximum dispersal distance for native flora species characteristic of the community is estimated to be at least 100 m and potentially much further. The Cumberland Plain Woodland present within the subject land and adjoining areas currently exists in a fragmented landscape. Future development the proposal may facilitate will result in a reduction of these already fragmented areas and increase dispersal distances.
	○ Other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development	The TEC proposed for removal already occurs in a fragmented landscape and is considered to constitute 'stepping stone' habitat for mobile species. Dispersal distances will increase; however, this increase in dispersal distances only increases distance over an already fragmented landscape. Although a reduction in the TEC's area of extent will occur, it is mostly limited to the removal of grassland areas that are not considered to significantly affect the connectivity of the TEC. The TEC's dispersal vectors will still be able to access areas of the TEC to be retained in the study area and wider surrounds.
	Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	Within the subject land, the Cumberland Plain Woodland occurs as PCT 3319. The PCT 3319 vegetation within the subject land that conforms to the BC Act listed Cumberland Plain Woodland occurs in two separate conditions; Canopy and DNG. Condition scores for each are below. • PCT 3319_Canopy ○ VI: 40.1 ○ Composition: 36.9 ○ Structure: 55.6 ○ Function: 31.5 • PCT 3319_DNG ○ VI: 5.4 ○ Composition: 25.7 ○ Structure: 42.2 ○ Function: 0.1
5	The assessor may also provide new information that	Not applicable.

Criteria	Additional Impact Assessment Provisions	Response
	demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	

8.3. Impacts that Require an Offset

8.3.1. Native Vegetation

In accordance with the BAM, a future DA the proposal facilitates requires offsets for the clearing of native vegetation as the following criteria is met:

- A vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an EEC or CEEC.

The PCTs and vegetation zones requiring offsets is documented in **Table 23**. This area is mapped in **Figure 9**.

Table 23 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	PCT#	Management Zone	Area (ha)	Patch Size Class	Current VI Score	Future VI Score	Change in VI Score
3319_Canopy	3319	Complete Clearance	3.51	>100	40.1	0	-40.1

8.3.2. Threatened Species

The BAM requires the proposal to offset the clearing of species credit species habitat. The species credit species habitat to be offset is documented in **Table 24**, and the areas subject to threatened species offsetting is shown in **Figure 12**.

Table 24 Summary of impacts to threatened species requiring an offset

Scientific Name	Common Name	BC Act Status	Biodiversity Risk Weighting	Area (ha)
Chalinolobus dwyeri	Large-eared Pied Bat	V	3	3.51
Marsdenia viridiflora subsp. viridiflora - endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E	2	3.51
Meridolum corneovirens	Cumberland Plain Land Snail	E	2	3.51

Scientific Name	Common Name	BC Act Status	Biodiversity Risk Weighting	Area (ha)
Myotis macropus	Southern Myotis	V	2	14.02
Ninox connivens	Barking Owl	V	2	16.26
Ninox strenua	Powerful Owl	V	2	16.26
Petaurus norfolcensis	Squirrel Glider	V	2	3.51
Phascolarctos cinereus	Koala	E	2	3.51
Tyto novaehollandiae	Masked Owl	V	2	16.26

V = Vulnerable, E = Endangered

8.4. Impacts that do not Require an Offset

In accordance with the BAM, the proposal does not require offsets for the clearing of native vegetation in the Vegetation Zones PCT 3319_DNG and PCT 3319_LCG as the following criterion is met:

- A vegetation zone that has a VI score of <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

The PCT and associated vegetation zones not requiring offsets is documented in **Table 25**. This area is mapped on **Figure 11**.

Table 25 Native vegetation impacts that do not require an offset

Zone	Veg Zone Name	Management Zone	BC Act Status	Total VI Loss	Biodiversity Risk Weighting	Area (ha)	Credits
2	3319_DNG	Complete Clearance	CEEC	-5.4	2.5	13.8	0
3	3319_LCG	Complete Clearance	Not Listed	-3.9	2.5	7.1	0

8.5. Impacts that do not Require Further Assessment

All areas identified as 'exotic vegetation' or 'dams' within the subject land do not require an offset. These areas comprise approximately 1.97 ha, as shown on **Figure 8**.

8.6. Application of the No Net Loss Standard

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigated, and all residual impacts are offset by retirement of the required number of biodiversity credits. Future development the proposal will facilitate will result in the removal of 24.46 ha of native vegetation from the subject land, which includes 3.51 ha of PCT 3319_Canopy that requires offsetting under the BAM, as well as 13.84 ha of PCT 3319_DNG and 7.11 ha of PCT_LCG that are too degraded to require offsetting under BAM.

The removal of native vegetation will result in the loss of 3.51 ha of habitat for the following species credit species: Large-eared Pied Bat, Marsdenia viridiflora subsp. viridiflora endangered population, Cumberland Plain Land Snail, Southern Myotis, Barking Owl, Powerful Owl, Squirrel Glider, Koala and Masked Owl.

The ecosystem credit requirement for the proposal is summarised in **Table 26** and the species credit requirement is summarised in **Table 27.** The 'like for like' offsetting options for ecosystem credits and species credits are provided in **Table 28** and **Table 29**, respectively. The BAMC credit reports have been included in **Appendix C**.

Table 26 Summary of ecosystem credit liability

Vegetation Zone	PCT#	Management Zone	TEC	Area (ha)	Credits Required
3319_Canopy	3319	Complete Clearance	CEEC	3.51	88

Table 27 Summary of species credit liability

Scientific Name	Common Name	Area (ha)	Credits Required
Chalinolobus dwyeri	Large-eared Pied Bat	3.51	106
Marsdenia viridiflora subsp. *viridiflora* - endangered population	*Marsdenia viridiflora* R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	3.51	70
Meridolum corneovirens	Cumberland Plain Land Snail	3.51	70
Myotis macropus	Southern Myotis	14.02	40
Ninox connivens	Barking Owl	16.26	102
Ninox strenua	Powerful Owl	16.26	102
Petaurus norfolcensis	Squirrel Glider	3.51	70
Phascolarctos cinereus	Koala	3.51	70
Tyto novaehollandiae	Masked Owl	16.26	102

Table 28 Like for like offsetting options for PCT 3319

Any PCT in the below Class	And in any of below trading groups	Zone	Containing Hollow-bearing Trees?	Credits	In the below IBRA Subregions
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Canopy	Yes	88	Cumberland , Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 29 Like for like offsetting options for species credits

Species Credit	Like-for-like Credit Options	IBRA subregion
Chalinolobus dwyeri	*Chalinolobus dwyeri*	Any in NSW
Marsdenia viridiflora subsp. *viridiflora* - endangered population	*Marsdenia viridiflora* subsp. *viridiflora* - endangered population	Any in NSW
Meridolum corneovirens	*Meridolum corneovirens*	Any in NSW
Myotis macropus	*Myotis macropus*	Any in NSW
Ninox connivens	*Ninox connivens*	Any in NSW
Ninox strenua	*Ninox strenua*	Any in NSW
Petaurus norfolcensis	*Petaurus norfolcensis*	Any in NSW
Phascolarctos cinereus	*Phascolarctos cinereus*	Any in NSW
Tyto novaehollandiae	*Tyto novaehollandiae*	Any in NSW

9. Conclusion

Cumberland Ecology was engaged to prepare a preliminary BDAR for the proponent to support the proposed rezoning of the subject land. Although a BDAR is not formally required to support rezoning applications, a preliminary BDAR was prepared at the request of DPE in order to demonstrate what impacts on biodiversity a future DA within the subject land may facilitate. Due to time constraints associated with DPE's request for a BDAR and when the BDAR is required to be presented to Council and DPE, limited scope for targeted threatened species surveys were included in this preliminary BDAR. As a result, several threatened species credit species have been assumed as present, which could be either surveyed for or have an expert report prepared for in the future, in order to remove them from proposal's total credit liability, if they were in-fact deemed not to be present. Therefore, the results provided in this preliminary BDAR are preliminary only and further studies are recommended to be completed to support a formal BDAR at the DA stage.

As proposed, the proposal will result in the clearing of up to approximately 24.46 ha of native vegetation. This includes 17.35 ha of the TEC Cumberland Plain Woodland. Most of the TEC to be impacted (13.84 ha) is a grassland form of the TEC that conforms to the community's listing criteria as defined under its Final Determination; however, the actual condition of this grassland form of the TEC is so low that it does not trigger offsetting under the BAM. Remaining areas of the TEC to be impacted includes 3.51 ha of a woodland form that generally contains highly degraded shrub and ground layers that are dominated by the state priority weeds *Lycium ferocissimum* (African Boxthorn) and *Lantana camara* (Lantana). The total credit liability for ecosystem credits is 88 PCT 3319 credits.

Cumberland Plain Woodland is an SAII candidate entity; however, the proposed impacts on the TEC are considered unlikely to result in a SAII due to the relatively small scale of the impacts on high quality patches of the TEC in the subject land, and the proposed retention of other areas of the community under the Rosalind Park Structure Plan, all of which will be managed under a management plan in perpetuity.

In addition to the removal of the TEC Cumberland Plain Woodland, the proposal would potentially facilitate the removal of suitable habitat for one (1) threatened flora species credit species and eight (8) threatened fauna species credit species. The total credit liability for species credits is 732. Undertaking targeted threatened species surveys at the DA stage would likely significantly reduce the total species credit liability presented in this assessment.

Measures to avoid impacts on biodiversity have been demonstrated through the retention of 1.9 ha of the highest quality condition of the TEC within the study area that will be rezoned for conservation and managed in perpetuity under a VMP. This area includes 1.59 ha of woodland and 0.31 ha of grassland that both conform to the TEC Cumberland Plain Woodland. However, opportunities for further avoidance are constrained by the topography of the subject land as well as providing a development consistent with the larger rezoning proposed, as detailed in the Rosalind Park Structure Plan. It is also noted that significant avoidance has already been demonstrated as part of the wider Rosalind Park planning proposal, of which the subject land only forms a relatively small part of. This includes the retention of a 40 ha koala corridor consistent with the recommendations of the CKPOM and the Chief Scientist & Engineer Report, as well as the retention of additional areas of TEC vegetation in the centre of the wider Rosalind Park site.

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigated, and all residual impacts are offset by retirement of the required

number of biodiversity credits. The proposal has sought to avoid impacts to biodiversity values, and a suite of mitigation measures will be implemented for a future DA the proposal facilitates including: weed management, delineation of clearing limits, pre-clearance surveys, sedimentation control measures, dewatering protocols and implementation of a VMP over retained vegetation in the study area.

With the implementation of the proposed mitigation measures and the offsetting described, it is considered that the impacts of this proposal on biodiversity can be appropriately managed, consistent with the BAM.

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APPENDIX A :
BAM Plot/Transect Data

Table 30 BAM plot/transect data

Plot	PCT	Area	Patch Size	Condition Class	Composition - Tree	Composition - Shrub	Composition - Grass	Composition - Forb	Composition - Ferns	Composition - Other	Structure - Tree	Structure - Shrub	Structure - Grass	Structure - Forb	Structure - Ferns	Structure - Other	Large Trees	Hollow Trees	Litter Cover	Length Fallen Log	Tree Stem 5-9cm	Tree Stem 10-19cm	Tree Stem 20-29cm	Tree Stem 30-49cm	Tree Stem 50-79cm	Tree Regeneration	High Threat Exotic
1	3319	7.11	101	LCG	0	0	5	0	0	0	0	0	26	0	0	0	0	0	4	0	0	0	0	0	0	0	85
2	3319	13.8	101	DNG	0	0	10	4	0	1	0	0	97	1.3	0	0.1	0	0	4	0	0	0	0	0	0	0	12
4	3319	13.8	101	DNG	0	0	12	1	0	1	0	0	71	0.5	0	0.1	0	0	3.2	0	0	0	0	0	0	0	31
5	3319	13.8	101	DNG	0	0	8	2	0	0	0	0	53	0.3	0	0	0	0	2.2	0	0	0	0	0	0	0	49
6	3319	3.51	101	Canopy	2	0	9	5	0	1	25	0	34	0.5	0	0.1	1	5	9	1.5	0	0	1	1	1	0	52
7	3319	13.8	101	DNG	0	0	9	1	0	0	0	0	63	0.1	0	0	0	0	2.4	0	0	0	0	0	0	0	33
8	3319	7.11	101	LCG	0	0	4	1	0	0	0	0	45	0.1	0	0	0	0	3.2	0	0	0	0	0	0	0	60
9	3319	13.8	101	DNG	0	0	8	3	0	0	0	0	83	0.5	0	0	0	0	1.4	0	0	0	0	0	0	0	16

Plot	PCT	Area	Patch Size	Condition Class	Composition - Tree	Composition - Shrub	Composition - Grass	Composition - Forb	Composition - Ferns	Composition - Other	Structure - Tree	Structure - Shrub	Structure - Grass	Structure - Forb	Structure - Ferns	Structure - Other	Large Trees	Hollow Trees	Litter Cover	Length Fallen Log	Tree Stem 5-9cm	Tree Stem 10-19cm	Tree Stem 20-29cm	Tree Stem 30-49cm	Tree Stem 50-79cm	Tree Regeneration	High Threat Exotic
10	3319	3.51	101	Canopy	2	1	13	4	0	1	50	0.1	30	1	0	0.1	1	1	20	5	0	0	0	1	1	1	19
11	3319	3.51	101	Canopy	1	0	11	3	0	1	30	0	22	0.3	0	2	1	2	2.6	3	0	0	0	1	0	1	73
12	3319	13.8	101	DNG	0	0	7	0	0	0	0	0	48	0	0	0	0	0	2.6	0	0	0	0	0	0	0	20
13 (2022) - 14 (2023)	3319	13.8	101	DNG	0	0	9	3	0	1	0	0	49	0.3	0	0.1	0	0	7	0	0	0	0	0	0	0	41

Date: 28/04/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, MPE	Plot ID: P 1	Start:	49	293509	6222960	
Photos: 808 - 811	Orientation (°): 199	End:	48	293485	6222919	
Dimensions: □20x20, □10x40	PCT: LPDNG Exotic					Sheet: 1 of 1

Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1 Sporob creb.	5	500				
2 Paspalum dilatatum	55	5000				
3 chloris ventricesa	0.1	10				
4 Trifolium repens	0.25	50				
5 Plantago lanceolata	0.2	100				
6 Medicago poly.	0.1	20				
7 chloris gayana	15	1000				
8 Sida rhombifol.	0.1	30				
9 Verbena quadr.	0.1	20				
10 Both. decip. decip.	1	100				
11 Cynodon dactylon	20	[illegible]				
12 Taraxacum officinale	0.1	10				
13 Hypoch. radic.	0.1	30				
14 Setaria parv.	1	100				
15 Lolium perenne	1	200				
16 conyza bonar.	0.1	10				
17 Senecio madagasc.	0.1	5				
18 Cirsium vulgare	0.2	20				
19 Raphan. rugos.	0.1	3				
20 Conch. clandest.	15	1500				
21 Lysimach. arvensis	0.1	20				
22 cyclosperm. lepto.	0.1	10				
23 Carex inversa	0.1	10				
24 Sonch oler.	0.1	2				
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/04/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, MP	Plot ID: P 2	Start:	50	293458	6222869	
Photos: 812 - 815	Orientation (°): 127	End:	51	293499	6222842	Sheet: 1 of 1
Dimensions: ☒20x20, ☐10x40	PCT: DNG - CPW					

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Themeda triand.	30	2000				
2	Sporobolus elong.	40	~~4000~~ 3000				
3	Sida rhomb.	0.5	50				
4	Geranium soland.	1	200				
5	Cynodon dactylon.	10	1000				
6	Hypoch. radic.	0.1	50				
7	Cirsium vulgare	1	30				
8	Hypericum gramineum	0.1	3				
9	Setaria parvif.	5	500				
10	Glycine microph.	0.1	1				
11	Microlaena stip. stip.	5	500				
12	Sporob. creber	10	1000				
13	Oxalis perenn.	0.1	50				
14	Verbena bonari.	2	100				
15	Centaurium eryth.	0.1	1				
16	Senecio madag.	0.2	10				
17	Rytidosp. caesp.	0.1	5				
18	Linum trigynum	0.1	10				
19	Both. decip. decip.	1	100				
20	Lantana camara	0.4	1				
21	Plantago lanceol.	0.1	50				
22	Rosa canin.	0.5	3				
23	Eragrost. leptost.	0.1	5				
24	Asperula confert.	0.1	20				
25	Hypericum perfor.	0.2	30				
26	Verbena quadr.	0.1	10				
27	Anthosachne scaber	0.1	10				
28	Conyza sumatr.	0.1	3				
29	Paspalum dilatatum	10	1000				
30	Olea europ. cuspid	0.1	1				
31	Aristida ramosa	1	100				
32	Chloris gayana	1	50				
33	Romulea rosea var. aust.	0.1	100				
34	Conyza bonari.	0.1	3				
35	Eragr. curv.	0.5	30				
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/04/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, MP.	Plot ID: P 3	Start:	52	293750	6222793	
Photos: 816 - 819	Orientation (°): 93	End:	53	293800	6222801	
Dimensions: ☐20x20, ☑10x40	PCT: K.bayg EOG					Sheet: 1 of 1

Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1 Paspalid dist.	0.1	5				
2 Cynod dact.	20	2000				
3 Cenchrus cland.	70	7000				
4 Paspalum dilatatum	5	500				
5 Cirsium vulg.	1	50				
6 Plantago lanc.	1	300				
7 Senecio mada	0.2	10				
8 Verbena quadr.	0.1	10				
9 Trifol. repens	0.1	20				
10 Setaria parvif	1	100				
11 Lolium perenne	1	300				
12 ~~[illegible]~~ Eragr curv.	2	50				
13 Sporob. creber.	0.1	5				
14 Sonchus oleraceus	0.1	3				
15 Eriochloa pseud.	0.1	5				
16 Sida rhomb.	0.1	10				
17 Raphstr. rugosum	0.1	2				
18 Carex inversa	0.1	50				
19 Panicum effusum	0.1	1				
20 Tarax officin	0.1	2				
21 Lysimach. arvensis	0.1	20				
22 Alternanth. punget.	0.1	1				
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/04/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF. MP.	Plot ID: P 4	Start:	54	293739	6222817	
Photos: 820 - 823	Orientation (°): 255	End:	55	293689	6222819	Sheet: 1 of 1
Dimensions: □20x20, □10x40	PCT: LDENG					

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Sporob. creb.	50	5000				
2	Cynodon dactylon	5	500				
3	Verbena bonariensis	1	50				
4	chloris ventricosa	0.2	30				
5	Enteropogon ramosus	0.1	5				
6	Both. decip. decip.	3	300				
7	Paspalum dilat.	10	1000				
8	Verbena guaichay	0.1	10				
9	Micro stip stip.	10	1000				
10	Setaria parvif.	2	200				
11	Panicum effusum	0.5	50				
12	[redacted] Eragr. curv.	20	2000				
13	Geranium solanderi	0.5	40				
14	chloris gayana	1	40				
15	[redacted] Plantago lanceol.	0.1	30				
16	Aristida ramosa	1	100				
17	both. decip decip						
18	Sporob. elong	1	40				
19	Anthosachne scab.	0.1	10				
20	Medicago polym.	0.1	5				
21	Eragr. leptost.	0.1	10				
22	Centaurea tenuif.	0.1	2				
23	Sida rhombif.	0.2	30				
24	Glycine tabacina	0.1	5				
25	Briza subaristata	0.1	10				
26	Paspalidium distans	0.1	5				
27	[redacted] Hypericum perfor.	0.1	10				
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/4/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, MR.	Plot ID: P 5	Start:	56	293758	6221941	
Photos: 824 - 827	Orientation (°): 310	End:	57	293726	6222964	
Dimensions: □20x20, □10x40	PCT: 1 PCT					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Sporob elong.	1	35				
2	Dipp. dilat	30	3000				
3	Carex inversa	0.1	100				
4	[redacted]	[redacted]	[redacted]				
5	Eragr. curvi.	15	10000				
6	Cynodon dactylon	10	1000				
7	Eclypt. lepto.	2	200				
8	Verbena quadrang	1	50				
9	Both. decip. decip.	5	500				
10	Sida rhom bifolia	0.3	50				
11	Geranium solanderi	0.2	10				
12	Wahlenbergia communis	0.1	1				
13	Panicum effusum	0.1	2				
14	Briza subaristata	0.2	20				
15	Cirsium vulgare	0.1	10				
16	Bidens pilosa	0.1	2				
17	Conyza bonar.	0.1	5				
18	Plantago lanc	0.1	20				
19	Cenchrus clandest	1	50				
20	Senecio madagasc	0.2	10				
21	Verbena bonar.	0.5	200				
22	Micro stip stip.	5	500				
23	Sporob creb.	30	3000				
24	Nassella nees.	2	100				
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: **TG**=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: **C** = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

cumberland ecology

Date: 28/4/2023	Project #: 21170	Location	Waypoint	Easting	Northing
Personnel: BE, MP	Plot ID: P 6 320	Start:	58	294008	6223069
Photos: 830 - 833	Orientation (°): 320	End:	57	293996	6223119
Dimensions: □20x20, □10x40	PCT: CPW - weedy				

Sheet: 1 of 1

Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1 Eragr. leptost.	5	500				
2 Olea europ. cusp.	30	20				
3 Micro stip stip	15	1500				
4 Euc. crebra	10	1				
5 Euc. moluc.	15	2				
6 Cynodon dactyl.	5	500				
7 Chloris ventr.	1	100				
8 Sporob. creb.	5	500				
9 Rytidosp. caesp.	0.5	50				
10 Asparagus asper.	0.2	5				
11 Ehrharta erecta	10	1000				
12 Sida rhomb.	0.25	30				
13 Tarax. offcin.	0.1	5				
14 Einadia poly.	0.1	10				
15 Conyza bonar.	0.1	3				
16 Solanum nigrum.	1	20				
17 Glyc. tabac.	0.1	2				
18 Cirsium vulgare	0.2	5				
19 Setaria parvif.	1	100				
20 Plectranthus parvif.	1	40				
21 Senecio mad.	0.2	5				
22 Oxalis perenn.	0.1	5				
23 Einad. trigon.	0.1	2				
24 Aristida ramosa	1	100				
25 Vittadinia cuneat.	0.1	10				
26 Conyza sumatr.	0.1	5				
27 Rytidosp. racemos.	0.1	2				
28 Lycium ferociss.	35	60				
29 Veronica plebeia	0.1	5				
30 Dichondra repens	0.1	50				
31 Austro verticill.	1	20				
32 Sida rhomb.	0.2	20				
33 Lant. cam.	5	3				
34 Nassella nees.	0.2	5				
35						
36						
37						
38						
39						
40						

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**... etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**... up to **100, 200**... up to **1,000**...etc

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Date: 28/4/2023	Project #: 21120	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BT, MP.	Plot ID: P 7	Start:	60	293 839	6225139	
Photos: 834 - 837	Orientation (°): 252	End:	61	293 791	6223131	
Dimensions: □20x20, □10x40	PCT: LOPNG					Sheet: 1 of 1

Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
Spofob creb.	30	3000				
Verbena bonar.	2	100				
Verbena quadr.	0.25	20				
Microlaena stip. stip	5	500				
Briza subaristata	1	100				
Cynodon dactylon	5	500				
Both macra	1	100				
Eragr. curv.	1	50				
Both. decip decip.	15	1000				
Geranium solanderi	0.1	3				
Sida rhomb.f.	0.25	30				
Lotus peremne	1	200				
Eragr. cunif						
Eragr. lepto.	5	500				
Hybch radic.	0.1	40				
Chloris ventric.	2	200				
Hypericum perfor.	0.1	20				
Massela medicaginea	1	40				
Cirsium vulgare	0.1	2				
Setaria parv.f.	5	500				
Lysimachia arvensis	0.1	50				
Lilium trigynum	0.1	20				
Digitaria sp.	0.1	1				no1
Medicago polymorph.	0.1	10				
Plantago lanceolata	0.1	50				
Rumex crispus	0.1	200				
Paspalum dil.	36	3000				

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: **TG**=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: **C** = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/04/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BE, MP.	Plot ID: P 8	Start:	62	293616	6223448	
Photos: 838 - 847	Orientation (°): 255	End:	63	293565	6223147	
Dimensions: ☑20x20, ☐10x40	PCT: Ext. grass.					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Paspalum dilat.	55	5000				
2	Sporob. creb.	5	500				
3	Chloris gayana	5	500				
4	Sida acuta	0.1	10				
5	Micro stip sth.	5	500				
6	Geranium solanderi	0.1	10				
7	Plantago lanceol.	0.1	50				
8	Soweria madagascar.	0.1	5				
9	Medicago arabica	0.1	10				
10	Taraxacum offic.	0.1	20				
11	Sida rhomb.	0.1	10				
12	Cynodon dactylon	35	3000				
13	Stachys arvensis	0.1	5				
14	Verbena quadrident.	0.1	5				
15	Carex inversa	0.1	20				
16	Verbena bonariensis	0.1	2				
17	Hypochaeris radic.	0.1	10				
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
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33							
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36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/04/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BT, MP.	Plot ID: P 09	Start:	64	293644	6223336	
Photos: 842 - 845	Orientation (°): 232	End:	65	293602	6223311	
Dimensions: □20x20, □10x40	PCT: LOONG/E102. grass					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Sporob. creb.	30	30000				
2	Cynodon dactylon	20	2000				
3	Micro stip stip.	30	3000				
4	Both. decip decip.	2	200				
5	Verbena quadr.	0.2	20				
6	Lysimach. anerg.is	0.1	50				
7	Lolium perenne	1	200				
8	Paspalum dilatatum	15	1500				
9	Geranium solander.	0.3	40				
10	Plantago lanceo lata	0.2	100				
11	Alternanth. pung.	0.1	1				
12	Sida rhomb.	0.1	10				
13	Rumex brown.i	0.1	1				
14	Aristida ramosa	1	100				
15	Chloris truncata	0.1	5				
16	Chloris gayana	0.5	30				
17	Cenchrus parif.	1	100				
18	Lolium perenne						
19	Eragrostis leptost	0.2	20				
20	Hypericum perfor.	0.1	20				
21	Oxalis perennans	0.1	2				
22	Carex inversa	0.1	30				
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 1/5/2023	Project #: 24170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: RM MP	Plot ID: P 10	Start:	01	293569	223281	
Photos: 1331 - 1334	Orientation (°):	End:	02	293578	223327	Sheet: 1 of 2
Dimensions: ▱20x20, □10x40	PCT:					

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Eucalyptus moluccana	30	8			C, Sc, S	
2	Eucalyptus crebra	20	4			C, Sc	
3	Olea europaea ssp cuspidata	30	40				
4	Lycium ferocissimum	15	20				
5	Paspalum dilatatum	1	50				
6	Chloris ventricosa	2	200				
7	Verbena bonariensis	0.4	20				
8	Sida rhombifolia	10	200				
9	Themeda triandra	0.4	20				
10	Eragrostis leptostachya	2	200				
11	Bromus catharticus	1	100				
12	Microlaena stip v. stip	10	1000				
13	Paspalum dilatatum	1	50				
14	Plantago lanceolata	0.4	40				
15	Setaria parviflora	1	100				
16	Dichondra repens	0.6	60				
17	Ehrharta erecta	1	100				
18	Sporobolus creber	10	500				
19	Poa sieberiana v. sieb	0.6	10				
20	Bothriochloa macra	0.4	40				
21	Dactylis glomerata	0.4	40				
22	Austrostipa sp.	0.4	15				
23	Cirsium vulgare	0.2	10				
24	Chloris gayana	0.4	20				
25	Senecio madagascariensis	0.1	5				
26	Araujia sericifera	1	20				
27	Oxalis perennans	0.2	20				
28	Asparagus asparagoides	0.2	10				
29	Acacia implexa	0.1	1			S	
30	Lepidium africanum	0.1	5				
31	Aristida ramosa	2	100				
32	Cynodon dactylon	1	100				
33	Lantana camara	0.2	1				
34	Austrostipa verticillata	1	20				
35	Carex inversa	0.2	20				
36	Rytidosperma caespitosum	0.2	20				
37	Veronica plebeia	0.1	5				
38	Gamochaeta americana	0.1	10				
39	Eragrostis curvula	0.2	10				
40	Cyperus gracilis	0.1	10				

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: **TG**=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: **C** = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: __/__/____	Project #: _____	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: _____	Plot ID: P 10	Start:				
Photos: _____	Orientation (°): _____	End:				Sheet: 2 of 2
Dimensions: □20x20, □10x40	PCT:					

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Glycine tabacina	0.1	2				
2	Eriodia nutans ssp. nutans	0.1	5				
3							
4							
5							
6							
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9							
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37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: **TG**=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: **C** = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 1/5/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: RM, MP	Plot ID: P 4	Start:	03	293620	222761	
Photos: 1336 - 1339	Orientation (°):	End:	04	293589	222800	Sheet: of
Dimensions: □20x20, □10x40	PCT:					

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
						C.	
1	Eucalyptus moluccana	30	2				
2	Amyema pendula ssp pendula	2	10				
3	Olea europaea ssp cuspidata	2	10				
4	Lycium ferocissimum	50	50				
5	Einadenta erecta	5	250				
6	Bromus catharticus	2	100				
7	Cylindrenus imbecillus	0.1	10				
8	Cynodon vulgare	1	40				
9	Microlaena stipoides v. stip	5	500				
10	Lantana camara	5	20				
11	Asparagus asparagoides	0.4	20				
12	Sporobolus creber	10	500				
13	Plantago lanceolata	0.2	20				
14	Sida rhombifolia	0.4	20				
15	Lysimachia arvensis	0.2	20				
16	Chloris ventricosa	0.4	40				
17	Paspalum dilatatum	2	100				
18	Eragrostis curvula	10	500				
19	Bothriochloa macra	1	100				
20	Cynodon dactylon	5	500				
21	Rytidosperma race v. race	0.2	20				
22	Conyza bonariensis	0.1	10				
23	Einadia nutans v. nutans	0.1	10				
24	Oxalis perennans	0.1	10				
25	Einadia trigonos	0.1	5				
26	Sporobolus creber	10	500				
27	Conyza sumatrensis	1	50				
28	Modiola caroliniana	0.1	5				
29	Cyperus gracilis	0.1	10				
30	Eriochloa pseudoacrotricha	0.4	40				
31	Malva parviflora	0.2	20				
32	Carex inversa	0.1	5				
33	Hypochaeris radicata	0.2	20				
34	Rubus fruticosus spp. comp.	0.2	10				
35	Verbena bonariensis	0.1	5				
36	Austrostipa sp.	0.1	2				
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Date: 1/5/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: RM MP	Plot ID: P_12	Start:	05	294041	223144	
Photos: 1341-1344	Orientation (°): ___	End:	06	294054	223097	Sheet: __ of __
Dimensions: ◻20x20, □10x40	PCT:					

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Sporobolus creber	20	1000				
2	Paspalum dilatatum	10	500				
3	Cynodon dactylon	10	1000				
4	Cenchrus clandestinus	10	500				
5	Bothriochloa macra	10	1000				
6	Sida rhombifolia	1	60				
7	Oxalis corniculata	0.2	40				
8	Verbena bonariensis	0.2	20				
9	Plantago lanceolata	5	350				
10	Trifolium repens	5	500				
11	Microlaena stipoides v. stip	5	500				
12	Conyza sumatrensis	0.2	20				
13	Senecio madagascariensis	0.2	20				
14	Sporobolus elongatus	1	50				
15	Eriochloa pseudoacrotricha	2	200				
16	Conyza bonariensis	0.1	10				
17	Rytidosperma caespitosum	0.2	20				
18							
19							
20							
21							
22							
23							
24							
25							
26							
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32							
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: **TG**=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: **C** = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Date: 2/5/2023	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: KM MP	Plot ID: P 13	Start:	16	293596	223381	
Photos: 1354-1357	Orientation (°):	End:	17	293596	223433	
Dimensions: □20x20, □10x40	PCT:					Sheet: of

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Chloris gayana	60	3000				
2	Cirsium vulgare	5	150				
3	Setaria parviflora	5	250				
4	Verbena bonariensis	1	100				
5	Cynodon dactylon	5	500				
6	Oxalis perennans	0.1	10				
7	Bidens subalternans	0.4	40				
8	Paspalum dilatatum	1	50				
9	Geranium solanderi	0.2	20				
10	Microlaena stip v. stip	5	500				
11	Themeda triandra	0.4	40				
12	Senecio madagascariensis	0.2	20				
13	Hypochaeris radicata	0.2	20				
14	Conyza bonariensis	0.1	2				
15	Eucalyptus sphaericus	0.1	10				
16	Lysimachia arvensis	0.1	10				
17	Conyza sumatrensis	0.1	10				
18	Sida rhombifolia	0.4	40				
19	Cyperus gracilis	0.1	10				
20	Acacia implexa	0.2	5				
21	Plantago lanceolata.	0.1	10				
22	Eragrostis curvula.	0.4	10				
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							

Date: 11/04/2021	Project #: 21170	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, MP.	Plot ID: P 13	Start:	223	293872	6222891	
Photos: 313 - 316	Orientation (°): 235	End:	224	293823	6222880	
Dimensions: ☑20x20, ☐10x40	PCT: LPDNG					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Nassella neesiana	20	1000				
2	Themeda triandra	15	1000				
3	Verbena bonariensis	5	200				
4	Senecio madagascariensis	0.25	100				
5	Panicum effusum	15	1500				
6	Dichanthium sericeum	1	100				
7	Sida rhombifolia	0.25	20				
8	Paspalum dilatatum	20	2000				
9	Plantago lanceolata	0.1	30				
10	Gamphocarpus fruticosus	0.5	20				
11	Glycine tabacina	0.1	10				
12	Aristida ramosa	1	100				
13	Both. decip. decip.	5	500				
14	Bidens pilosa	0.5	35				
15	Setaria parviflora	10	1000				
16	Eragrostis leptostachya	1	100				
17	Sporobolus creber	1	100				
18	Verbena quadrangularis	0.2	30				
19	Cenchrus solandri	0.1	10				
20	melinis repens	0.1	10				
21	Oxalis corniculata	0.1	30				
22	Cynodon dactylon	5	400				
23	Rhynchosia brownii	0.1	2				
24	Lepidium africanum	0.1	10				
25	Microlaena stipoides	5	500				
26	Malvaceae phlox.	0.1	10				
27	Cirsium vulgare	0.1	2				
28	Petrorhagia dubia	0.1	5				
29	Oxalis bifurcata	0.1	3				
30	Linum trigynum	0.1	5				
31	Conyza sumatrensis	1	50				
32	Conyza bonar.	0.1	3				
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): 0.1, 0.2, 0.3...etc. up to 1, 2, 3...etc. up to 10, 15, 20, 25...etc. up to 100
Abundance: 1, 2, 3...up to 10, 20, 30...up to 100, 200...up to 1,000...etc

GF Group: TG=Tree, SG=Shrub, GG=Grass, FG=Forb, EG=Fern, OG=Other
Stratum: C = Canopy, SC = Sub-canopy, S = Shrub, G = Ground

Date: 1/12/2022	Project #: 21170	Location	Waypoint	Easting	Northing
Personnel: RM MP	Plot ID: P_17	Start:	192		
Photos: 1691 - 1694	Orientation (°):	End:	193		
Dimensions: ☑20x20, □10x40	PCT:				

cumberland ecology

Sheet: __ of __

Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1 Eucalyptus moluccana	20	3			C,SC	
2 Olea europaea ssp. cuspidata	70	300				
3 Bursaria spinosa	0.6	5			S	
4 Verbena bonariensis	0.1	5				
5 Plectranthus parviflorus	1	20				
6 Sida rhombifolia	0.1	10				
7 Microlaena stipoides v. stipoides	5	500				
8 Oxalis perennans	0.2	20				
9 Carex inversa	0.1	10				
10 Brunoniella australis	0.1	10				
11 Veronica plebeia	0.1	5				
12 Ehrharta erecta	0.2	20				
13 Plantago lanceolata	0.1	10				
14 Olearia viscidula	0.1	1				
15 Poa labillardierei	0.2	10				
16 Lycium ferocissimum	15	25				
17 Dichondra repens	0.2	20				
18 Bidens subalternans	0.1	10				
19 Glycine tabacina	0.1	5				
20 Cyperus gracilis	0.1	10				
21 Asparagus asparagoides	0.1	2				
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Date: 28/04/2023

Personnel: M.P. B.F.

Project #: 21170

Plot ID: P001 20×20

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50–79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	5 2 4 6 3			
Average Score	4			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

- Grassland- cattle present
- Plot is within mapped watercourse, no watercourse is present – photos - 2610-2609

B-cattle

Date: 28/04/2023

Personnel: MP, BF

Project #: 21170

Plot ID: P002, 20x20

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	6

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	5 3 2 5 5			
Average Score	4			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Grassland - no recent grazing

A - cordyline

Date: 28/03/2023

Personnel: MR. OK.

Project #: 21170

Plot ID: P003 , 10x10

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[8, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	1 1 2 1 1			
Average Score				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

- Kikuyu dominant

D - cattle

Date: 28/04/2023

Personnel: MP. BE

Project #: 21170

Plot ID: P 064

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☒ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☒ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7] (≥10cm diameter, >50cm in length)	
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	3 3 2 3 5			
Average Score	3.2			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

grassland - low density

B-condition

Date: 28/04/2023

Personnel: MP, BK

Project #: 21176

Plot ID: P 005

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[4]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	2 2 3 2 2			
Average Score	2.2			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Good - B condition

Date: 28/04/2022

Personnel: M.O. BK

Project #: 21170

Plot ID: P006

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☑ Yes ☐ No	1	1
30-49 cm	☑ Yes ☐ No	1111	1111
20-29 cm	☑ Yes ☐ No	1	
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☑ Yes ☐ No

1. DBH measured at 1.3m above ground.
2. Only living, native tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	5, 1
Total (m)	1.5

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]					Bare Ground Cover (%)					Cryptogram Cover (%)					Rock Cover (%)				
1 x 1m Score[8]	5	10	10	12	8															
Average Score	9																			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

CPW- dense Banksia/Lambertia/Olive

Most trees in area with DBH over 30cm have small/medium hollows

Date: 26/09/2023

Personnel: MP, BF

Project #: 21120

Plot ID: P007

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☒ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☐ No		
10-19 cm	☐ Yes ☒ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	2 2 1 3 4			
Average Score	2.4			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (< 10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Grassland

Date: 28/04/2023

Personnel: MP, BC

Project #: 21170

Plot ID: P008

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7] (≥10cm diameter, >50cm in length)	
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	5 4 2 3 2			
Average Score	3.2			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Grassland

Date: 28/04/2023

Personnel: MP. BE.

Project #: 21170

Plot ID: P009

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No	1	
50-79 cm	☐ Yes ☑ No	1	
30-49 cm	☐ Yes ☑ No	1	
20-29 cm	☐ Yes ☑ No	1	
10-19 cm	☐ Yes ☑ No	1	
5-9 cm	☐ Yes ☑ No	1	
<5 cm	☐ Yes ☑ No	1	
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7] (≥10cm diameter, >50cm in length)	
Tally	
Total (m)	0

6. Dead native and exotic species recorded
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	2 1 1 2 1			
Average Score	1.4			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Fresh grassland

Date: 01/05/2023

Personnel: MP, RM

Project #: 21170

Plot ID: P010

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☐ No		
50-79 cm	☑ Yes ☐ No	1	1
30-49 cm	☑ Yes ☐ No		
20-29 cm	☐ Yes ☐ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☑ Yes ☐ No		
Are there hollow-bearing trees within the zone?[5]			☑ Yes ☐ No

1. DBH measured at 1.3m above ground.
2. Only living native tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	5, 3.5, 1
Total (m)	(5)

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	5 | 5 | 10 | 15 | 65			
Average Score	20			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

SHW- Olive/Boxthorn infestation

Date: 01/05/2023

Personnel: MP, RM

Project #: 21170

Plot ID: P011

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[3, 4]	Hollow-bearing Tree Count[4]
80+ cm	☑ Yes ☐ No	1	1
50-79 cm	☐ Yes ☑ No	0	
30-49 cm	☑ Yes ☐ No	1	1
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☑ Yes ☐ No		
Are there hollow-bearing trees within the zone?[5]			☑ Yes ☐ No

1. DBH measured at 1.3m above ground.
2. Only living native tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	1, 5, 1, 1, 5
Total (m)	13 (3)

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]					Bare Ground Cover (%)					Cryptogram Cover (%)					Rock Cover (%)				
1 x 1m Score[8]	2	3	3	2	3															
Average Score																				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

SHV- Boxthorn in Garden

Date: 01/05/2023

Personnel: MP, RM

Project #: 21170

Plot ID: P012

cumberland ecology

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7] (≥10cm diameter, >50cm in length)	
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	2 5 2 2 2			
Average Score	2.6			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Grassland - surveyed by K. Kingsford

Date: 02/05/2023	Project #: 21170	cumberland ecology
Personnel: MP, RM.	Plot ID: P013	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	1 2 1 3 1			
Average Score	1.6			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Chloris gayana dom grassland

Date: 11/04/2022	Project #: 21170	cumberland ecology
Personnel: MP, BF,	Plot ID: P ~~Q01~~ 13	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☐ No	/	
50-79 cm	☐ Yes ☐ No	/	
30-49 cm	☐ Yes ☐ No	/	
20-29 cm	☐ Yes ☐ No	/	
10-19 cm	☐ Yes ☐ No	/	
5-9 cm	☐ Yes ☐ No	/	
<5 cm	☐ Yes ☐ No	/	
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	/
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	5 5 5 10 10			
Average Score	7			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

- Gradual better within than adjoining areas on upper slopes
- Shale Hills Woodland

Date: 01/12/2022	Project #: 21170	cumberland ecology
Personnel: MP, RM, __	Plot ID: P017	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☑ Yes ☐ No	1	1
50-79 cm	☑ Yes ☐ No	111	111
30-49 cm	☑ Yes ☐ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☑ Yes ☐ No		
<5 cm	☑ Yes ☐ No		
Are there hollow-bearing trees within the zone?[5]			☑ Yes ☐ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	5.5, 3, 1, .5, 4, 1, 2.5, 1, 9.5, 4, 1.5, 10, 9.5, 3, 1.5,
Total (m)	57.5

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	60 | 95 | 85 | 90 | 80			
Average Score	82			

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	

Additional Notes

African olive dominated woodland with dense boxthorn in open areas around plot.

APPENDIX B :
Flora Species List

Table 31 Floristic data

Scientific Name	Common Name	Exotic	High Threat Weed	1		2		3		4		5		6		7		8		9		10		11		12		13		13 (2022) - 14 (2023)		17 (2022) - 15 (2023)	
	Plot #			C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Acacia implexa	Hickory Wattle																					0.1	1					0.2	5				
Alternanthera pungens	Khaki Weed	*	Yes					0.1	1											0.1	1												
Amyema pendula subsp. *pendula*																								2	10								
Anthosachne scaber	Wheatgrass, Common Wheatgrass					0.1	10			0.1	10																						
Araujia sericifera	Moth Vine	*	Yes																			1	20										
Aristida ramosa	Purple Wiregrass									1	100			1	100					1	100	2	100							1	100		
Aristida vagans	Threeawn Speargrass					1	100																										
Asparagus asparagoides	Bridal Creeper	*	Yes											0.2	5							0.2	10	0.4	20							0.1	2
Asperula conferta	Common Woodruff					0.1	20																										
Austrostipa verticillata	Slender Bamboo Grass													1	20							1	20	0.1	2								
Bidens pilosa	Cobbler's Pegs	*	Yes									0.1	2																	0.5	35		
Bidens subalternans	Greater Beggar's Ticks	*	Yes																									0.4	40			0.1	10
Bothriochloa decipiens var. decipiens	Pitted Bluegrass			1	100	1	100			3	300	5	500			15	1000			2	200									5	500		
Bothriochloa macra	Red Grass															1	100					0.4	40	1	100	10	1000						
Briza subaristata		*	Yes							0.1	10	0.2	20			1	100																
Bromus catharticus	Praire Grass	*																				1	100	2	100								
Brunoniella australis	Blue Trumpet																															0.1	10
Bursaria spinosa	Native Blackthorn																															0.6	5
Carex inversa	Knob Sedge			0.1	10			0.1	50			0.1	100			0.1	200	0.1	20	0.1	30	0.2	20	0.1	5							0.1	10
Cenchrus clandestinus	Kikuyu Grass	*	Yes	15	1500			70	7000			1	50													10	500						
Centaurium erythraea	Common Centaury	*				0.1	1																										
Centaurium tenuiflorum	Branched Centaury, Slender centaury	*								0.1	2																						
Chloris gayana	Rhodes Grass	*	Yes	15	1000	1	50			1	40			1	40			5	500	0.5	30	0.4	20					60	3000				
Chloris truncata	Windmill Grass																			0.1	5												
Chloris ventricosa	Tall Chloris			0.1	10					0.2	30			1	100	2	200					2	200	0.4	40								
Cirsium vulgare	Spear Thistle	*		0.2	20	1	30	1	50			0.1	10	0.2	5	0.1	2					0.2	10	1	40			5	150	0.1	2		
Conyza bonariensis	Flaxleaf Fleabane	*		0.1	10	0.1	3					0.1	5	0.1	3									0.1	10	0.1	10	0.1	2	0.1	3		
Conyza sumatrensis	Tall fleabane	*				0.1	3							0.1	5									1	50	0.2	20	0.1	10	1	50		
Cyclospermum leptophyllum	Slender Celery	*		0.1	10																												
Cynodon dactylon	Common Couch			20	2000	10	1000	20	2000	5	500	10	1000	5	500	5	500	35	3000	20	2000	1	100	5	500	10	1000	5	500	5	400		
Cyperus gracilis	Slender Flat-sedge																					0.1	10	0.1	10			0.1	10			0.1	10
Dactylis glomerata	Cocksfoot	*																				0.4	40										
Dichondra repens	Kidney Weed													0.1	50							0.6	60									0.2	20
Dichanthium sericeum subsp. sericeum	Queensland Bluegrass																													1	100		
Digitaria ramularis																0.1	1																
Ehrharta erecta	Panic Veldtgrass	*	Yes											10	1000							1	100	5	250							0.2	20
Einadia nutans subsp. nutans	Climbing Saltbush																					0.1	5	0.1	10								
Einadia polygonoides	Knotweed Goosefoot													0.1	10																		
Einadia trigonos	Fishweed													0.1	2									0.1	5								
Enteropogon acicularis	Curly Windmill Grass									0.1	5																						
Eragrostis curvula	African Lovegrass	*	Yes			0.5	30	2	50	20	2000	15	1000			1	50					0.2	10	10	500			0.4	10				
Eragrostis leptostachya	Paddock Lovegrass					0.1	5			0.1	10	2	200	5	500	5	500			0.2	20	2	200							1	100		
Eriochloa pseudoacrotricha	Early Spring Grass							0.1	5															0.4	40	2	200						
Eucalyptus crebra	Narrow-leaved Ironbark													10	1							20	4										
Eucalyptus moluccana	Grey Box													15	2							30	8	30	2							20	3
Euchiton sphaericus	Star Cudweed																											0.1	10				
Geranium solanderi	Native Geranium					1	200			0.5	40	0.2	10			0.1	3	0.1	10	0.3	40							0.2	20	0.1	10		
Glycine microphylla	Small-leaf Glycine					0.1	1																										
Glycine tabacina	Variable Glycine									0.1	5			0.1	2							0.1	2							0.1	10	0.1	5
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush	*																												0.5	20		
Hypericum gramineum	Small St John's Wort					0.1	3																										
Hypericum perforatum	St. Johns Wort	*	Yes			0.2	30			0.1	10					0.1	20			0.1	20												
Hypochaeris radicata	Catsear	*		0.1	30	0.1	50									0.1	40	0.1	10					0.2	20			0.2	20				
Lantana camara	Lantana	*	Yes			0.4	1							5	3							0.2	1	5	20								

Scientific Name	Common Name	Exotic	High Threat Weed	Plot # 1		2		3		4		5		6		7		8		9		10		11		12		13		13 (2022) - 14 (2023)		17 (2022) - 15 (2023)	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Lepidium africanum	Common Peppercress	*																				0.1	5							0.1	10		
Linum trigynum	French Flax	*				0.1	10									0.1	20													0.1	5		
Lolium perenne	Perennial Ryegrass	*		1	200			1	300							1	200			1	200												
Lycium ferocissimum	African Boxthorn	*	Yes											35	60							15	20	50	50							15	25
Lysimachia arvensis	Scarlet Pimpernel	*		0.1	20			0.1	20							0.1	50			0.1	50	0.1	10	0.2	20			0.1	10				
Malva parviflora	Small-flowered Mallow	*																						0.2	20								
Medicago arabica	Spotted Burr Medic	*																0.1	10														
Medicago polymorpha	Burr Medic	*		0.1	20					0.1	5					0.1	10													0.1	10		
Melinis repens	Red Natal Grass	*																												0.1	10		
Microlaena stipoides var. stipoides	Weeping Grass					5	500			10	1000	5	500	15	1500	5	500	5	500	30	3000	10	1000	5	500	5	500	5	500	5	500	5	500
Modiola caroliniana	Red-flowered Mallow	*																						0.1	5								
Nassella neesiana	Chilean Needle Grass	*	Yes									2	100	0.2	5	1	40													20	1000		
Olea europaea subsp. cuspidata	African Olive	*				0.1	1							30	20							30	40	2	10							70	300
Olearia viscidula	Wallaby Weed																															0.1	1
Oplismenus imbecillis																								0.1	10								
Oxalis corniculata	Creeping Oxalis	*																								0.2	40			0.1	30		
Oxalis perennans						0.1	50							0.1	5					0.1	2	0.2	40	0.1	10			0.1	10			0.2	20
Oxytes brachypoda	Large Tick-trefoil																													0.1	3		
Panicum effusum	Hairy Panic							0.1	1	0.5	50	0.1	2																	15	1500		
Paspalum dilatatum	Paspalum	*	Yes	55	5000	10	1000	5	500	10	1000	30	3000			30	3000	55	5000	15	1500	1	50	2	100	10	500	1	50	20	2000		
Paspalidium distans								0.1	5	0.1	5																						
Petrorhagia dubia		*																												0.1	5		
Plantago lanceolata	Lamb's Tongues	*		0.2	100	0.1	50	1	300	0.1	30	0.1	20			0.1	50	0.1	50	0.2	100	0.4	40	0.2	20	5	350	0.1	10	0.1	30	0.1	10
Plectranthus parviflorus																																1	20
Poa labillardierei	Tussock																															0.2	10
Poa sieberiana var. sieberiana	Snowgrass																					0.6	10										
Rapistrum rugosum	Turnip Weed	*		0.1	3			0.1	2																								
Romulea rosea var. australis	Onion Grass	*	Yes			0.1	100																										
Rosa canina	Dog Rose	*				0.5	3																										
Rubus fruticosus sp. agg.	Blackberry complex	*	Yes																					0.2	10								
Rumex brownii	Swamp Dock																			0.1	1									0.1	2		
Rytidosperma caespitosum	Ringed Wallaby Grass					0.1	5							0.5	50							0.2	20			0.2	20						
Rytidosperma racemosum var. racemosum	Wallaby Grass													0.1	2									0.2	20								
Senecio madagascariensis	Fireweed	*	Yes	0.1	5	0.2	10	0.2	10			0.2	10	0.2	5			0.1	5			0.1	5			0.2	20	0.2	20	0.5	100		
Setaria parviflora		*		1	100	5	500	1	160	2	200			1	100	5	500			1	100	1	100					5	250	10	1000		
Sida acuta	Spinyhead Sida	*																0.1	10														
Sida rhombifolia	Paddy's Lucerne	*		0.1	30	5	50	0.1	10	0.2	30	0.3	50	0.2	30	0.25	30	0.1	10	0.1	10	10	200	0.4	20	1	60	0.4	40	0.25	20	0.1	10
Solanum nigrum	Black-berry Nightshade	*												1	20																		
Sonchus oleraceus	Common Sowthistle	*		0.1	2			0.1	3																								
Sporobolus creber	Slender Rat's Tail Grass			5	500	10	1000	0.1	5	50	5000	30	3000	5	500	30	3000	5	500	30	30000	10	500	10	500	20	1000			1	100		
Sporobolus elongatus	Slender Rat's Tail Grass					40	3000			1	40	1	35													1	50						
Stachys arvensis	Stagger Weed	*																0.1	5														
Taraxacum officinale	Dandelion	*		0.1	10			0.1	2					0.1	5			0.1	20														
Themeda triandra						30	2000															0.4	20					0.4	40	15	1000		
Trifolium repens	White Clover	*		0.25	50			0.1	20																	5	500						
Verbena bonariensis	Purpletop	*				2	100			1	50	0.5	20			2	100	0.1	2			0.4	20	0.1	5	0.2	20	1	100	5	200	0.1	5
Verbena quadrangularis		*		0.1	20	0.1	10	0.1	10	0.1	10	1	50	0.1	10	0.25	20	0.1	5	0.2	20									0.2	30		
Veronica plebeia	Trailing Speedwell													0.1	5							0.1	5									0.1	5

APPENDIX C :
BAM Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00040328/BAAS17027/23/00040469

Proposal Name
21170 Rosalind

BAM data last updated *
14/04/2023

Assessor Name
David Robertson

Assessor Number
BAAS17027

BAM Data version *
58

Proponent Names

Report Created
30/05/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
30/05/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	3319-Cumberland Shale Hills Woodland

Species
Chalinolobus dwyeri / Large-eared Pied Bat

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3319-Cumberland Shale Hills Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	24.5	88	0	88

BAM Biodiversity Credit Report (Like for like)

3319-Cumberland Shale Hills Woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Canopy	Yes	88	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_DNG	No	0	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_LCG	No	0	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**3319_Canopy**	3.5	106.00

Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	**3319_Canopy**	3.5	70.00
Meridolum corneovirens / Cumberland Plain Land Snail	**3319_Canopy**	3.5	70.00
Myotis macropus / Southern Myotis	**3319_Canopy, 3319_DNG, 3319_LCG**	14.0	40.00
Ninox connivens / Barking Owl	**3319_Canopy, 3319_DNG, 3319_LCG**	16.3	102.00
Ninox strenua / Powerful Owl	**3319_Canopy, 3319_DNG, 3319_LCG**	16.3	102.00
Petaurus norfolcensis / Squirrel Glider	**3319_Canopy**	3.5	70.00
Phascolarctos cinereus / Koala	**3319_Canopy**	3.5	70.00
Tyto novaehollandiae / Masked Owl	**3319_Canopy, 3319_DNG, 3319_LCG**	16.3	102.00

Credit Retirement Options

Like-for-like credit retirement options

Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion
	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW

Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Spp	IBRA subregion
	Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Any in NSW
Meridolum corneovirens / Cumberland Plain Land Snail	Spp	IBRA subregion
	Meridolum corneovirens / Cumberland Plain Land Snail	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Ninox connivens / Barking Owl	Spp	IBRA subregion
	Ninox connivens / Barking Owl	Any in NSW
Ninox strenua / Powerful Owl	Spp	IBRA subregion
	Ninox strenua / Powerful Owl	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW

Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Tyto novaehollandiae / Masked Owl	Spp	IBRA subregion
	Tyto novaehollandiae / Masked Owl	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00040328/BAAS17027/23/00040469

Proposal Name

21170 Rosalind

BAM data last updated *

14/04/2023

Assessor Name

David Robertson

Assessor Number

BAAS17027

BAM Data version *

58

Proponent Name(s)

Report Created

30/05/2023

BAM Case Status

Finalised

Assessment Revision

0

Assessment Type

Part 4 Developments (General)

Date Finalised

30/05/2023

BOS entry trigger

BOS Threshold: Biodiversity Values Map

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	3319-Cumberland Shale Hills Woodland

Species
Chalinolobus dwyeri / Large-eared Pied Bat

Additional Information for Approval

PCT Outside Ibra Added

None added

BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3319-Cumberland Shale Hills Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	24.5	88	0	88.00

3319-Cumberland Shale Hills Woodland

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_Canopy	Yes	88	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_DNG	No	0	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3319_LCG	No	0	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**3319_Canopy**	3.5	106.00
Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	**3319_Canopy**	3.5	70.00
Meridolum corneovirens / Cumberland Plain Land Snail	**3319_Canopy**	3.5	70.00
Myotis macropus / Southern Myotis	**3319_Canopy, 3319_DNG, 3319_LCG**	14.0	40.00
Ninox connivens / Barking Owl	**3319_Canopy, 3319_DNG, 3319_LCG**	16.3	102.00
Ninox strenua / Powerful Owl	**3319_Canopy, 3319_DNG, 3319_LCG**	16.3	102.00
Petaurus norfolcensis / Squirrel Glider	**3319_Canopy**	3.5	70.00
Phascolarctos cinereus / Koala	**3319_Canopy**	3.5	70.00
Tyto novaehollandiae / Masked Owl	**3319_Canopy, 3319_DNG, 3319_LCG**	16.3	102.00

Credit Retirement Options

Like-for-like options

Chalinolobus dwyeri/ Large-eared Pied Bat	Spp		IBRA region
	Chalinolobus dwyeri/Large-eared Pied Bat		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Marsdenia viridiflora subsp. viridiflora - endangered population/ Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Spp		IBRA region
	Marsdenia viridiflora subsp. viridiflora - endangered population/Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Flora	Endangered Population	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Meridolum corneovirens/ Cumberland Plain Land Snail	Spp	IBRA region	
	Meridolum corneovirens/Cumberland Plain Land Snail	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Myotis macropus/ Southern Myotis	Spp	IBRA region	
	Myotis macropus/Southern Myotis	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Ninox connivens/ Barking Owl	Spp	IBRA region	
	Ninox connivens/Barking Owl	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Ninox strenua/ Powerful Owl	Spp	IBRA region	
	Ninox strenua/Powerful Owl	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Petaurus norfolcensis/ Squirrel Glider	Spp	IBRA region	
	Petaurus norfolcensis/Squirrel Glider	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Phascolarctos cinereus/ Koala	Spp	IBRA region	
	Phascolarctos cinereus/Koala	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Endangered	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Tyto novaehollandiae/ Masked Owl	Spp	IBRA region	
	Tyto novaehollandiae/Masked Owl	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00040328/BAAS17027/23/00040469	21170 Rosalind	14/04/2023
Assessor Name	Report Created	BAM Data version *
David Robertson	30/05/2023	58
Assessor Number	BAM Case Status	Date Finalised
BAAS17027	Finalised	30/05/2023
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland Shale Hills Woodland												
1	3319_Canopy	Cumberland Plain Woodland in the Sydney Basin Bioregion	40.1	40.1	3.5	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	88

2	3319_DNG	Cumberland Plain Woodland in the Sydney Basin Bioregion	5.4	5.4	13.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
3	3319_LCG	Cumberland Plain Woodland in the Sydney Basin Bioregion	3.9	3.9	7.1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
											Subtotal	**88**
											Total	**88**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	True	106
								Subtotal	**106**

Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas (Flora)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered Population	Not Listed	False	70
								Subtotal	**70**
Meridolum corneovirens / Cumberland Plain Land Snail (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	70
								Subtotal	**70**
Myotis macropus / Southern Myotis (Fauna)									
3319_Canopy	40.1	40.1	0.33	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	7
3319_DNG	5.4	5.4	8.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	23

3319_LCG	3.9	3.9	5.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	10
								Subtotal	**40**
Ninox connivens / Barking Owl (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	70
3319_DNG	5.4	5.4	9.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	26
3319_LCG	3.9	3.9	3.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	6
								Subtotal	**102**
Ninox strenua / Powerful Owl (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	70

3319_DNG	5.4	5.4	9.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	26
3319_LCG	3.9	3.9	3.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	6
								Subtotal	**102**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	70
								Subtotal	**70**
Phascolarctos cinereus / Koala (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	70
								Subtotal	**70**
Tyto novaehollandiae / Masked Owl (Fauna)									
3319_Canopy	40.1	40.1	3.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	70

3319_DNG	5.4	5.4	9.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	26
3319_LCG	3.9	3.9	3.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	6
								Subtotal	**102**

APPENDIX D :
BAM Compliance Table

Table 32 BAM compliance table

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
Introduction	Chapters 2 and 3	Information	
		Introduction to the biodiversity assessment including:	-
		brief description of the proposal	Section 1.3.2
		identification of subject land boundary, including: operational footprint construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1.3.3
		general description of the subject land	Section 1.3.4
		sources of information used in the assessment, including reports and spatial data	Section 1.4
		Maps and Tables	
		Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 4
Landscape	Sections 3.1 and 3.2, Appendix E	Information	
		Identification of site context components and landscape features, including:	
		general description of subject land topographic and hydrological setting, geology and soils	Section 1.3.4 and Section 3.2
		percent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Section 3.3
		IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Section 3.2.1
		rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Section 3.2.2
		wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	Section 3.2.3
		connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Section 3.2.4

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.)	Section 3.2.5
		areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	Section 3.2.6
		any additional landscape features identified in any SEARs for the proposal	N/A
		NSW (Mitchell) landscape on which the subject land occurs	Section 3.2.7
		Maps and Tables	
		Site Map Boundary of subject land Cadastre of subject land Landscape features identified in BAM Subsection 3.1.3	Figure 1
		Location Map Digital aerial photography at 1:1,000 scale or finer Boundary of subject land Assessment area, (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development Landscape features identified in BAM Subsection 3.1.3 Additional detail (e.g. local government area boundaries) relevant at this scale	Figure 2
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: IBRA bioregions and subregions rivers, streams and estuaries wetlands and important wetlands connectivity of different areas of habitat karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features areas of outstanding biodiversity value occurring on the subject land and assessment area any additional landscape features identified in any SEARs for the proposal NSW (Mitchell) landscape on which the subject land occurs	Figure 1 and Figure 2
		Data	
		All report maps as separate jpeg files	N/A

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Individual digital shape files of: subject land boundary assessment area (i.e. subject land and 1500 m buffer area) boundary cadastral boundary of subject land areas of native vegetation cover landscape features	N/A
Native vegetation	Chapter 4, Appendix A and Appendix H	Information	
		Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	Section 4.1
		Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	Section 4.1
		Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	Section 2.1, Section 2.3.1, and Section 4.2
		Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 2.3
		Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A
		For each PCT within the subject land, describe:	-
		vegetation class	Section 4.2
		extent (ha) within subject land	Table 5
		evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	Section 4.2.1.3
		plant species relied upon for identification of the PCT and relative abundance of each species	Section 4.2.1.3 + Plot Data

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Section 4.2.1.4
		estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.))	Section 4.2.1
		Describe the vegetation integrity assessment of the subject land, including:	-
		identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Section 4.5
		assessment of patch size (as described in BAM Subsection 4.3.2)	Section 4.5
		survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	Table 2
		use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	Bam-C Assessment
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	-
		identify the PCT or vegetation class for which local benchmark data will be applied	-
		identify published sources of local benchmark data (if benchmarks obtained from published sources)	-
		describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	-
		provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	-
		provide written confirmation from the decision-maker that they support the use of local benchmark data	-
		Maps and Tables	
		Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 8
		Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 9
		Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 11

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 5
		Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 10 and Table 6
		Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 11
		Table of current vegetation integrity scores for each vegetation zone within the site and including: composition condition score structure condition score function condition score presence of hollow bearing trees	Table 7, Appendix A
		Data	
		All report maps as separate jpeg files	Uploaded to BAM-C
		Plot field data (MS Excel format)	Uploaded to BAM-C
		Plot field data sheets	Uploaded to BAM-C, Appendix E
		Digital shape files of: PCT boundaries within subject land TEC boundaries within subject land vegetation zone boundaries within subject land floristic vegetation survey and vegetation integrity plot locations	N/A
Threatened species	Chapter 5	Information	
		Identify ecosystem credit species likely to occur on the subject land, including:	-
		list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	Table 8
		justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	Section 5.2.2
		justification for addition of any ecosystem credit species to the list	-

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Identify species credit species likely to occur on the subject land, including:	-
		list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	Table 9
		justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	Table 9
		justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	Table 9
		justification for addition of any species credit species to the list	-
		From the list of candidate species credit species, identify:	-
		species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	-
		species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))	-
		species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.))	Section 5.3.2.1
		species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	-
		Present the outcomes of species credit species assessments from:	-
		threatened species survey (as described in BAM Section 5.2.4)	Table 10
		expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3)	-
		Where survey has been undertaken include detailed information on:	-
		survey method and effort, (as described in BAM Section 5.3)	Section 2.4.2 and Section 2.5.2
		justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published	Section 2.4.2 and Section 2.5.2
		timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was	Table 3

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		undertaken outside these guides include justification fo1r the timing of surveys	
		survey personnel and relevant experience	Table 1
		describe any limitations to surveys and how these were addressed/overcome	-
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	-
		justification of the use of an expert report	-
		identify the expert, provide evidence of their expert credentials and Departmental approval of expert status	-
		all requirements of Box 3 have been addressed in the expert report	-
		Where use of local data is proposed (BAM Subsection 1.4.2):	-
		identify relevant species	-
		identify data to be amended	-
		identify source of information for local data, e.g. published literature, additional survey data, etc.	-
		justify use of local data in preference to VIS Classification or TBDC data	-
		provide written confirmation from the decision-maker that they support the use of local data	-
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	-Section 5.3.2.4
		the unit of measure for each species is documented	Table 11
		for species assessed by area:	Table 11
		the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	Section 5.3.2.4
		a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	-Section 5.3.2.4
		for species assessed by counts of individuals:	-
		the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	-

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	-
		the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	-
		Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	Table 11
		Maps and Tables	
		Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: the ecosystem credit species removed from the list the sensitivity to gain class of each species	Table 8
		Table detailing species credit species in accordance with BAM section 5.2 and identifying: the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 9
		Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	-Table 10 and 11
		Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	-
		Data	
		Digital shape files of suitable habitat identified for survey for each candidate species credit species	-
		Survey locations including GPS coordinates of any plots, transects, grids	Figure 6 and 7, Appendix A
		Digital shape files of each species polygon including GPS coordinates of located individuals	-

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Species polygon map in jpeg format	-
		Expert reports and any supporting data used to support conclusions of the expert report	-
		Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	Appendix A
Prescribed Impacts	Chapter 6	Information	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	-
		karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)	Section 5.4, Table 13 and Figure 13
		occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2)	-
		corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3)	Section 5.4, Table 13 and Figure 13
		water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	Section 5.4, Table 13 and Figure 13
		protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	-
		where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	Section 5.4, Table 13 and Figure 13
		Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Table 13
		Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3)	Table 13
		Where the proposed development is for a wind farm:	-
		identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and	-

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	
		provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	-
		predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	-
		Maps and Tables	
		Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figure 13
		Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	-
		Data	
		Digital shape files of prescribed impact feature locations	N/A
		Prescribed impact features map in jpeg format	N/A
Avoid and minimise impacts	Chapter 7	Information	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	Chapter 6
		modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	-
		routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	-
		alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	-
		alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	-

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	-
		Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Section 7.2.1(3.))	-
		Maps and Tables	
		Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 15
		Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	-
		Maps demonstrating indirect impact zones where applicable	-
		Data	
		Digital shape files of: alternative and final proposal footprint direct and indirect impact zones	-
		Maps in jpeg format	N/A
Assessment of Impacts	Chapter 8, Sections 8.1 and 8.2	Information	
		Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Section 7.1.1 and Section 7.1.2
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	Section 7.1.3
		description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	Table 19
		documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	Table 19
		reporting any limitations or assumptions, etc. made during the assessment	-
		identification of the threatened entities and their habitat likely to be affected	Table 19

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	Section 7.2
		assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with:	-
		karst, caves, crevices, cliffs, rocks and other features of geological significance	-
		human-made structures	-
		non-native vegetation	-
		connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Section 7.2.1
		movement of threatened species that maintains their life cycle	Section 7.2.1
		water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	Section 7.2.2
		assessment of the impacts of wind turbine strikes on protected animals	-
		assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Section 7.2.3
		Maps and Tables	
		Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 18
		Data	
		N/A	-
Mitigation and Management of Impacts	Chapter 8, Sections 8.4 and 8.5	Information	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	-
		techniques, timing, frequency and responsibility	Table 21
		identify measures for which there is risk of failure	Table 21
		evaluate the risk and consequence of any residual impacts	Table 21
		document any adaptive management strategy proposed	Table 21

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Identification of measures for mitigating impacts related to:	
		displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	Table 21
		indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	Table 21
		mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	Section 7.4
		Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Section 7.5
		Maps and Tables	
		Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 21
		Data	
		N/A	-
Impact Summary	Chapter 9	Information	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	Section 8.2 and Table 22
		addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	-
		addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	-
		documenting assumptions made and/or limitations to information	-
		documenting all sources of data, information, references used or consulted	-
		clearly justifying why any criteria could not be addressed	-
		Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 8.3
		Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 8.4
		Identification of areas not requiring assessment in accordance with BAM Section 9.3	Section 8.5
		Maps and Tables	

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
		Map showing the extent of TECs at risk of an SAII within the subject land	-
		Map showing location of threatened species at risk of an SAII within the subject land	-
		Map showing location of: impacts requiring offset impacts not requiring offset areas not requiring assessment	Figure 15
		Data	
		Digital shape files of: extent of TECs at risk of an SAII within the subject land location of threatened species at risk of an SAII within the subject land boundary of impacts requiring offset boundary of impacts not requiring offset boundary of areas not requiring assessment	N/A
		Maps in jpeg format	N/A
Impact Summary	Chapter 10	Information	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	-
		future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H)	Table 23
		change in vegetation integrity score (BAM Subsection 8.1.1)	Table 23
		number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 9)	Table 26
		number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	Table 27
		Maps and Table	
		Table of PCTs requiring offset and the number of ecosystem credits required	Table 26
		Table of threatened species requiring offset and the number of species credits required	Table 27
		Data	
		Submitted proposal in the BAM Calculator	N/A

BDAR Section	BAM Ref.	BAM requirement	Location addressed in BDAR
Biodiversity Credit Report	Chapter 10	Information	
		Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	Table 28 and Table 29
		BAM credit report in pdf format	Appendix C
		Maps and Tables	
		Table of credit class and matching credit profile	Table 28 and Table 29
		Data	
		BAM credit report in pdf format	Appendix C

FIGURES

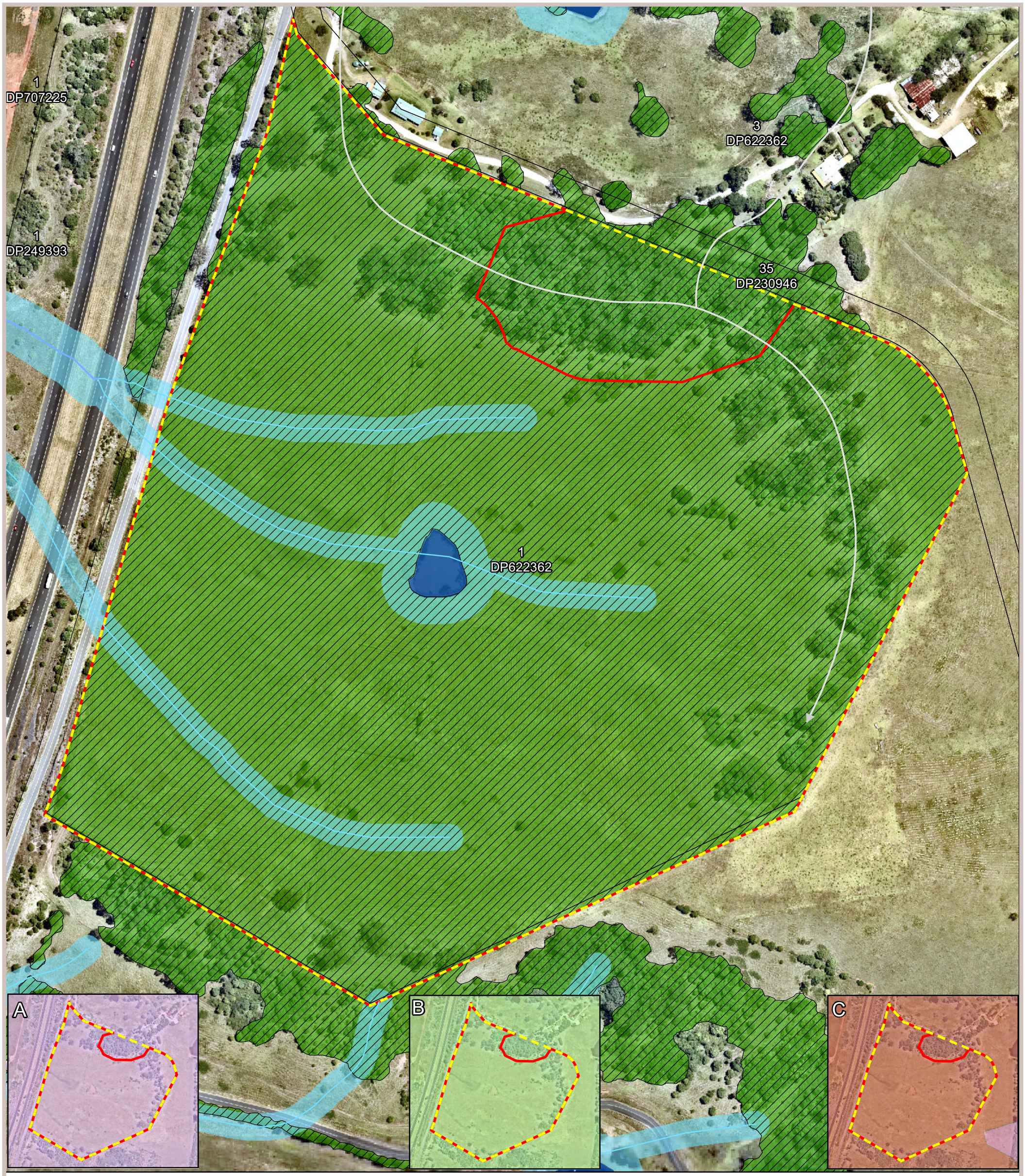

Figure 1. Site map

A

B

C

Legend

- Subject Land
- Study Area
- Assessment Area
- Native Vegetation Cover
- Patch Size
- Habitat Connectivity
- Cliff
- Wetlands and Waterbodies
- Riparian Corridor

Watercourses

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 6th Order Stream or above

IBRA Region (Inset A)

- Sydney Basin

IBRA Subregion (Inset B)

- Cumberland

NSW (Mitchell) Landscapes (Inset C)

- Cumberland Plain
- Hawkesbury - Nepean Channels and Floodplains
- Sydney Basin Diatremes
- Upper Nepean Gorges

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 10/1/2023

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Penrith LGA

DECCW (2008). Landscapes (Mitchell) of NSW - Version 3.

DSEWPaC (2012). Interim Biogeographic Regionalisation for Australia (IBRA) - Version 7.

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0 200 400 600 800 m

I:\...\21170\Figures\RP2\20230526\Figure 2. Location map

Figure 2. Location map

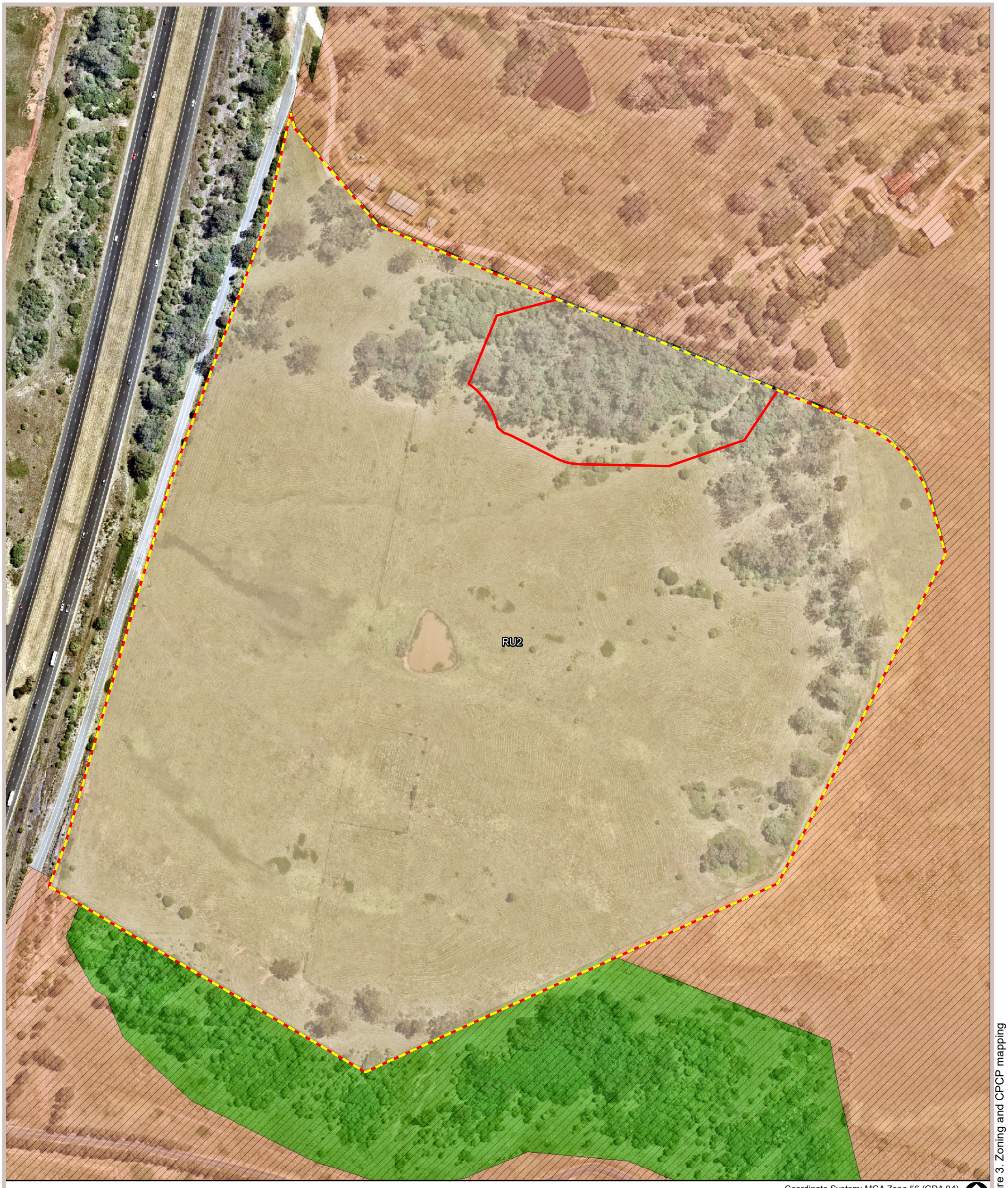
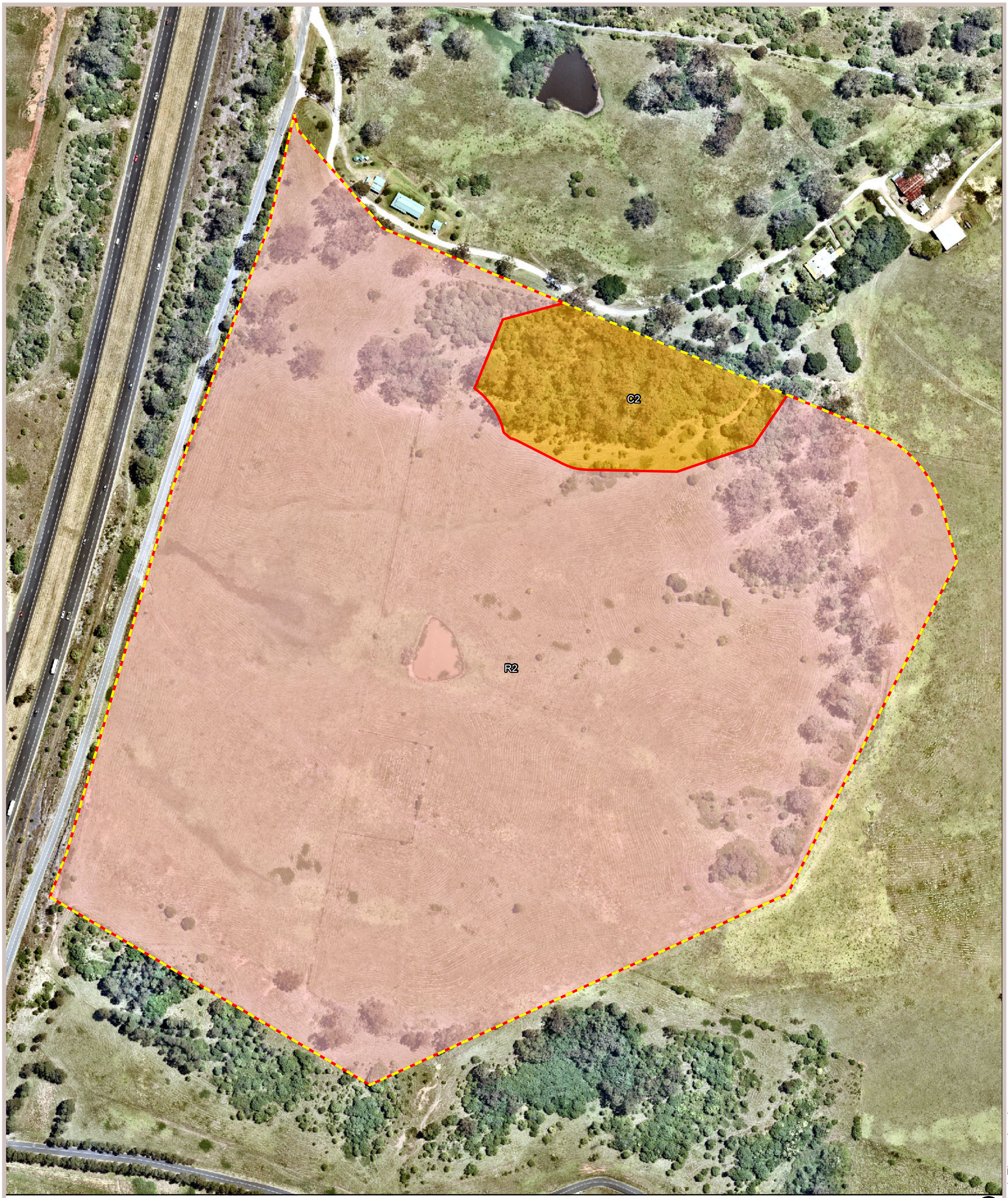


Figure 3. Zoning of the subject land and CPCP mapping



Legend

Subject Land

Study Area

Land Zoning

C2 - Environmental Conservation

R2 - Low Density Residential

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
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Dated: 10/1/2023

Data Source:
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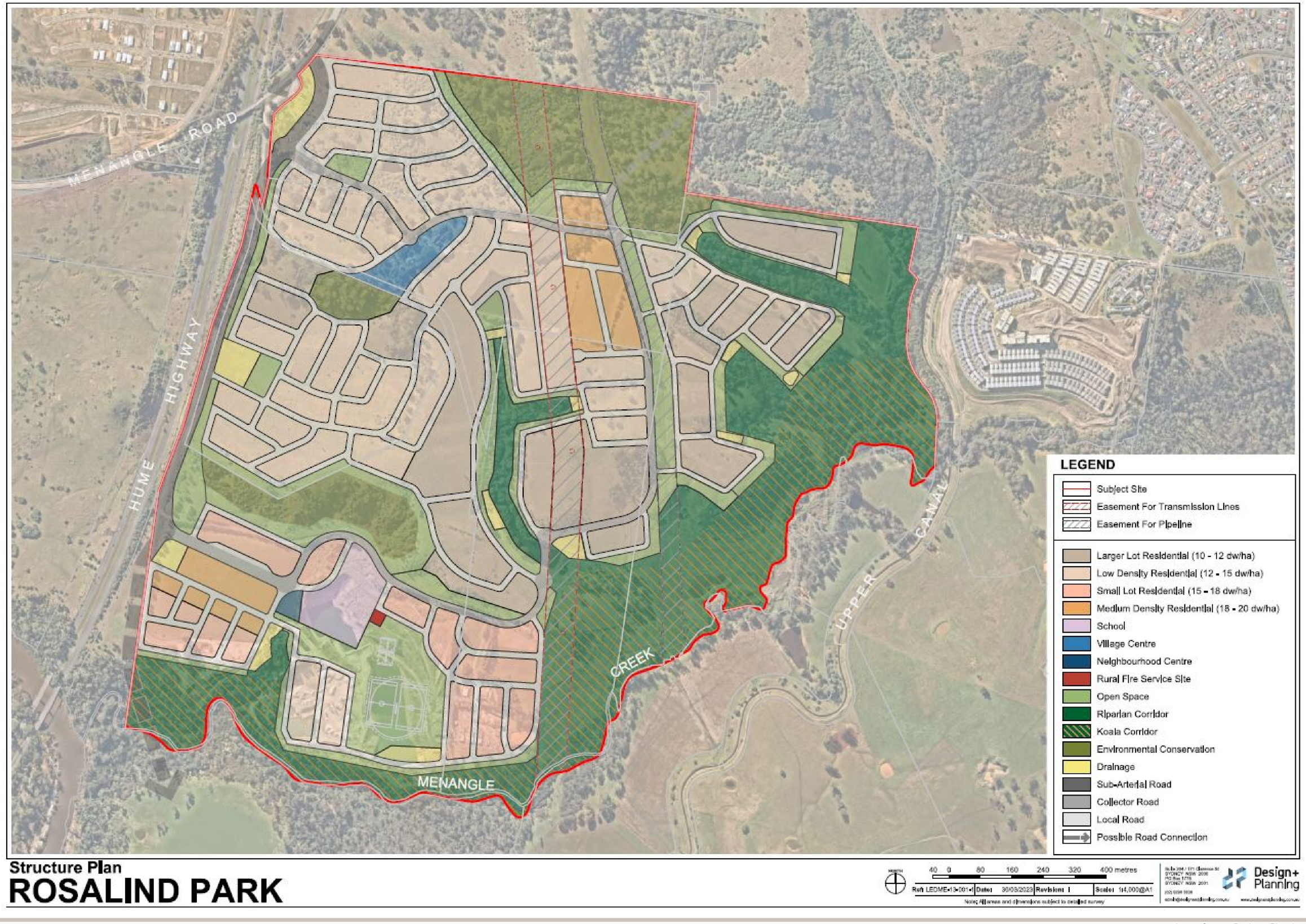
I:\...\21170\Figures\RP2\20230526\Figure 4. The project layout

Figure 4. The proposal layout (proposed rezoning)



I:\...\21170\Figures\RP2\20230512\Figure 5. The planning proposal

Image Source: Design + Planning 2023

Figure 5. The planning proposal

Figure 6. Flora survey locations

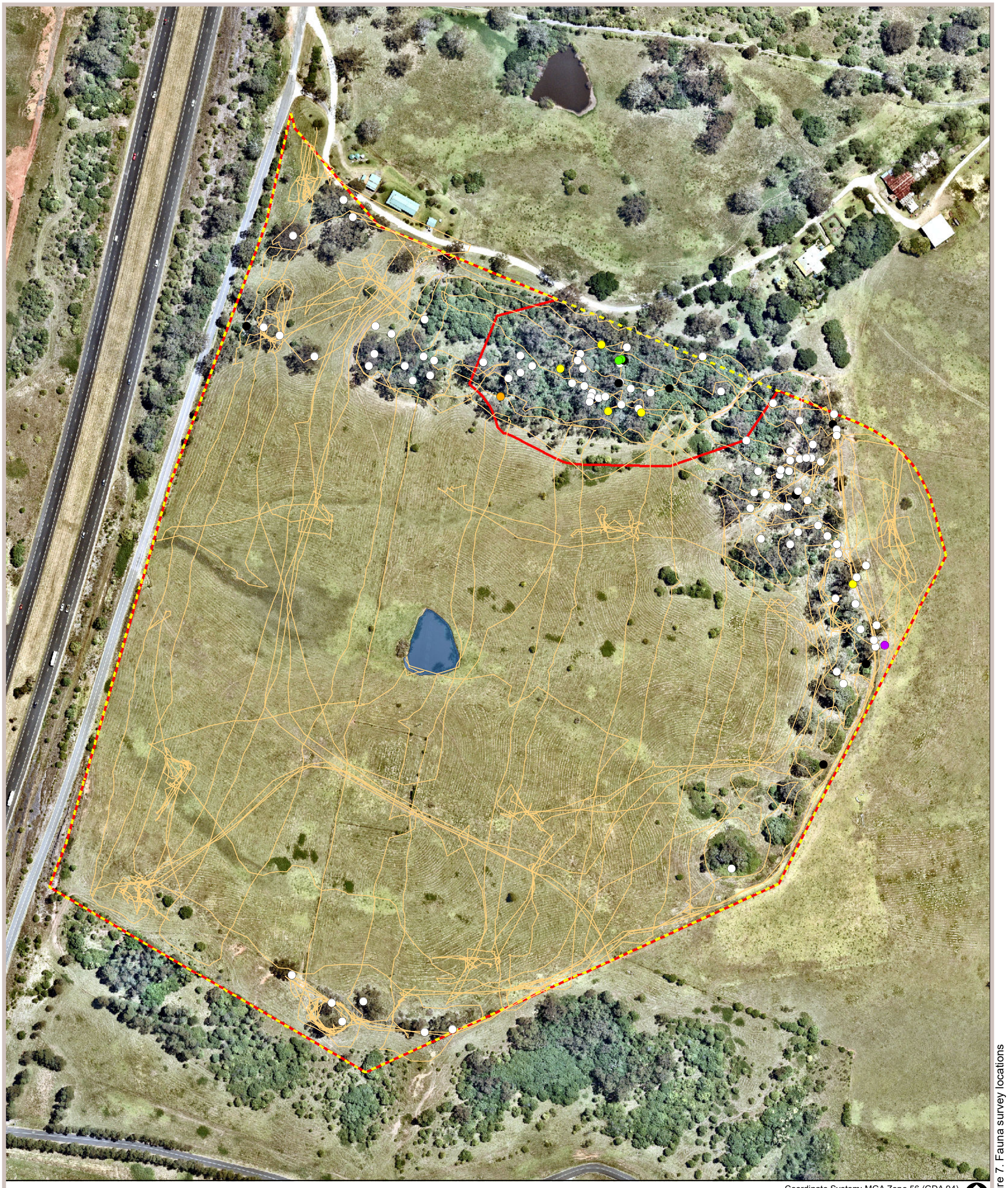


Figure 7. Fauna survey locations

Legend

Subject Land

Study Area

Vegetation Extent

Native Vegetation

Exotic Vegetation

Dams

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 10/1/2023

Data Source:
NSW Government Spatial Services
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I:\...\21170\Figures\RP2\20230526\Figure 8. Native Vegetation Extent

Figure 8. Native Vegetation Extent within the Subject Land

Figure 9. Plant Community Types within the Subject Land

Legend

Subject Land

Study Area

Threatened Ecological Community

Cumberland Plain Woodland in the Sydney Basin Bioregion

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 10/1/2023

Data Source:
NSW Government Spatial Services
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0 25 50 75 100 m

I:\...\21170\Figures\RP2\20230526\Figure 10. TECs

Figure 10. Threatened Ecological Communities within the Subject Land

Figure 11. Vegetation Zones within the Subject Land

Legend

Subject Land

Study Area

Species Polygon

Large-eared Pied Bat, Koala, Squirrel Glider, Cumberland Plain Land Snail and Marsdenia viridiflora

Masked Owl, Powerful Owl and Barking Owl

Southern Myotis

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
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Data Source:
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0 25 50 75 100 m

I:\...\21170\Figures\RP2\20230526\Figure 12. Species credit species polygons

Figure 12. Species credit species polygons

Legend

Subject Land

Study Area

Prescribed Impact

Vehicle Strike

Habitat Connectivity

Waterbodies, Water Quality and Hydrological Processes

1st Order Stream

2nd Order Stream

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
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Data Source:
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0 30 60 90 120 m

I:\...\21170\Figures\RP2\20230526\Figure 13. Extent of prescribed impacts

Figure 13. Extent of prescribed impacts

Legend

Subject Land

Study Area

Buffer (500 m)

Serious and Irreversible Impact Entity

Cumberland Plain Woodland in the Sydney Basin Bioregion

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 10/1/2023

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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0 50 100 150 200 m

I:\...\21170\Figures\RP2\20230526\Figure 14. CPW_SAII

Figure 14. Extent of Cumberland Plain Woodland within 500m of the Subject Land

Legend

Subject Land

Study Area

Impacts Requiring Offset

Large-eared Pied Bat, Koala, Squrrel Glider, Cumberland Plain Land Snail and Marsdenia viridiflora SPecies Poygons

Masked Owl, Powerful Owl and Barking Owl Species Polygons

Southern Myotis Species Polygon

Zone 1: 3319_Canopy

Impacts Not Requiring Offset

Zone 2: 3319_DNG

Zone 3: 3319_LCG

Impacts Not Requiring Further Assessment

Exotic Vegetation

Dams

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
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Dated: 10/1/2023

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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I:\...\21170\Figures\RP2\20230526\Figure 15. Thresholds for Assessment

Figure 15. Thresholds for Assessment