BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

PROPOSED DEVELOPMENT OF:

MAMRE AND ABBOTTS ROAD INTERSECTION
KEMPS CREEK NSW 2178

Prepared by:

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Abbreviations

Abbreviation	Meaning
AOBV	Areas of Outstanding Biodiversity Value
AWTS	Aerated Wastewater Treatment System
APZ	Asset Protection Zone (bushfire protection)
BAM	Biodiversity Assessment Methodology
BAM - C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
DA	Development Application
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DPIE	NSW Department of Planning, Industry and Environment (formerly OEH)
DEE	Department of Environment and Energy
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Ha	Hectare
HTE	High Threat Exotic
LEP	Local Environmental Plan
LGA	Local Government Area
MU	Map Unit
NPWS	NSW National Parks and Wildlife Service
OEH	Office of Environment and Heritage
PCT	Native vegetation classification system approved by NSW Plant Community Type Control Panel
PFC	Projected Foliage Cover
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
TBCD	Threatened Biodiversity Data Collection

Glossary

Acronym / Term	Definition
Accredited Biodiversity Assessor	Individuals accredited by the Department of Planning, Industry and Environment (DPIE) to apply the Biodiversity Assessment Method.
Assessment area	The subject land and area within the 1,500-metre buffer zone surrounding the subject land (or 500-metre buffer zone for linear proposals) determined under subsection 3.1.2 of the Biodiversity Assessment Method 2020.
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified.
Biodiversity Offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of the proposed development
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
Council	The relevant Council of the LGA for the Subject Land
Ecosystem credit	The class of biodiversity credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
Locality	A 1500m buffer area surrounding the Subject Land
Native Vegetation	Means any of the following types of plants native to New South Wales: (a) trees (including any sapling or shrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland.
Proposal	The details of the proposed development.
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
Species credit	The class of biodiversity credit that relate to threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject Land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal.

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CERTIFICATION

I, Alex Fraser of Fraser Ecological, hereby state that this Biodiversity Development Assessment Report (BDAR) assessing the impacts of the proposed road intersection upgrade at Mamre Rd and Abbotts Rd, Kemps Creek, has been prepared in accordance with the Biodiversity Assessment Method (BAM) 2020 established under the NSW *Biodiversity Conservation Act 2016*. Fieldwork for this project was undertaken by Alex Fraser. Report writing was undertaken by Alex Fraser and Jesse McIvor.

Conflicts of Interest

The Accredited Assessors have signed an agreement to abide by the Accredited BAM Assessor Code of Conduct. The authors declare in accordance with the Assessors Code of Conduct that no actual, perceived, or potential conflicts of interest exist.

Disclaimer

This document may only be used for the purposes for which it was commissioned. Fraser Ecological accepts no liability or responsibility in respect of any use or reliance upon this report by any third party. Unauthorised use of this report in any form is prohibited.

Alex Fraser
B.A Applied Science (Hons), Cert 3 Natural Area Restoration
BAAS18156 Accredited Assessor
Principal Ecologist, Fraser Ecological

EXECUTIVE SUMMARY

Fraser Ecological has been engaged to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed road upgrade development ('the Proposal') along Mamre Road and Abbotts Road located in the Penrith City Council LGA.

This BDAR has been prepared in accordance with the Office of Environment and Heritage (OEH) (2020) Biodiversity Assessment Method (BAM). In addition to field validated surveys in accordance with the BAM (2020), this assessment report incorporates the findings of the previous Flora and Fauna Assessment undertaken by Narla Environmental dated March 2024. The BOS trigger for this BDAR is that the development is identified as a State Significant Development.

Field surveys validated two (2) vegetation zones of uniform condition within the Subject Land:

- PCT 3320 - Cumberland Shale Plains Woodland (remnant trees or derived native grassland) equating to 0.2ha and identified as Vegetation Zone 1
- Exotic Vegetation (not classifiable as a PCT) equating to 4.29 ha

PCT 3320 (Vegetation Zone 1) consisted of native canopy species such as *Eucalyptus tereticornis* and *Eucalyptus mollucanna* above a highly disturbed understory dominated by exotic grasses such as *Cenchrus clandestinus, Paspalum dilatatum and Chloris Gayana* within the roadside corridor.

PCT 3320 Cumberland Shale Plains Woodland and conforms to the BC Act listed CEEC, Cumberland Plain Woodland in the Sydney Basin Bioregion. It contains species indicative of this CEEC and occurs within the associated geology and landscape position. This vegetation within the Project Area is very poor condition, and failed to meet the condition thresholds for the community, and therefore, does not conform to the CEEC listed under the EPBC Act (see section 4.1.2).

No threatened plant species were recorded on-site.

One (1) mapped dam was identified within the Subject Land, however, it occurs within the 'Certified Urban Capable Land' and does not require assessment under this BDAR. However, as a precautionary measure we undertook targeted surveys for threatened Green and Golden Bell Frog (*Litoria aurea*) to ensure there are no indirect to this species should it be present. It was not recorded during surveys. Previous surveys by Narla Environmental did no record this species.

It has been determined that there is no potential for significant impact upon any of the potentially occurring EPBC Act listed threatened species. Therefore, no assessment under the Significant Impact Guidelines for Matters of National Environmental Significance (MNES) was required.

It was deemed that the proposed works are unlikely to result in a significant impact such that a local viable population or occurrence of any of the threatened fauna species will be placed at risk of extinction.

The following Vegetation Integrity Score (VIS) was determined:

Vegetation Zone	PCT	Total Area of Impact (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current Vegetation Integrity Score
1	3320	0.2	4.4	7.5	45.5	11.5

The following vegetation zones require an offset:

Vegetation Zone	Total Area of Impact (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Number of Ecosystem Credits Required
1	**0.2**	**11.5**	**0**	**0**

Due to the poor condition of the PCT 3320 CPWL vegetation (VIS = 11.5) and the relatively small area of impact the proposal (0.2 ha), the proposal does not require the retirement of ecosystem credits.

Cumberland Plain Woodland (CPWL) in the Sydney Basin Bioregion in the Sydney Basin Bioregion is listed as a Threatened Ecological Community (TEC) under the *BC Act 2016* and *EPBC Act 1999* and is listed as a SAII entity in the Threatened Biodiversity Data Collection (DPIE 2021d).

Proposed impact minimisation/ mitigation measures proposed in Section 4.7 included (but not limited) to the following:

1. Assigning a Project Ecologist to undertake pre-clearing surveys within the 'Urban certified' dams for threatened Green and Golden Bell Frog (*Litoria aurea*) as a precautionary measure

2. Stormwater management and sedimentation/ erosion control
3. Tree protection measure during construction
4. Use of locally native species in revegetation

To assist the consent authority, the guidance document Guidance to assist a decision-maker to determine a serious and irreversible impact includes criteria that enable the application of the four principles set out in clause 6.7 of the BC Regulation to identify the species and ecological communities that are likely to be the subject of serious and irreversible impacts. The SAII assessment was provided in Section 5.4 and concluded that the proposal would not have a significant impact upon the local population of the CPWL CEEC.

1 INTRODUCTION

1.1 Overview

Fraser Ecological have been engaged to provide a Biodiversity Development Assessment Report (BDAR) for the proposed activity at Mamre Road and Abbotts Road Intersection Road Upgrade, Kemps Creek in the Penrith Local Government Area (LGA).

The proposed activity involves:

- upgrades to Mamre Road,
- upgrades to the Mamre and Abbotts Roads intersection
- development of land within the Mamre Road Precinct (APPENDIX A).

All areas associated with the proposed activity are hereafter referred to as the 'Subject Land'. Following the BAM 2020 for linear developments, the area of land within 500m along each side of the centre line of the linear subject land will be referred to as the 'Assessment Area'.

Subject Land is not mapped on the NSW DPE's Sensitive Biodiversity Values Map and the clearing threshold is not exceeded.

However, the trigger for this BDAR is that the development is identified as a State Significant Development.

1.2 Site Description

The Subject Land is characterised by a moderately undulating landscape surrounded by rural residences and paddocks. The Subject Land covers an area of approximately 5.51ha extending 1.2km along Mamre Road, incorporating the intersection with Abbots Road. The Subject Land is composed principally of exotic-dominated grasslands and paddocks interspersed with patches of hardstand, exotic vegetation, and minor remnant vegetation.

Figure 1: Location of the proposed activity

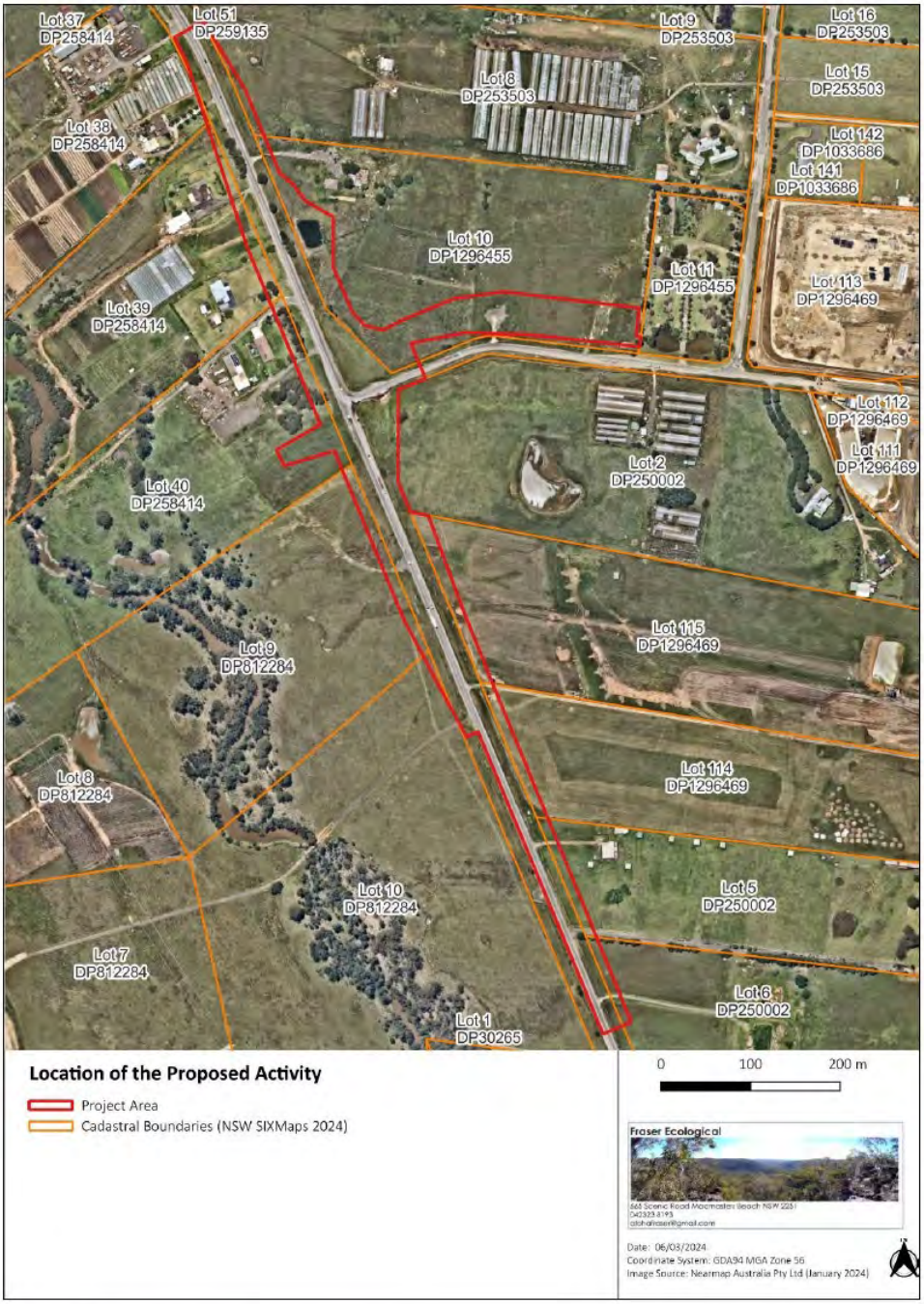


Figure 1. The Location of the Proposed Activity.

Fraser Ecological

Figure 1:
Location of the proposed activity

Subject Land

NOTE: Subject Land derived from supplied CAD Data
Not Survey Accurate on Map.
For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source
Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_1

Scale: 1:25,000

Google Satellite Imagery 2024

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

SITE: Mamre Rd, Kemps Creek NSW 2178

0 400 800 1,200 1,600 2,000 4,000 Meters

Fraser Ecological

Figure 1a:
Location of the proposed activity

Subject Land

NSW Cadastre GDA2020

NOTE: Subject Land derived from supplied CAD Data
Not Survey Accurate on Map.
For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source
Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_1

Scale: 1:4,000

Aerial imagery: Nearmap 30/03/2024
GDA2020

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

Mount Vernon

Kemps Creek

SITE: Mamre Rd, Kemps Creek NSW 2178

0 50 100 150 200 250 300 600 Meters

nearmap

1.3 Description of Proposed Development

The proposed development and construction proposed by AT&L will be referred to as 'proposed activity', which includes:

- Widening the road beyond the existing road reserve (either side on Aldington Road);
- Site sheds, material storage as required for road construction project;
- Signalised intersections;
- Earthworks including raising and lowering the road;
- Stormwater (new and larger culverts under and adjacent to road);
- Relocation of services (above and underground)
- New services (incl water, power, comms).
- Temporary works as necessary to facilitate construction;
- Temporary works buffer as necessary to facilitate construction.

The development is identified as a State Significant Development (SSD) as the road upgrades at Kemps Creek are in an identified environmentally sensitive area. Therefore, a BDAR is required to further assess the impacts of the proposed development on the local biodiversity.

1.4 State Environmental Planning Policy: Industry and Employment 2021

The proposed activity will be undertaken in a manner that meets the requirements of the SEPP (I&E). The Project Area contains land that is zoned as'IN1: General Industrial' and 'SP2: Infrastructure'. The SEPP requires that the development satisfies the zone objectives, which are:

Zone IN1: General Industrial

- To facilitate a wide range of employment-generating development including industrial, manufacturing, warehousing, storage and research uses and ancillary office space;
- To encourage employment opportunities along motorway corridors, including the M7 and M4;
- To minimise any adverse effect of industry on other land uses;
- To facilitate road network links to the M7 and M4 Motorways;

- To encourage a high standard of development that does not prejudice the sustainability of other enterprises or the environment; and
- To provide for small-scale local services such as commercial, retail and community facilities (including child care facilities) that service or support the needs of employment-generating uses in the zone.

Zone SP2: Infrastructure:

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

1.5 Aim and Assessment Method

This report has been prepared in accordance with the BAM (DPIE 2020a) and aims to:

- Describe the biodiversity values present within the Subject Land, including the extent of native vegetation, vegetation integrity and the presence of Threatened Ecological Communities (TECs).
- Determine the habitat suitability within the Subject Land for candidate threatened species.
- Prepare an impact assessment in regard to potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and SAIIs within the Subject Land.
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values.
- Calculate the biodiversity credits (i.e., ecosystem credits and species credits) that measure potential impacts of the proposal on biodiversity values. This calculation will inform the decision maker as to the number and class of offset credits required to be purchased and retired because of the proposed development.

1.5.1 Database Searches

The following database searches were undertaken to compile a list of threatened flora and fauna species predicted to occur in the area:

- Review of threatened fauna and flora records within a 10 km radius of the Subject Land, contained in the Atlas of NSW Wildlife (NSW BioNet).

- Review of the MNES records within a 10 km radius of the Subject Land, using the Commonwealth Department of Environment and Energy (DEE), EPBC Act Protected Matters Search Tool.

1.5.2 Vegetation Mapping

Southeast NSW Native Vegetation Classification and Mapping (NSW OEH 2011 update)- SCIVI. VIS_ID 2230

Classification and descriptions of native vegetation types of southeast NSW (including the South Coast and parts of the eastern tablelands), and map of extant distribution of these veg types at 1:100 000 interpretation scale. Based on the South Coast - Illawarra Vegetation Integration (SCIVI) Project, which aimed to integrate many previous vegetation classification and mapping works to produce a single regional classification and map plus information on regional conservation status of vegetation types, to inform the South Coast and Illawarra Regional Strategies. Vegetation classification based on a compilation of ~ 8,500 full-floristic field survey sites from previous studies. Classified vegetation types referred to previous studies. Distribution of veg types was mapped by spatial interpolation (modelling) from classified sites, using a hybrid decision-tree/expert system. Final model was cut to \'extant\' boundaries using a compiled coverage of aerial photograph interpretation (API) of woody and wetland vegetation boundaries. A total of 189 vegetation types were identified, and types related to Endangered Ecological Communities are highlighted.; VIS_ID 2230.

The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489

This layer contains digital mapping of the native vegetation communities of the Sydney Metropolitan area. Vegetation communities have been derived from the analysis of 2200 floristic sites collated for the study area. Identified vegetation communities have been related to currently listed threatened ecological communities listed under the NSW TSC Act, 1995 and the Commonwealth EPBC Act, 1999. Native vegetation communities have been mapped using a combination of detailed image interpretation, relationships between sample sites and abiotic environmental variables. The derived digital data layer includes fields that describe the vegetation community, interpreted dominant species and understorey characteristics, interpretation confidence, disturbance type and severity, NSW vegetation formation and classes and related NSW Plant Community Types. These are described in detail in technical reports OEH (2016) The Native Vegetation of the Sydney Metropolitan Area. Volume 1: Technical Report. Version 3.0. Office of Environment and Heritage Sydney. OEH (2016) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0. NSW Office of Environment and Heritage, Sydney. Version 3.0 of the Native Vegetation of the Sydney Metropolitan Area updates the Plant Community Type and Biometric Vegetation Type of each map unit.

1.5.3 Literature Review

Information sources reviewed included, but were not necessarily limited to:

- Aerial Photograph Interpretation (API);
- Relevant guidelines, including:
    - OEH *Biodiversity Assessment Method*, 2017 No 469
    - *NSW Guide to Surveying Threatened Plants* (OEH, 2016)
    - *'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (OEH, 2018)
    - *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Department of Environment and Conservation (DEC), 2004)
- OEH Threatened Species, Populations and Ecological Communities website
- Commonwealth DEE Species, Profile and Threats Database;
- OEH Threatened Species, Populations and Ecological Communities website
- Commonwealth DEE Species, Profile and Threats Database;
- Threatened species survey and assessment guidelines: field survey methods for fauna: Amphibians (DEC 2009);
- NSW Guideline to Surveying Threatened Plants (OEH 2016b);
- Operational Manual for BioMetric 3.1. (DECCW 2011);
- Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010a);
- Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999(Commonwealth of Australia 2010b);
- Survey guidelines for Australia's threatened frogs. Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010c);
- Survey guidelines for Australia's threatened mammals. Guidelines for detecting
- Mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2011);
- Survey guidelines for Australia's threatened orchids.

- Guidelines for detecting bats listed as 'threatened' under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2013).

1.5.4 Information Sources

A desktop survey was performed to ensure all relevant documentation is considered when preparing the plan. Documents and other information resources utilised include:

- Aerial photographs (Google Maps, Metromaps & DPI Land Information)
- NSW Land and Property Information SIX Maps Viewer (https://maps.six.nsw.gov.au/)
- The Southeast NSW Native Vegetation Classification and Mapping (NSW OEH 2010) mapped using QGIS software overlaid with cadastral boundaries obtained from the NSW Planning Portal database collection.
- Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman and Murphy 1989) using the eSPADE Version 2.2 managed by the NSW Office of Environment and Heritage accessed 17/05/2024.
- Civil engineering plans prepared AT&L Drawing no: 21-843-SKC297 Issue P3 dated 4/3/24 (refer to Appendix A)
- Narla (2024) Flora and Fauna Assessment – Mamre and Abbotts Roads Intersection Upgrade. March 2024.

1.6 Proposed Action Trigger for BDAR

SSD: Proposed Road Upgrade at Kemps Creek

Under the EP&A Act, development may be declared State significant development (SSD). This declaration may be made by a State Environmental Planning Policy (SEPP) or by the Minister for Planning (the Minister) and is generally based on the scale, nature, location and strategic importance of the development to the State.

All SSD projects require development consent from either the Independent Planning Commission or the Minister before they may proceed.

Prior to determination, they are subject to a comprehensive assessment with extensive community participation. The Department of Planning, Housing and Infrastructure (the Department) co-ordinates this assessment.

All SSD projects are determined on their merits, having regard to their economic, environmental, and social impacts and the principles of ecologically sustainable development.

State significant development includes:

- new education facilities, hospitals, and correctional centres
- chemical industries
- manufacturing facilities
- mining and extraction operations
- tourist and recreation facilities
- some port facilities
- waste management facilities
- energy generating facilities.

A proposal is considered state significant if it:

- is over a certain size
- is in a sensitive environmental area
- will exceed a specific capital investment value.

The development is identified as a State Significant Development (SSD) as the road upgrades at Kemps Creek are in an identified environmentally sensitive area. Therefore, a BDAR is required to further assess the impacts of the proposed development on the local biodiversity.

1.7 Cumberland Plain Conservation Plan (CPCP)

Part of the Subject Land has been nominated as 'Certified-urban Capable Land' under the Cumberland Plain Conservation Plan (CPCP). Development in these areas does not require further biodiversity assessment under the BC Act. However, there are sections within the Subject Land that are mapped as 'Excluded Land' or 'Avoided Land' that require biodiversity assessment under the BC Act. The CPCP area has been mapped in relation to impacted native vegetation communities within Section 3.

Therefore, all impacts to vegetation located within 'Certified-urban Capable Land' have not been assessed within this report. BC Act Tests of Significant (5-part Tests) have been conducted for areas of Cumberland Plain Woodland (Appendix C), which were located with areas mapped under the CPCP as 'Excluded Land'.

The Department of Planning and Environment is currently pursuing Commonwealth approval for the CPCP under Part 10 of the EPBC Act. Landholders can submit development applications, seek subdivision, or start master planning. However, development that will have a significant impact on Matters of National Environmental

Significance (MNES) on certified - urban capable land cannot commence until the Commonwealth CPCP approval is in place.

The Cumberland Plain Woodland located within the Subject Land was found to not meet the listing advice for protection under the EPBC Act however, an assessment of significant impact on the EBPC listed Green and Golden Bell Frog has been conducted as part of this proposal (Appendix C).

1.8 Assessment Limitations

The results of this assessment will not necessarily yield a complete inventory of all flora and fauna species with potential to occur on the Subject Land. The timing of the survey may not have coincided with emergence times of some species of flora and fauna, such as seasonally flowering herbs, seasonal migratory fauna, or nocturnal fauna.

To account for those species that could not be identified during the field survey, detailed habitat assessments were combined with desktop research and local ecological knowledge to establish an accurate prediction of the potential for such species to occur on or adjacent to the Subject Land.

This assessment also relies upon some of the previous survey work undertaken by Narla Environmental's Flora and Fauna Assessment dated March 2024 – particularly the surveys for threatened frog species.

Site survey was limited to areas within the roadside corridor (not private lands for the BAM plot data collection).

As mentioned earlier, part of the Subject Land has been nominated as 'Certified-urban Capable Land' under the Cumberland Plain Conservation Plan (CPCP). Development in these areas does not require further biodiversity assessment under the BC Ac

1.9 Methodology

A previous site assessment was undertaken by Narla Ecologists Jayden Maloney and Hannah Martin on the 9th and 10th of February 2023, and the 14th and 15th of March 2023. An additional site assessment was then conducted by Narla Ecologist Chris Moore and Kayla Spithoven on the 1st of March 2024 as part of the previous Flora and fauna Assessment (Narla 2024). During the site assessments, the following activities were undertaken:

- Identifying and recording the vegetation communities within the Project Area, with focus on identifying any threatened ecological communities (TECs);
- Recording a detailed list of flora species encountered within the Project Area, with a focus on threatened species, species diagnostic of threatened ecological communities and Priority Weeds;

- Recording opportunistic sightings of any fauna species seen or heard on or within the immediate surrounds of the Project Area;
- Targeted surveys for threatened flora;
- Identifying and recording the locations of notable fauna habitat such as important nesting, roosting or foraging microhabitats;
- Targeting the habitat of any threatened and regionally significant fauna including:
- Tree hollows (habitat for threatened large forest owls, parrots, and arboreal mammals);
- Caves and crevices (habitat for threatened reptiles, small mammals, and microbats);
- Termite mounds (habitat for threatened reptiles);
- Soaks (habitat for threatened frogs);
- Wetlands (habitat for threatened fish, frogs, and water birds);
- Drainage lines (habitat for threatened fish and frogs);
- Fruiting trees (food for threatened frugivorous birds and mammals);
- Flowering trees (food for threatened nectarivorous mammals and birds);
- Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals); and
- Any other habitat features that may support fauna (particularly threatened) species.
- Assessing the connectivity and quality of the vegetation within the Project Area and surrounding area.

Plot-based floristic vegetation surveys were conducted, in accordance with s.5.2.1.9 of the BAM, by Alex Fraser and Jesse McIvor on the 21/05/2024.

1.9.1 Weather conditions during targeted surveys

Weather conditions recorded at the nearest weather station prior to and during the general flora and fauna survey period by Narla (2024) are provided in Table 3 (BOM 2024). This data reveals little to no rainfall and hot conditions leading up to each survey, which is unlikely to have a significant effect on triggering the emergence/flowering of threatened species that could potentially occur within the Project Area.

Table 1: Weather conditions during Narla Environmental's frog surveys recorded at Badgerys Creek AWS (station 067108) preceding and during the survey periods (survey dates in bold)

Survey Type	Survey date	Day	Minimum Temp. (°C)	Maximum Temp. (°C)	Rainfall (mm)
Lead up to survey	02-Feb-23	Thu	18.1	34.4	0
	03-Feb-23	Fri	16.8	29.3	0
	04-Feb-23	Sat	13.6	27.8	0
	05-Feb-23	Sun	10.2	31.2	0
	06-Feb-23	Mon	17.3	31.8	0
	07-Feb-23	Tue	19.4	30.6	0
	08-Feb-23	Wed	18.4	28.2	0
Survey Dates	**09-Feb-23**	**Thu**	**18.2**	**24.6**	**0**
	10-Feb-23	**Fri**	**15.0**	**33.3**	**0**
Lead up to survey	7-Mar-23	Tue	18.3	36.2	0
	8-Mar-23	Wed	10.2	33.4	0
	9-Mar-23	Thu	12.5	30.3	0
	10-Mar-23	Fri	12.3	30.6	0
	11-Mar-23	Sat	14.1	35.0	0
	12-Mar-23	Sun	19.7	30.2	0
	13-Mar-23	Mon	17.0	22.7	2.8
Survey Dates	**14-Mar-23**	**Tue**	**16.8**	**24.6**	**6.6**
	15-Mar-23	**Wed**	**16.4**	**31.4**	**8.4**
Lead up to survey	23-Feb-24	Fri	18.5	37.1	0
	24-Feb-24	Sat	18.0	20.6	2.2
	25-Feb-24	Sun	13.9	23.7	0.4
	26-Feb-24	Mon	16.4	30.8	0
	27-Feb-24	Tue	18.9	23.0	0.6
	28-Feb-24	Wed	19.3	30.7	0
	29-Feb-24	Thu	20.3	38.7	0
Survey Date	**01-Mar-24**	**Fri**	**20.7**	**30.5**	**0.4**

Figure 2 Location of survey effort

Figure 7. Threatened Species Survey effort and Habitat Features identified with the Project Area.

2 LANDSCAPE FEATURES

2.1 IBRA Bioregions and Subregions

Dominant landscape forms have been used to divide Australia into bioregions. The Subject Land is within the **NSW Sydney Basin IBRA bioregion** and **Cumberland IBRA subregion**.

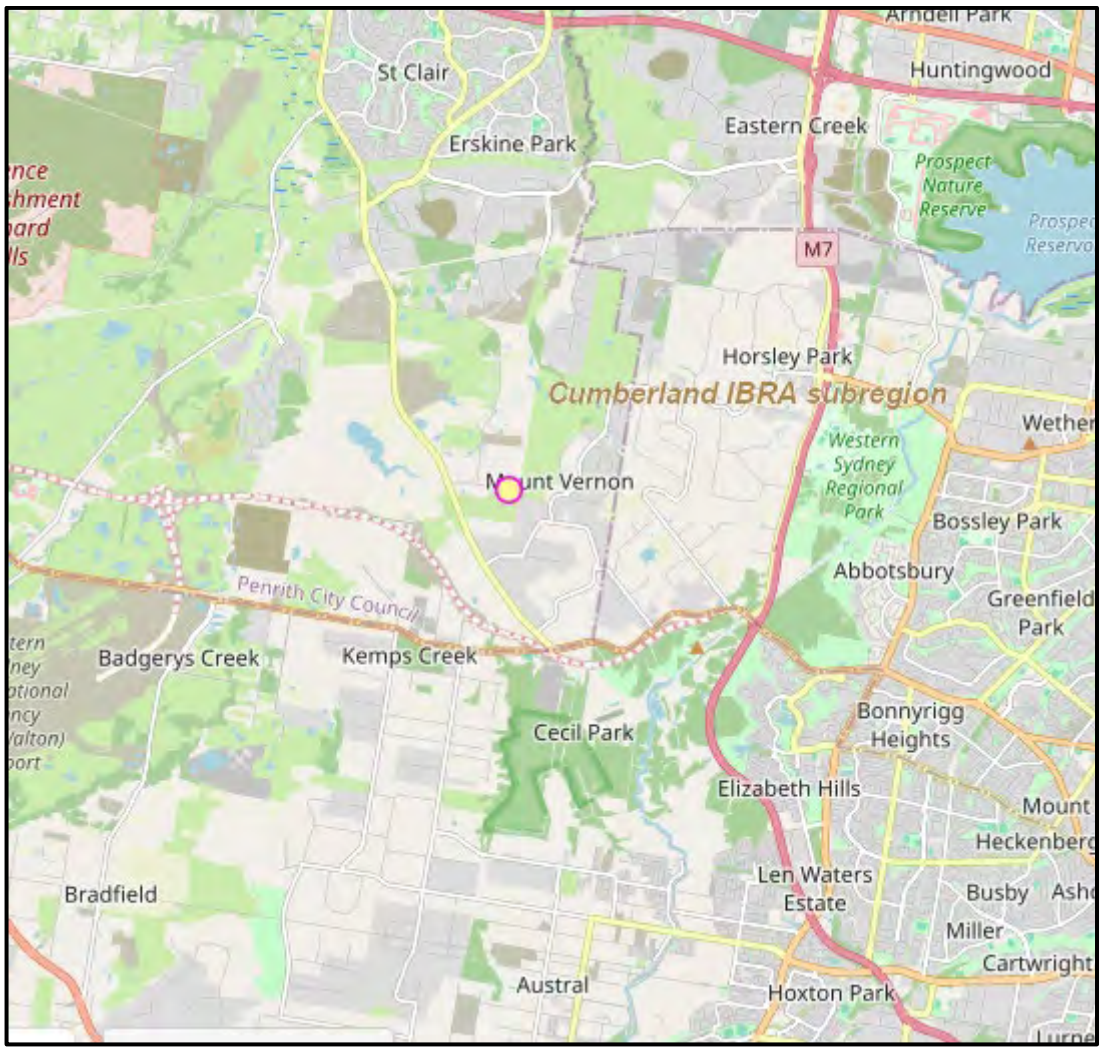


Figure 3: Location of the Subject Land within the Cumberland IBRA subregion

2.2 NSW Landscape Regions (Mitchell Landscapes)

Mitchell Landscapes are used to describe areas in NSW in a broad sense and group together areas with relatively homogenous geomorphology, soils and broad vegetation types and are mapped at a scale of 1:250000. The Subject Land is within the Cumberland Plain Mitchell Landscape. The estimated cleared fraction for the Mitchell Landscape for the Cumberland Plain Landscape is 0.89.

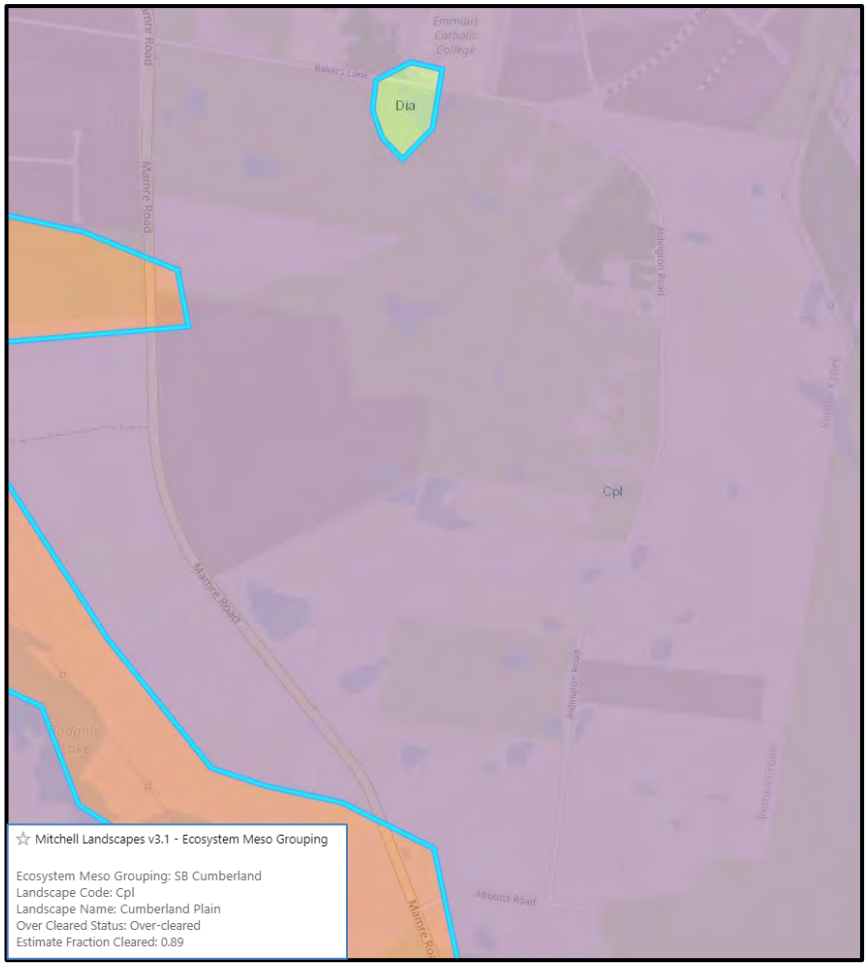


Figure 4: Location of the Subject Land within the Cumberland Plain Mitchell Landscape

2.3 Native Vegetation Extent

The native vegetation cover within a 1,500 m buffer area surrounding and including the Subject Land have been mapped in Figure 5 below.

Using GIS tools, it is estimated that the native vegetation cover would be 12.4% provided within the BDAR manual and this was used in the BAM Offsets calculator.

Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, considering vegetation condition and extent.

2.4 Patch Size

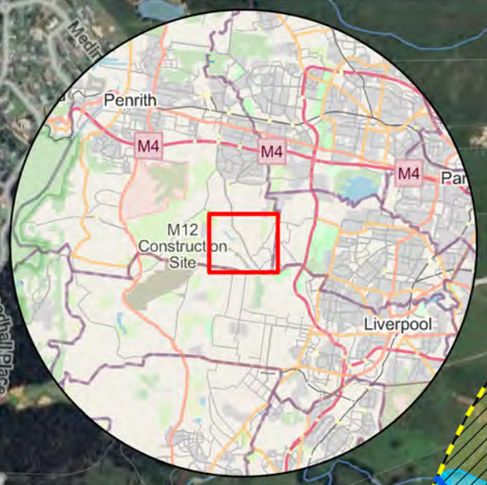
Patch size is used to describe an area of intact native vegetation, that includes native vegetation with a gap of less than 100 m from the next area of moderate to good condition native vegetation. This gap is less than or equal to 30 m for non-woody ecosystems.

The patch size for the vegetation on the Subject Land is less than 20ha.

The native vegetation on the Subject Land is surrounded by major roads, cleared rural residential/ agricultural lands, industrial and urban residential lands containing some isolated paddock trees.

Figure 5: Landscape assessment map (including 1500m radius around the subject land)

Area within 1500m Buffer of Subject Land	Area ha
1500m Buffer Area	1132.4
ML - Cumberland Plain	958.5
ML - Hawkesbury - Nepean Channels and Floodplains	173.9
BV - Threatened species or communities with potential for serious and irreversible impacts	66.1
BV - Biodiverse riparian land	44.1
IBRA7 Region - Sydney Basin,Cumberland	1132.4



IBRA7 Region:
Sydney Basin
Sub Region: Cumberland

KEMPS CREEK

SITE: Mamre Rd, Kemps Creek NSW 2178

0 200 400 600 800 1,000 2,000 Meters

Fraser Ecological

Figure 5:
Landscape assessment map (including 1500m radius around the subject land)

Subject Land

Subject Site 1500m buffer

NSW Strahler Stream Order

1

2

3 - 4

IBRA7 Regions

Sydney Basin,Cumberland

Biodiversity Values May24

Biodiverse riparian land

Threatened species or communities with potential for serious and irreversible impacts

Mitchell Landscapes 3_1 GDA2020

SB Cumberland,Cumberland Plain

SB Cumberland,Hawkesbury - Nepean Channels and Floodplains

NOTE: Subject Land derived from supplied CAD Data Not Survey Accurate on Map. For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_1

Scale: 1:16,000

Aerial imagery: Nearmap 30/03/2024 GDA2020

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

2.5 Wetland, Rivers, Streams and Estuaries

One (1) second order watercourse and associated 20m riparian buffer zone are located on the Subject Land. This watercourse is in low condition, with the only habitat present being a degraded culvert and exotic vegetation around a soak.

One (1) mapped dam was also identified within the Subject Land. The dam occurs within the 'Certified Urban Capable Land' and does not require assessment under this BDAR (Figure 6).

As a precautionary measure we undertook targeted surveys for threatened Green and Golden Bell Frog (*Litoria aurea*). It was not recorded during surveys.

No additional unmapped water features were observed within the Subject Land.

No significant wetlands, rivers, streams and estuaries are present within the Subject Land.

Figure 6: Mapped watercourses and associated buffers

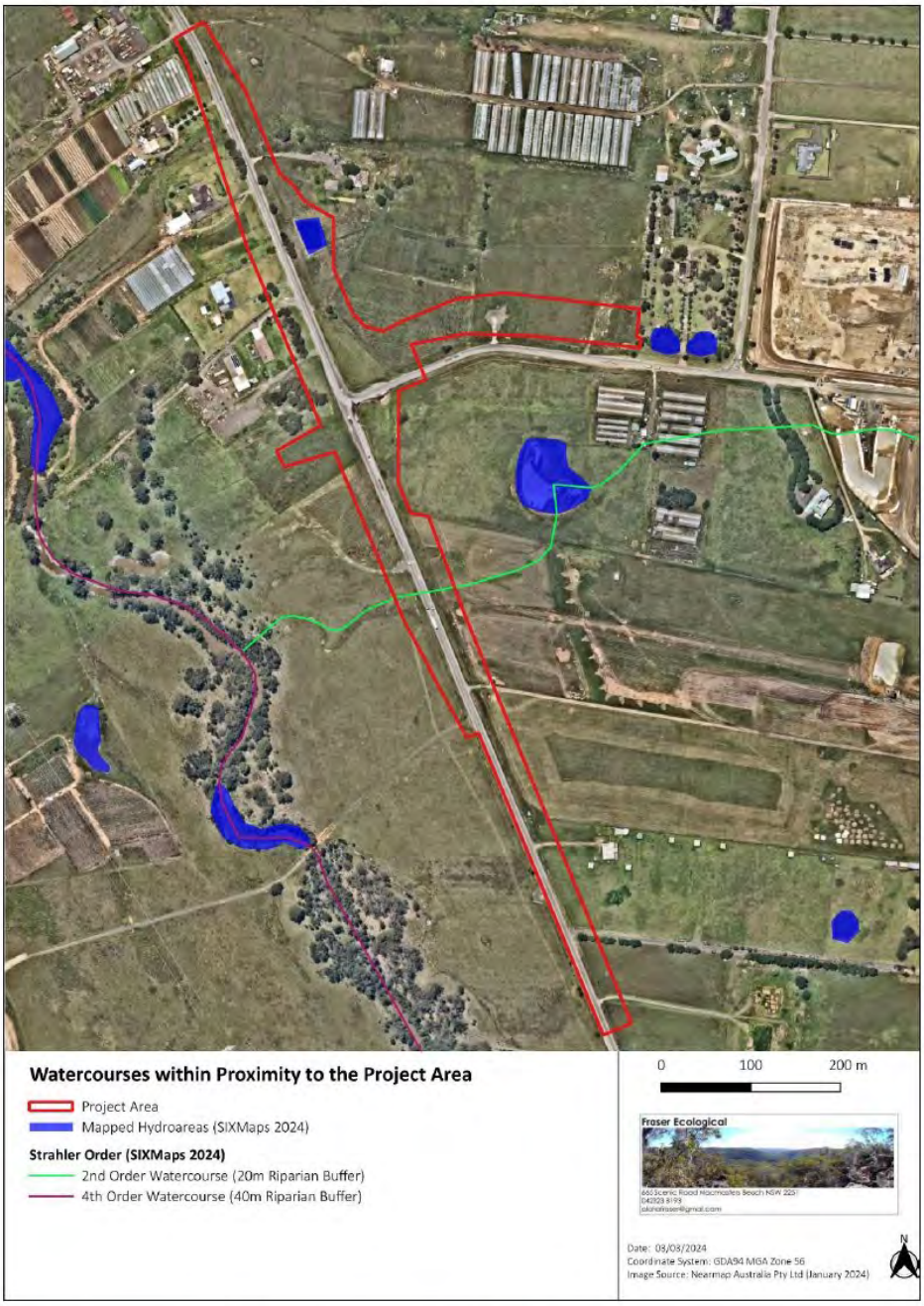
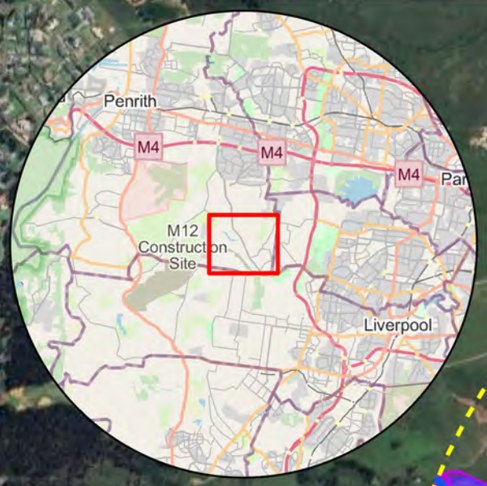


Figure 2. Watercourses and their associated Riparian Buffers within the Project Area.



STRAHLER	Length (m) within 1500m Buffer
1	3031.8
2	3389.2
4	5187

Water Body Type	Perenniality	Area (ha) within 1500m Buffer
ManMadeWaterBody	Perennial	23.3
NaturalWaterCourse	Perennial	23.4

2

KEMPS CREEK

SITE: Mamre Rd, Kemps Creek NSW 2178

0 200 400 600 800 1,000 2,000 Meters

Fraser Ecological

Figure 6:
Mapped watercourses and associated buffers

Subject Land

Subject Site 1500m buffer

NSW HydroAreas

ManMadeWaterBody

NaturalWaterCourse

NSW Strahler Stream Order

1

2

3 - 4

Biodiversity Values May24

Biodiverse riparian land

NOTE: Subject Land derived from supplied CAD Data
Not Survey Accurate on Map.
For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source
Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_1

Scale: 1:16,000

Aerial imagery: Nearmap 30/03/2024
GDA2020

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

2.6 Connectivity Features

The biodiversity value of corridor networks is well known. Landscapes that retain more connections between patches of otherwise isolated areas of vegetation are more likely to maintain more numerous and more diverse populations of various plant and animal species (Lindenmayer and Fischer, 2006). Conversely, a lack of landscape connectivity can have a range of negative impacts on species populations (Lindenmayer and Fischer, 2006). It is thought that if existing remnants are left to persist without sufficient immigration to maintain genetic diversity, continued losses of biodiversity are certain (Parker *et al.* 2008).

The proposed development impact area does not form part of a local habitat corridor.

2.7 Areas of Geological Significance and Soil Hazard Features

Soil Landscape Mapping (1: 100 000 Sheets) from eSPADE v2.2 indicates the Subject Land occurs on the 'Blacktown' Soil Landscape (Bannerman and Hazelton 2011). The Subject Land ranges from 42m to 44m above sea level (asl; Google 2024). The following excerpts from the soil landscape description summarise the landscape characteristics.

Blacktown Soil Landscape Description

The Blacktown soil landscape is characterized by gently undulating rises on Wianamatta Group shales, with local relief to 30 m and slopes usually >5%.The geology consists of Wianamatta Group—Ashfield Shale comprising of laminite and dark grey siltstone, Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone. Soils are shallow to moderately deep (>100cm) hard setting mottled texture contrast soils and Brown Podzolic Soils on crests, grading to Yellow Podzolic Soils on lower slopes and drainage lines. The Subject Land is not mapped as having any risk of acid sulfate soils.

2.8 Areas of Outstanding Biodiversity Value

Under the BC Act, the Minister for the Environment may declare Areas of Outstanding Biodiversity Value (AOBV). These are special areas that contain irreplaceable biodiversity values that are considered important to NSW, Australia or globally.

No listed AOBV occur within the Subject Land or within a 1,500 m buffer around the Subject Land.

2.9 Important Area Habitat Mappping

There are no threatened species mapped on the NSW DPIE's Important Habitat Map.

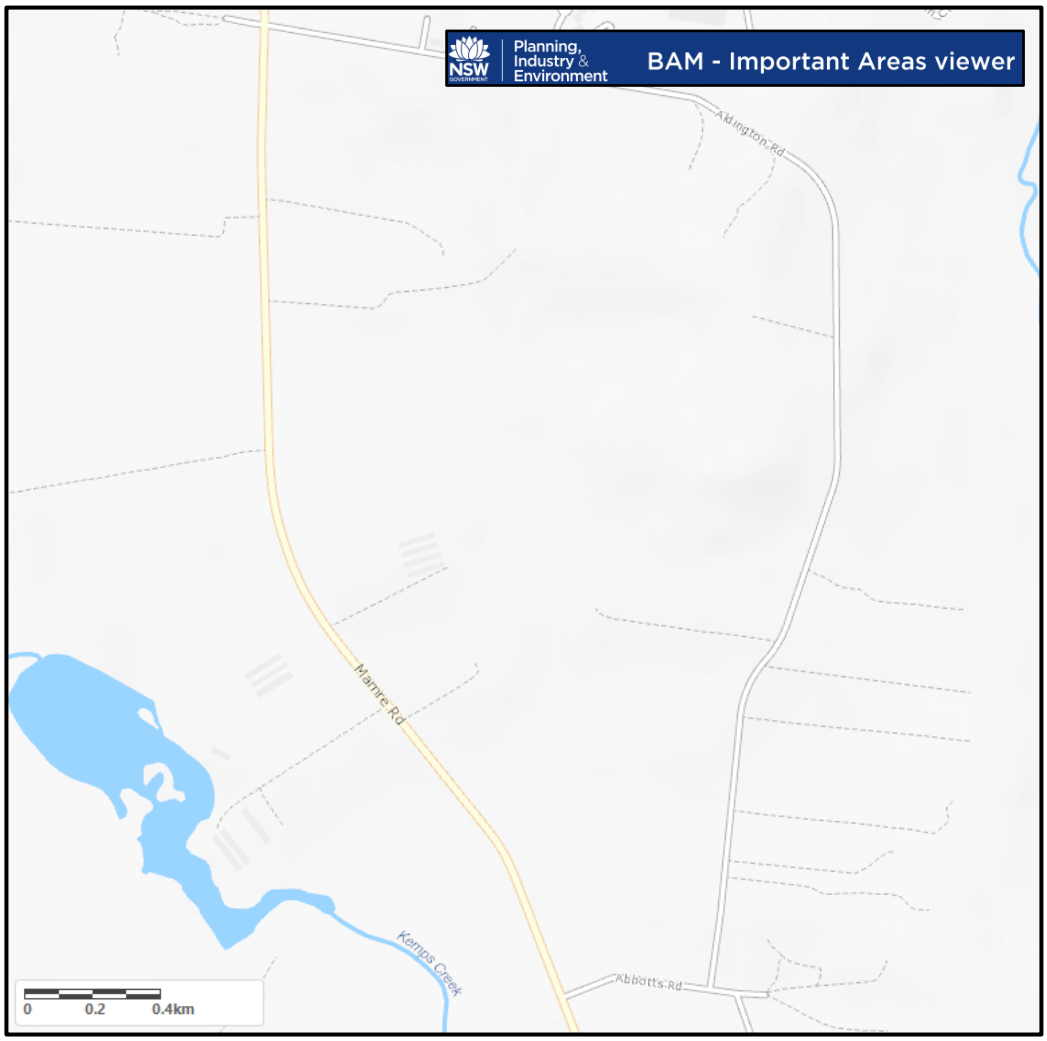


Figure 7: Important Habitat Map for the Subject Land

3 NATIVE FLORA AND FAUNA

3.1 NSW State Vegetation Type Map (SVTM) PCT's

Fraser Ecological examined local satellite imagery, geological mapping, soil landscape mapping and topographic mapping, in addition to existing vegetation mapping (DPE 2022) in order to stratify the Project Area and guide the site assessment survey efforts.

The following resources were consulted during the site assessment to assist with the identification of vegetation communities present within the Project Area:

- eSPADE v2.2 (DPE 2024d);
- Soil Landscapes of the Penrith 1:100,000 sheet (Bannerman and Hazelton 2011);
- State Vegetation Type Mapping (DPE 2022).

3.1.1 Historically mapped vegetation communities

Based on historical vegetation mapping, two (2) vegetation communities are present within the Subject Land

- PCT 3448: Castlereagh Ironbark Forest;
- and Non-native Vegetation.

PCT 3448 conforms to the BC listed EEC, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, and the EPBC Act listed CEEC, Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion (Figure 8).

3.1.2 Field validated vegetation communities

Field surveys validated two (2) vegetation zones of uniform condition within the Subject Land:

- PCT 3320 - Cumberland Shale Plains Woodland (remnant trees or derived native grassland)
- Exotic Vegetation (not classifiable as a PCT)

These are described in Table 2 provided on the following pages.

Table 2: Cumberland Shale Plains Woodland identified within the Project Area

PCT 3320 Cumberland Shale Plains Woodland	
	
Extent within the Project Area (approx.; excluding areas mapped as Certified-urban Capable Land)	**0.2ha (Figure 9)**
Description (DPE 2022)	
A tall to very tall sclerophyll woodland to open forest with a mid-stratum of soft-leaved shrubs and small trees with a grassy ground cover that is extensive on rises and upper slopes of hills south from Cecil Hills, in the south-western part of the Cumberland Plain to the west of Sydney. It is most extensive in Campbelltown, Camden and Wollondilly local government areas. The canopy commonly includes Eucalyptus moluccana and Eucalyptus tereticornis, with a sparse shrub to small tree layer which very frequently includes Bursaria spinosa and at least one species of Acacia, of which Acacia implexa is most frequent. The presence of Acacia implexa helps distinguish this PCT from PCT 3320, which has a similar assemblage and structure. The mid-dense ground layer typically includes forbs, grasses and twiners. Dichondra repens is almost always present and Microlaena stipoides, Desmodium varians, Brunoniella australis and Aristida ramosa are very frequent. This PCT typically occurs in a warm, moist climate between 90-300 metres asl. It has been heavily cleared and now occurs in small remnants with varying levels of disturbance within a rural landscape. The canopy in these remnants often comprises immature cohorts of trees that have regenerated after thinning or clearing.	

Description of the Vegetation in the Project Area.	
The vegetation within this zone consisted of native canopy species such as *Eucalyptus tereticornis and Eucalyptus mollucanna* above a highly disturbed understory dominated by exotic grasses such as *Cenchrus clandestinus, Paspalum dilatatum and Chloris gayana.* It is considered to be in poor condition.	
Justification of Vegetation Assignment	The determination of this community was based on the geographical region, landscape attributes including soil landscapes and elevation, and the presence of diagnostic species.
BC Act 2016 Status	This vegetation within the Project Area conforms to the BC Act listed Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community (CEEC) (see section 4.1.1).
EPBC Act 1999 Status	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is associated with this vegetation type. This vegetation within the Project Area however, failed to meet the condition thresholds for the community and therefore DOES NOT conform to the CEEC listed under the EPBC Act (see section 4.1.2).
References	Department of Planning and Environment (DPE) (2022) State Vegetation Type Mapping

Table 3: Exotic Vegetation identified within the Project Area

Exotic Vegetation	
	
Extent within the Project Area (approx.; excluding areas mapped as Certified-urban Capable Land)	**4.29 ha**
Description of the Vegetation in the Project Area.	
This zone contains primarily exotic vegetation. This exotic vegetation came in form of primarily an exotic dominated grassland. This zone had an almost absent canopy layer, except for sporadic roadside trees. The shrub layer was sparse however included the Priority Weed, *Rubus fruticosus* species aggregate. The ground layer was almost entirely comprised of exotic species. The Priority Weeds, *Senecio madagascariensis* was sighted within this layer. Environmental weeds in the ground layer included *Paspalum diltatum, Rumex obtusifolia, Conyza bonariensis, Cenchrus clandestinus, Chloris guyana, Bromus catharticus, Verbenabonariensis, Avena barbata, Sida rhombifolia, Solanum linnaeanum, Solanum nigrim, Bouteloua dactyloides,Trifolium repens, Araujia sericifera, Modiola caroliniana, Cirsium vulgare, Setaria parviflora, Hypochaerisradicata and Centaurium erythraea.*	

Exotic Vegetation	
Native groundcovers were sparse however included *Persicaria decipiens,Cynodon dactylon and Eragrostis brownii.*	
Justification of Vegetation Assignment	The vegetation within this area consisted of exotic vegetation with minimal native species. As the vegetation could not be classified as a native community it has been classified as Exotic Vegetation.
BC Act 2016 Status	n/a
EPBC Act 1999 Status	n/a

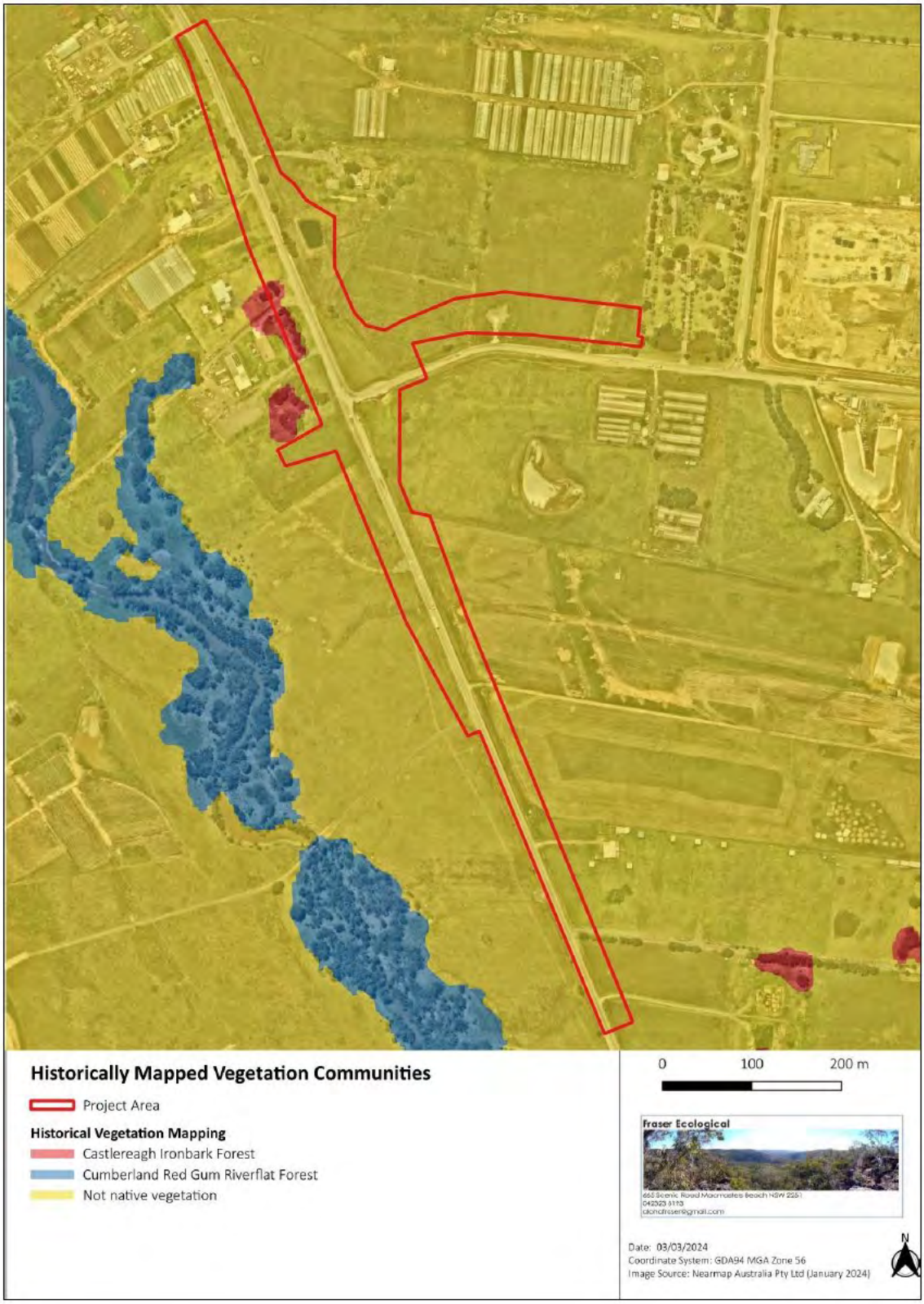
Table 4: Native species recorded on the Subject Land

Species	Canopy	Mid layer	Ground layer
*Araujia sericifera**			X
*Avena barbata**			X
*Bidens pilosa**			X
*Bouteloua dactyloides**	x		X
*Brassica spp.**			X
*Bromus catharticus**			X
*Cenchrus clandestinus**			X
*Centaurium erythraea**			X
Centella asiatica			X
*Chloris gayana**			X
*Cirsium vulgare**			X
Commelina cyanea			X
*Conyza bonariensis**			X
Corymbia maculate	x		
Corymbia citriodora	x		
Cynodon dactylon	x		X
*Cyperus eragrostis**			X
Dichondra repens			X
*Ehrharta erecta**			X
Eragrostis brownie			X
*Eragrostis curvula**			X
Eucalyptus moluccana	x		
Eucalyptus tereticornis	x		
*Fumaria spp.**			X
Glycine clandestine			X
*Hypochaeris radicata**			X
Lachnagrostis filiformis			X
*Lepidium bonariense**			X
*Megathyrsus maximus**			X
Oxalis perennans			X
*Paspalum dilatatum**			X
Persicaria decipiens			X
*Pinus radiata**			
*Plantago lanceolata**			X
*Rubus fruticosus species aggregate***		X	
*Rumex obtusifolia**			X

Species	Canopy	Mid layer	Ground layer
*Senecio madagascariensis***		x	X
*Setaria parviflora**			X
*Sida rhombifolia**			X
*Solanum linnaeanum**			X
*Solanum nigrum**			X
*Solanum sisymbriifolium**			
*Sonchus oleraceus**		x	X
*Sporobolus africanus**		x	X
*Taraxacum officinale**			X
*Tradescantia fluminensis**			X
*Trifolium repens**			X
Typha orientalis			X
*Verbena bonariensis**			X

*Represents exotic species; **represents priority weeds

Figure 8: Historically mapped vegetation communities


Historically Mapped Vegetation Communities
Project Area
Historical Vegetation Mapping
Castlereagh Ironbark Forest
Cumberland Red Gum Riverflat Forest
Not native vegetation
0
100
200 m
Fraser Ecological
Date: 03/03/2024
Coordinate System: GDA94 MGA Zone 56
Image Source: Nearmap Australia Pty Ltd (January 2024)
N

PCTID	PCTName	Area within 1500m Buffer (ha)	% within 1500m Buffer
0	Not classified	991.93	87.6
3319	Cumberland Shale Hills Woodland	0.81	0.07
3320	Cumberland Shale Plains Woodland	46.47	4.1
3448	Castlereagh Ironbark Forest	48.09	4.25
3629	Castlereagh Scribbly Gum Woodland	0.29	0.03
4023	Coastal Valleys Riparian Forest	0.05	0
4025	Cumberland Red Gum Riverflat Forest	44.77	3.95

Fraser Ecological

Figure 8:
Historically mapped vegetation communities

Subject Land

Subject Site 1500m buffer

NSW Strahler Stream Order

STRAHLER

1

2

3 - 4

SVTM PCT VC2.0M2.0 (December 2023)

3319,Cumberland Shale Hills Woodland

3320,Cumberland Shale Plains Woodland

3448,Castlereagh Ironbark Forest

3629,Castlereagh Scribbly Gum Woodland

4023,Coastal Valleys Riparian Forest

4025,Cumberland Red Gum Riverflat Forest

NOTE: Subject Land derived from supplied CAD Data Not Survey Accurate on Map. For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_1

Scale: 1:16,000

Google Satellite Imagery 2024

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

SITE: Mamre Rd, Kemps Creek NSW 2178

0 200 400 600 800 1,000 2,000 Meters

Fraser Ecological

Figure 8a: Historically mapped vegetation communities

Subject Land

NSW Strahler Stream Order

1

2

3 - 4

SVTM PCT VC2.0M2.0 (December 2023)

3448,Castlereagh Ironbark Forest

4025,Cumberland Red Gum Riverflat Forest

NOTE: Subject Land derived from supplied CAD Data
Not Survey Accurate on Map.
For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source
Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_2

Scale: 1:4,000

Aerial imagery: Nearmap 30/03/2024
GDA2020

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

SITE: Mamre Rd, Kemps Creek NSW 2178

0 50 100 150 200 250 300 600 Meters

Figure 9: Field-validated Vegetation Mapping and BAM Plot Location within the Project Area

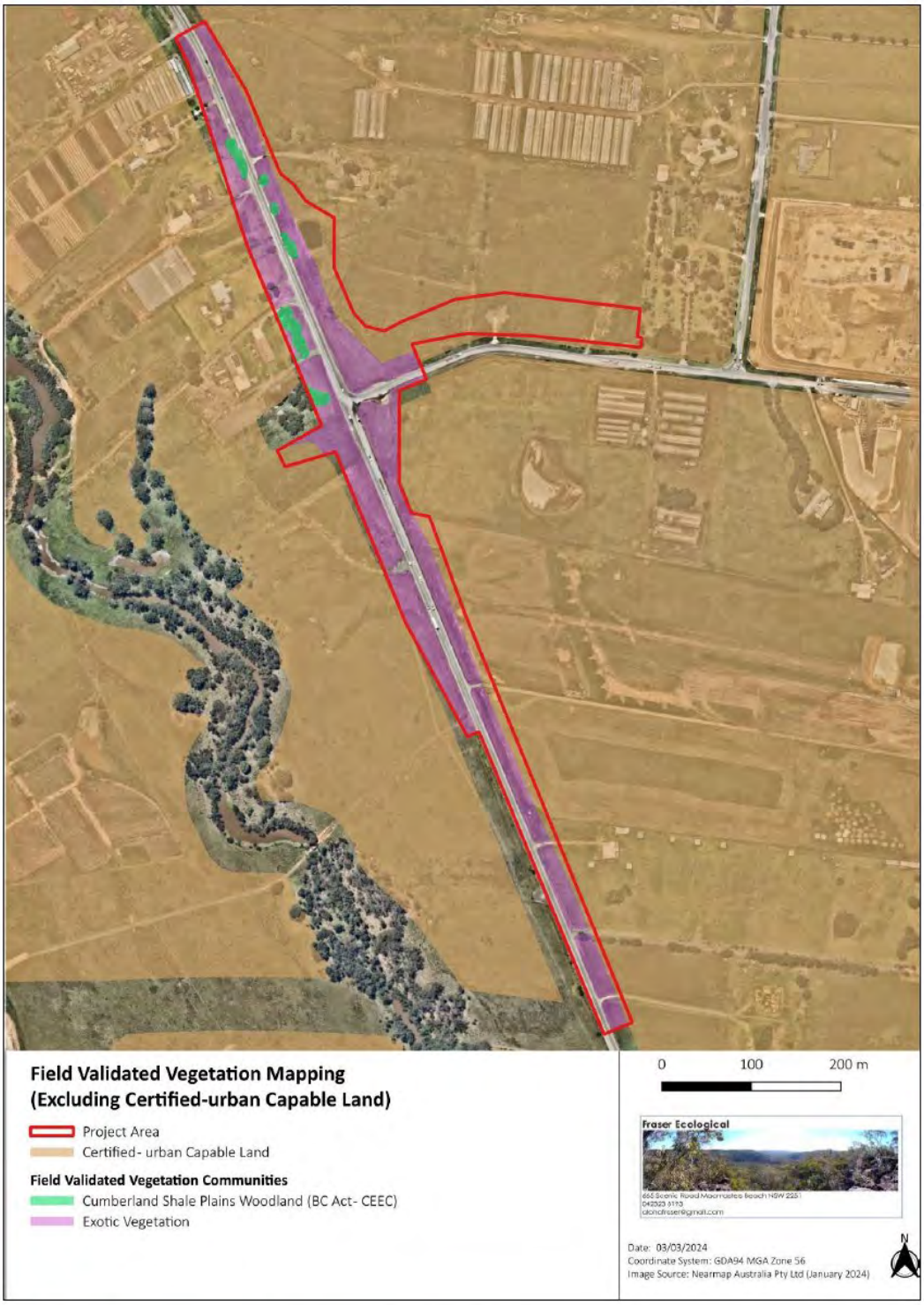


Figure X: Field-validated Vegetation Mapping within the Project Area.

Fraser Ecological

Figure 9: Field-validated Vegetation Mapping and BAM Plot Location within the Project Area

PCTID	PCTName	Area m2	Area ha
3320	Cumberland Plain Woodland (CCEC)	2013.02	0.201

Subject Land

NSW Strahler Stream Order

1

2

3 - 4

BAM Plot

20m x 20m

20m x 50m

Field Verified Vegetation

PCT 3320: Cumberland Plain Woodland (CCEC)

Mamre Road

Aldington Road

Abbotts Road

KEMPS CREEK

SITE: Mamre Rd, Kemps Creek NSW 2178

0 50 100 150 200 250 300 600 Meters

150.785° 150.7867° 150.7883° 150.79° 150.7917° 150.7933° 150.795° 150.7967° 150.7983°

-33.8533° -33.855° -33.8567° -33.8583° -33.86° -33.8617° -33.8633°

NOTE: Subject Land derived from supplied CAD Data Not Survey Accurate on Map. For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_2

Scale: 1:4,000

Aerial imagery: Nearmap 30/03/2024 GDA2020

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

3.1.3 Location of plot-based floristic vegetation surveys

Plot-based floristic vegetation surveys were conducted, in accordance with s.5.2.1.9 of the BAM, by Alex Fraser and Jesse McIvor on the 21/05/2024.

The 20 m x 20 m plots were sampled for the presence of flora species. The BAM Plots were carefully examined to identify all flora species present. Searches continued until it was confident that all flora species within the BAM Plots were detected. Data collected for each species included:

- Stratum and layers in which each species occurs
- Growth form for each species
- Scientific and common name for each species
- Percentage foliage cover (PFC) across the plot, of each species rooted in or overhanging the plot
- Abundance rating for each species

BAM Plot data is provided in Appendix B.

The location of the BAM plots is provided in Figure 9.

Photograph 1. BAM Plot 1 Midline (view south-east)

Photograph 2. BAM Plot 1 Midline (view north)

3.2 Fauna Habitat and Species

The representative BAM Plot sites were found to consist of trees, limited amount of shrubs, native and exotic understorey, leaf litter, and no hollow bearing habitat trees.

There is no outcropping or caves present within the Subject Land.

Additional fauna habitat within the Subject Land is detailed in Table 5.

Desktop analysis revealed several threatened fauna species have the potential to utilise habitat on the Subject Land during part of their lifecycles.

It has been determined that there is no potential for significant impact upon any of the potentially occurring EPBC Act listed threatened species. Therefore, no assessment under the Significant Impact Guidelines for Matters of National Environmental Significance (MNES) was required.

It was deemed that the proposed works are unlikely to result in a significant impact such that a local viable population or occurrence of any of the threatened species aforementioned will be placed at risk of extinction.

Table 5. Fauna habitat values of the Subject Land

Habitat Component	Subject Land Values
Coarse woody debris	Present.
Rock outcrops, bush rock, caves, crevices and overhangs	Absent.
Culverts, bridges, mine shafts, or abandoned structures	Numerous culverts were identified within the Project Area (Figure 2). These culverts were inspected utilising a torch from the entrances and no fauna were found to be inhabiting them at the time of the site assessments.
Nectar/lerp-bearing trees	Various eucalypt species were recorded within the Subject Site. These trees may provide intermittent nectar and/or lerp sources for nomadic nectivores. The Project Area and surrounds contained sporadic Eucalypt spp. and Corymbia spp.. Such trees and shrubs may provide intermittent nectar and/or lerp sources for a suite of species.
Nectar-bearing shrubs	Absent.
Koala and Greater Glider feed trees.	Present.
Large stick nests	Absent.
Sap and gum sources	Various eucalypt species were recorded within the Subject Site. These trees may provide intermittent sap sources for nomadic nectivores.
She-oak fruit (Glossy Black Cockatoo feed)	Present.
Soft-fruit-bearing trees	Present.
Dense shrubbery and leaf litter	Present
Tree hollows	Absent.
Decorticating bark	Absent.
Wetlands, soaks and streams	Present. Soaks were sporadically present within the Project Area. One (1) 2nd order stream was present within the Project Area.
Open water bodies	Present. A small dam was located within the Project Area however was located within land mapped as 'Certified-urban Capable Land'.
Estuarine, beach, mudflats, and rocky foreshores	Absent.

3.2.1 Migratory fauna species

- Desktop analysis revealed following EPBC Act listed migratory terrestrial fauna species were considered to have
- the potential to utilise habitat within the Project Area (e.g., foraging or passage) during part of their lifecycles:
- *Cuculus optatus* (Oriental Cuckoo);
- *Hirundapus caudacutus* (White-throated Needletail);
- *Hydroprogne caspia* (Caspian Tern);
- *Monarcha melanopsis* (Black-faced Monarch);
- *Motacilla flava* (Yellow Wagtail);
- *Myiagra cyanoleuca* (Satin Flycatcher); and
- *Rhipidura rufifrons* (Rufous Fantail).
- The proposed activity will have negligible impacts to potential foraging and breeding habitat for these species
- given their migratory nature. In the unlikely event that these species forage within the Project Area, the proposed
- removal of vegetation will have minimal impacts to foraging habitat given the large areas of better suited habitat
- in the surrounding area and in their migratory range. As such, the proposed activity will have no significant impact
- on these species; therefore, a Referral to Commonwealth pursuant to the EPBC Act is not required.

Table 6: Fauna species identified within and surrounding the Project Area

Class	Scientific Name	Common Name	Status
Amphibia	*Crinia signifera*	Common Eastern Froglet	Protected
	Limnodynastes peronii	Striped Marsh Frog	
	Litoria fallax	Eastern Dwarf Tree Frog	
Aves	*Acridotheres tristis*	Indian Myna	Introduced
	Columba livia	Rock Dove	
	Acanthiza pusilla	Brown Thornbill	Protected
	Ardea cinerea	Grey Heron	
	Bubulcus ibis	Cattle Egret	
	Cacatua sanguinea	Little Corella	
	Chenonetta jubata	Australian Wood Duck	
	Corvus coronoides	Australian Raven	
	Grallina cyanoleuca	Magpie Lark	
	Gymnorhina tibicen	Magpie	
	Hirundo neoxena	Welcome Swallow	
	Malurus cyaneus	Superb Fairywren	
	Manorina melanocephala	Noisy Miner	
	Neochmia temporalis	Red-browed Finch	
	Ocyphaps lophotes	Crested Pigeon	
	Phalacrocorax varius	Australian Pied Cormorant	
	Porphyrio melanotus	Australian Swamphen	
	Rhipidura leucophrys	Willie Wagtail	
	Vanellus miles	Masked Lapwing	
	Zanda funerea	Yellow-tailed Black Cockatoo	
	Zosterops lateralis	Silvereye	

3.3 Vegetation Integrity Assessment (BAM -C)

3.3.1 Vegetation Zones

For the purposes of the BAM, a 'Vegetation Zone' is an area of native vegetation on the Subject Land that has been determined to have a similar broad condition state and PCT allocation.

The assigned Vegetation Zones for the PCT's occurring on the Subject Land are described below.

Only one Vegetation Zone (Vegetation Zone 1) was identified on-site (refer to CPWL isolated tree extent shown Figure 9).

It comprises of isolated remnant native trees that do not have an intact understorey.

It equates to a total of 0.2ha. GIS shapefiles have also been produced for this Vegetation Zone and have been loaded onto BOAMs for assessors to access.

The plot data is provided in Appendix B.

3.3.2 Vegetation Integrity Scores

Each Vegetation Zone identified on the Subject Land was surveyed to obtain quantitative data including vegetation composition, structure and function. The results for each Vegetation Zone are presented in Table 7.

Vegetation Zone characteristics that are quantified during the BAM Plot surveys include:

- Growth form groups (used to assess composition and structure):
    - Tree
    - Shrub
    - Grass and grass like
    - Forb
    - Fern
    - Other
- Attributes (used to assess function):
    - Number of large trees
    - Tree regeneration
    - Tree stem size class
    - Total length of fallen logs

- Litter cover
- High threat exotic vegetation cover
- Hollow-bearing trees

The plot-based surveys were conducted, in accordance with s.5.3.4 of the BAM. For each Vegetation Zone one survey plot was established around a central 50 m transect.

BAM Plot Details

- 400 m² (20 m x 20 m) plot to assess the composition and structure attributes listed above.
- One 1000 m² (20 m x 50 m) plot to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs.

Table 7 details the vegetation integrity scores for each vegetation zone.

Table 7. Vegetation Integrity Scores

Vegetation Zone	PCT	Total Area of Impact (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current Vegetation Integrity Score
1	3320	0.2	4.4	7.5	45.5	11.5

4 THREATENED SPECIES AND ECOLOGICAL COMMUNITIES

4.1 Threatened Ecological Communities (TECs)

The vegetation mapped within the Subject Land as Cumberland Shale Plains Woodland conforms to the BC Act listed CEEC, Cumberland Plain Woodland in the Sydney Basin Bioregion as it contains species indicative of this CEEC and occurs within the associated geology and landscape position.

Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rainshadow area to the west of Sydney's Central Business District. The community typically occurs on flat to undulating or hilly terrain up to about 350 m elevation but may also occur on locally steep sites and at slightly higher elevations.

Cumberland Plain Woodland typically comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Shrubs may sometimes occur in locally dense stands. Less disturbed stands of the community may have a woodland or forest structure. Small trees or saplings may dominate the community in relatively high densities after partial or total clearing, and the groundcover may be relatively sparse, especially where densities of trees or shrubs are high (NSW Scientific Committee 2011).

Native species listed within the final determination (NSW Scientific Committee 2011) that occur within the Subject Land include:

- *Eucalyptus moluccana*
- *Eucalyptus tereticornis*

Approximately 0.2ha of land mapped as Cumberland Plain Woodland is located in land identified as "Excluded Land" or "Avoided Land" under the CPCP.

As described in Section 3.1.2, the CPWL vegetation community proposed for removal is very poor condition.

This vegetation was subject to further assessment under the BC Act (Appendix D – Assessment of Significance) and part of the SAII assessment provided in Section 5.4.

4.2 CPWL Listing under the EPBC Act 1999

In order to be protected as a matter of national environmental significance areas of the ecological community must meet both:

- The key diagnostic characteristics (Table 8); and
- At least the minimum condition thresholds (Table 9).

The vegetation mapped within the Subject Land as Cumberland Shale Plains Woodland does not meet the Key Diagnostic Features for the community (Table 9), nor does it meet the key condition thresholds required to meet the EPBC Act listing status.

Therefore, areas mapped as Cumberland Shale Plains Woodland within the Subject Land do not conform to the EPBC Act listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Threatened Species Scientific Committee 2009) and no further assessment under the EPBC Act is required for this vegetation in the Subject Land.

Table 8: Key diagnostics features required to meet the EPBC Listing Status for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Threatened Species Scientific Committee 2009).

Thresholds	Status in the Project Area
	Cumberland Shale Plains Woodland (Canopy)
Distribution is limited to the Sydney Basin Bioregion with most occurrences in the Cumberland Sub-region. This covers a geographic area commonly known as the Cumberland Plain, a rainshadow coastal valley in western Sydney.	Yes
Most occurrences are on clay soils derived from Wianamatta Group geology, with limited to rare occurrences on soils derived from Tertiary Alluvium, Holocene Alluvium, the Mittagong Formation, Aeolian Deposits and Hawkesbury Sandstone.	Yes
Upper tree layer species must be present with these features: ▪ The minimum projected foliage cover of canopy trees is 10% or more; and ▪ The tree canopy is typically dominated by *Eucalyptus moluccana* (Grey Box), *E. tereticornis* (Forest Red Gum) and/or *E. fibrosa* (Red Ironbark). Other canopy species may occur in association with the typical dominants and may be locally dominant at some sites.	Yes
A sparse lower tree layer may be present, typically with young eucalypts of upper tree canopy species and species of Acacia, Exocarpos and Melaleuca.	Yes
The understorey typically is dominated by the ground layer and shows these features: ▪ The ground layer typically comprises a variety of perennial native graminoids and forbs; ▪ Native graminoid species that are often present include: the grasses *Aristida ramosa* (Purple Wiregrass), *A. vagans* (Threeawn Speargrass), *Cymbopogon refractus* (Barbed Wire Grass), *Dichelachne micrantha* (Plumegrass), *Echinopogon caespitosus var. caespitosus* (Tufted Hedgehog Grass), *Eragrostis leptostachya* (Paddock Lovegrass), *Microlaena stipoides subsp. stipoides* (Weeping Grass), *Paspalidium distans* and *Themeda triandra* (Kangaroo Grass), and other graminoids *Carex inversa* (Knob Sedge), *Cyperus gracilis* (Slender Sedge), *Lomandra filiformis subsp. filiformis* (Wattle Mat-rush) and *L. multiflora subsp. multiflora* (Many flowered Mat-rush); ▪ Native forb and other herb species present include: *Asperula conferta* (Common Woodruff), *Brunoniella australis* (Blue Trumpet), *Cheilanthes sieberi* (Poison Rock-Fern), *Desmodium varians* (Slender Tick-trefoil), *Dianella longifolia* (Blue Flax-Lily), *Dichondra repens* (Kidney Weed), *Glycine spp., Hardenbergia violacea* (Native Sarsparilla), *Opercularia diphylla* (Stinkweed), *Oxalis perennans, Pratia purpurascens* (Whiteroot) and *Wahlenbergia gracilis* (Australian Bluebell); and A shrub layer may be present, to variable extent, and is often dominated by *Bursaria spinosa* (Blackthorn) while other species include: *Daviesia ulicifolia* (Gorse Bitter Pea), *Dillwynia sieberi*, *Dodonaea viscosa subsp. cuneata* (Wedge-leaf Hop-bush), *Indigofera australis* (Native Indigo) and *Lissanthe strigosa* (Peach Heath).	No

Table 9 Key diagnostics features required to meet the EPBC Listing Status for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Threatened Species Scientific Committee 2009).

Category and Rationale	Thresholds	Thresholds Present within the Project Area
A. Core thresholds that apply under most circumstances: patches with an understorey dominated by natives and a minimum size that is functional and consistent within mapping unit size applied in NSW.	Minimum patch size is >0.5ha. AND >50% of the perennial understorey vegetation cover is made up of native species.	No. The patch size is <0.5ha and <50% of the perennial understorey vegetation cover is made up of native species.
OR		
B. Larger patches which are inherently variable due to their rarity.	The patch size is >5ha; AND >30% of the perennial understorey vegetation cover is made up of native species.	No. The patch size is <5ha and <30% of the perennial understorey vegetation cover is made up of native species.
OR		
C. Patches with connectivity to large native vegetation remnants in the landscape.	The path size is >0.5ha; AND ≥30% of the perennial understorey vegetation cover is made up of native species; AND The patch is contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is ≥5ha in area.	No. The patch size is <0.5ha and <30% of the perennial understorey vegetation cover is made up of native species and the patch is not contiguous with another native vegetation remnant that is ≥5ha.
OR		
D. Patches that have large mature trees or trees with hollows (habitat) that are very scarce on the Cumberland Plain.	The patch size is >0.5ha in size; AND ≥30% of the perennial understorey vegetation cover is made up of native species; AND The patch has at least one tree with hollows per hectare or at least one large tree (≥80 cm dbh) per hectare from the upper tree layer species outlined in the Description and Appendix A.	No. The patch size is <0.5ha and <30% of the perennial understorey vegetation cover is made up of native species and the patch does not have at least one tree with hollows per hectare or at least one large tree >80cm dbh per hectare.

Cumberland Shale Plains Woodland within the Project Area DOES NOT meet the minimum condition thresholds for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest; therefore, it is NOT considered to be part of the CEEC under the EPBC listing.

Figure 10 CPWL occurring in the study area

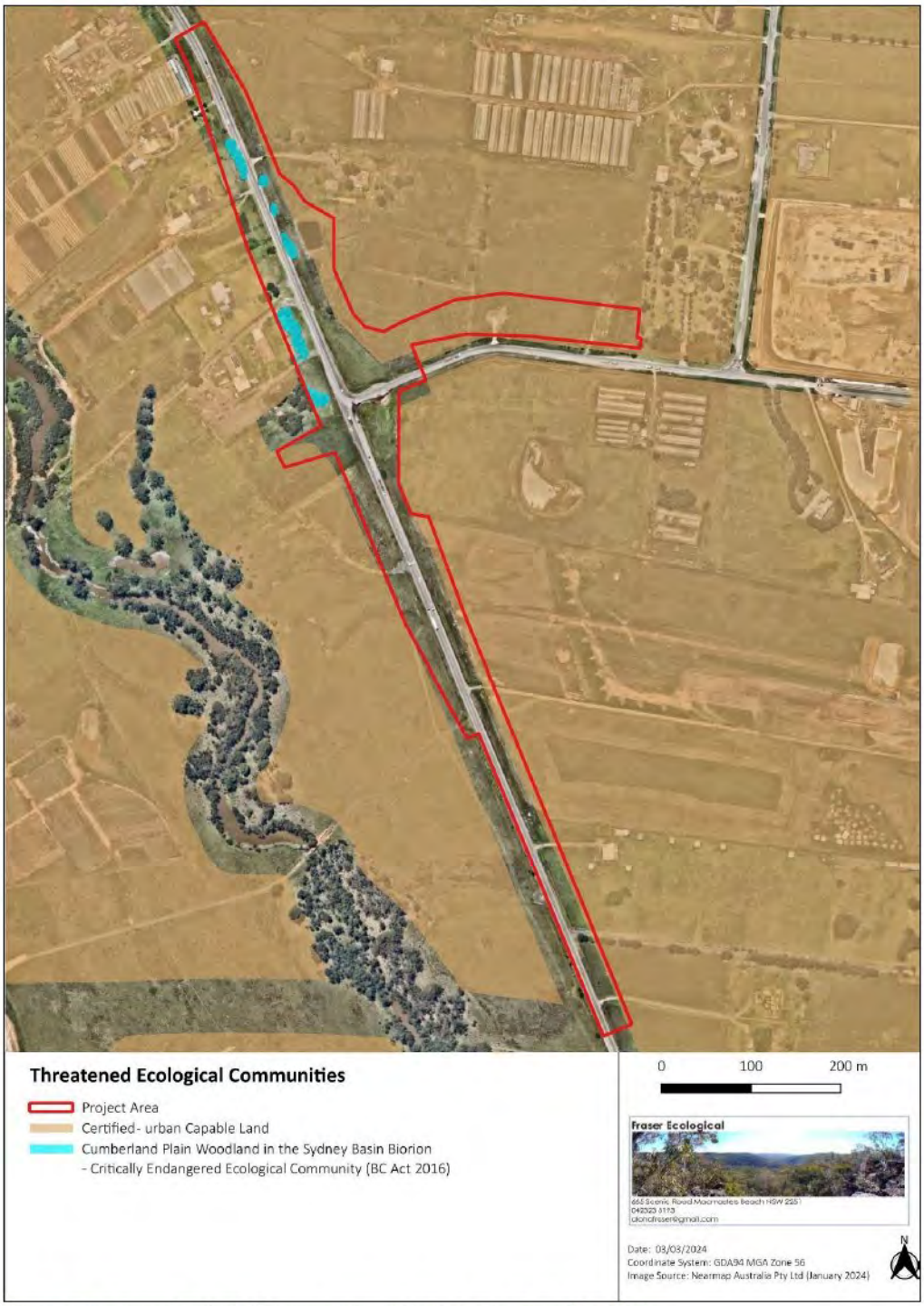


Figure 6. Threatened Ecological Communities within the Project Area (BC 2016).

Buffer	PCTID	PCTName	Area ha
1500m Buffer	3319	Cumberland Shale Hills Woodland	0.8
1500m Buffer	3320	Cumberland Shale Plains Woodland	46.5
1500m Buffer TOTAL Area			1132.4
500m Buffer	0	No Cumberland Plain Woodland CEEC	0
500m Buffer TOTAL Area			233.5

SITE: Mamre Rd, Kemps Creek NSW 2178

0 200 400 600 800 1,000 2,000 Meters

Fraser Ecological

Figure 10:
CPWL occurring in the study area

Subject Land

Subject Land Buffers

1500m Buffer

500m Buffer

SVTM PCT VC2.0M2.0 (December 2023)

3319,Cumberland Shale Hills Woodland

3320,Cumberland Shale Plains Woodland

NOTE: Subject Land derived from supplied CAD Data Not Survey Accurate on Map. For Illustration Purposes ONLY

Base Spatial Layers - NSW State Dept Open Source Accurate as of May 2024 GDA2020

DATE : 6/06/2024
Map Version: 1_1

Scale: 1:16,000

Google Satellite Imagery 2024

Projected Coordinate System:
Name: GDA2020 MGA Zone 56
Projection: Transverse Mercator
WKID: 7856

Although all care has been taken WiZarDTech accepts no responsibility from the use or inaccuracies of this map and spatial data.

4.3 Ecosystem Credit Species

Ecosystem credit species are those where the likelihood of occurrence of the species or elements of the species' habitat, can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. The Threatened Biodiversity Data Collection (TBCD) has identified several ecosystem credit species as requiring assessment as shown on the following page (Table 10).

Table 10 Ecosystem Credit Species Table

Common name	Species name	PCT
Black Falcon	*Falco subniger*	3320-Cumberland Shale Plains Woodland
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	3320-Cumberland Shale Plains Woodland
Black-necked Stork	*Ephippiorhynchus asiaticus*	3320-Cumberland Shale Plains Woodland
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	3320-Cumberland Shale Plains Woodland
Diamond Firetail	*Stagonopleura guttata*	3320-Cumberland Shale Plains Woodland
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	3320-Cumberland Shale Plains Woodland
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	3320-Cumberland Shale Plains Woodland
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	3320-Cumberland Shale Plains Woodland
Eastern Osprey	*Pandion cristatus*	3320-Cumberland Shale Plains Woodland
Flame Robin	*Petroica phoenicea*	3320-Cumberland Shale Plains Woodland
Gang-gang Cockatoo	*Callocephalon fimbriatum*	3320-Cumberland Shale Plains Woodland
Greater Broad-nosed Bat	*Scoteanax rueppellii*	3320-Cumberland Shale Plains Woodland
Grey-headed Flying-fox	*Pteropus poliocephalus*	3320-Cumberland Shale Plains Woodland
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	3320-Cumberland Shale Plains Woodland
Little Bent-winged Bat	*Miniopterus australis*	3320-Cumberland Shale Plains Woodland
Little Eagle	*Hieraaetus morphnoides*	3320-Cumberland Shale Plains Woodland
Little Lorikeet	*Glossopsitta pusilla*	3320-Cumberland Shale Plains Woodland
Regent Honeyeater	*Anthochaera phrygia*	3320-Cumberland Shale Plains Woodland
Rosenberg's Goanna	*Varanus rosenbergi*	3320-Cumberland Shale Plains Woodland
Scarlet Robin	*Petroica boodang*	3320-Cumberland Shale Plains Woodland

Common name	Species name	PCT
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*	3320-Cumberland Shale Plains Woodland
Speckled Warbler	*Chthonicola sagittata*	3320-Cumberland Shale Plains Woodland
Spotted Harrier	*Circus assimilis*	3320-Cumberland Shale Plains Woodland
Spotted-tailed Quoll	*Dasyurus maculatus*	3320-Cumberland Shale Plains Woodland
Square-tailed Kite	*Lophoictinia isura*	3320-Cumberland Shale Plains Woodland
Swift Parrot	*Lathamus discolor*	3320-Cumberland Shale Plains Woodland
Turquoise Parrot	*Neophema pulchella*	3320-Cumberland Shale Plains Woodland
Varied Sittella	*Daphoenositta chrysoptera*	3320-Cumberland Shale Plains Woodland
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	3320-Cumberland Shale Plains Woodland
White-throated Needletail	*Hirundapus caudacutus*	3320-Cumberland Shale Plains Woodland
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	3320-Cumberland Shale Plains Woodland

4.4 Species Credit Species (Candidate Species)

Species credit species (or candidate species) are those where the likelihood of occurrence of the species or elements of suitable habitat for the species, cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey. Assessment of the candidate species for this BDAR is detailed in Table 11 below.

One (1) mapped dam was also identified within the Subject Land. The dam occurs within the 'Certified Urban Capable Land' and does not require assessment under this BDAR.

As a precautionary measure we undertook habitat assessment surveys for threatened Green and Golden Bell Frog (*Litoria aurea*) in May 2024. It was not recorded during surveys.

Narla Environmental conducted site assessment for GGBF over the course of two (2) years within the known calling time for this species and no individuals were located.

The Assessment of Significance within Appendix C determined that:

- The proposed activity is will not lead to a long-term decrease in the size of an important population.
- The proposed activity will result in impacts to one (1) small dam. These features may provide breeding or foraging habitat for the Green and Golden Bell Frog. These features however are in low condition, surrounded by degraded roadside vegetation. As such, any potential disturbance to this species is likely to be temporary and localised, with better condition habitat (Kemps Creek) being untouched in the surrounding locality.
- The proposed activity will not reduce the area of occupancy of an important population of species. Site assessments were conducted over the course of two (2) years within the known calling time for this species and no individuals were located.
- Although the proposed activity may see a temporary reduction in potential habitat for the Green and Golden Bell Frog, the habitat is in low condition, and is surrounded by degraded roadside vegetation, thus providing less than optimal habitat for this species.

Due to the lack of suitable habitat it is highly unlikely that any threatened species occur within the development impact area.

Table 11: Candidate Species Table (justification for inclusion/exclusion for further assessment)

Table 11: Candidate species assessment (justification for exclusion/ inclusion)

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
Chalinolobus dwyeri	*Large-eared Pied Bat*	Vulnerable	Vulnerable	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin Petrochelidon ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.;1 Found in well-timbered areas containing gullies.;2 The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.;3 Likely to hibernate through the coolest months.;4 It is uncertain whether mating occurs early in winter or in spring.;5	Cliffs;Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	January;November;December	YES	Suitable habitat is absent- no biodiversity credits are required
Myotis macropus	*Southern Myotis*	Vulnerable		The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. 1 Forage over streams and pools catching insects and small fish by raking their feet across the water surface. 2 In NSW females have one young each year usually in November or December.	Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site.	Oct-March Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. 1 Forage over streams and pools catching insects and small fish by raking their feet across the water surface. 2 In NSW females have one young each year usually in November or December.	No	Suitable habitat is absent- no biodiversity credits are required
Heleioporus australiacus	*Giant Burrowing Frog*	Vulnerable	Vulnerable	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.;1 Spends more than 95% of its time in non-breeding	N/A	January;February;March;April;May;September;October;November;December	NO	Suitable habitat is absent- no biodiversity

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.	habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.;2 Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Most individuals will not attempt to breed every year.;3 The Giant Burrowing Frog has a generalist diet and studies to date indicate that they eat mainly invertebrates including ants, beetles, cockroaches, spiders, centipedes and scorpions.;4 When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. Males show strong territoriality at breeding sites. This species breeds mainly in autumn, but has been recorded calling throughout the year. Egg masses are foamy with an average of approximately 500-800 eggs and are laid in burrows or under vegetation in small pools. After rains, tadpoles are washed into larger pools where they complete their development in ponds or ponded areas of the creekline. Tadpole development ranges from around 12 weeks duration to up to 12 months with late developing tadpoles overwintering and completing development when warmer temperatures return.;5 Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.;6 This frog is a slow growing and long-lived species, living up to 10 years of age, possibly longer.;7				credits are required
Meridolum corneovirens	*Cumberland Plain Land Snail*	Endangered		Lives in small areas on the Cumberland Plain west of Sydney, from Richmond	Primarily inhabits Cumberland Plain Woodland (a critically endangered ecological community). This community is a	n/a	n/a	No	Suitable habitat is absent- no biodiversity

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. known from over 100 different locations, but not all are currently occupied, and they are usually isolated from each other as a result of land use patterns.	grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest, which are also listed communities. 1 Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. 2 Can dig several centimetres into soil to escape drought.3 Is a fungus specialist. Unlike the Garden Snail, does not eat green plants. It is generally active at night. 4 Little is known of its biology, including breeding biology. It is known to be hermaphroditic, laying clutches of 20-25 small, round, white eggs in moist, dark areas (such as under logs), with the eggs taking 2-3 weeks to hatch. There is a suggestion that the species breeds throughout the year when conditions are suitable.				credits are required
Ninox connivens	*Barking Owl (breeding)*	Vulnerable	Not Listed	The Barking Owl is found throughout continental Australia except for the central arid regions. Although still common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Many populations crashed as woodland on fertile soils was cleared over the past century, leaving linear riparian strips of remnant trees as the last inhabitable areas. Surveys in 2001 demonstrated that the	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils.;1 Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance.;2 Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch.;3 Requires very large permanent	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				Pilliga Forest supported the largest population in southern Australia. The owls sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights. Extensive wildfires in 2019-20 reduced habitat quality further, burnt many old, hollow-bearing trees needed as refuge by prey species and reduced the viability of some regional owl populations.	territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.;4 Two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas).;5 Nesting occurs during mid-winter and spring, being variable between pairs and among years. As a rule of thumb, laying occurs during August and fledging in November. The female incubates for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging occurs 2-3 weeks later. Young are dependent on their parents for several months.;6 Territorial pairs respond strongly to recordings of Barking Owl calls from up to 6 km away, though humans rarely hear this response farther than 1.5 km. Because disturbance reduces the pair's foraging time, and can pull the female off her eggs even on cold nights, recordings should not be broadcast unnecessarily nor during the nesting season.;7				
Pomaderris brunnea	*Brown Pomaderris*	Endangered	Vulnerable	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria.	Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.;1 Flowers appear in September and October.;2 The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years.;3 The species has been found in association with Eucalyptus amplifolia , Angophora floribunda , Acacia parramattensis , Bursaria spinosa and Kunzea ambigua .;4	N/A	August;September;October	NO	Suitable habitat is absent- no biodiversity credits are required
Burhinus grallarius	*Bush Stone-curlew*	Endangered	Not Listed	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.;1 Largely nocturnal, being especially active on moonlit nights.;2 Feed on insects and small vertebrates, such as frogs, lizards and snakes.;3 Nest on the ground in a scrape or small bare patch.;4 Two eggs are laid in spring and early summer.;5	Fallen/standing dead timber including logs;Null	January;February;March;April;May;June;July;August;September;October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				the south-east it is either rare or extinct throughout its former range.					
Eucalyptus benthamii	*Camden White Gum*	Critically endangered	Vulnerable	Occurs on the alluvial flats of the Nepean River and its tributaries. There are two major subpopulations: in the Kedumba Valley of the Blue Mountains National Park and at Bents Basin State Recreation Area. Several trees are scattered along the Nepean River around Camden and Cobbitty, with a further stand at Werriberri (Monkey) Creek in The Oaks. At least five trees occur on the Nattai River in Nattai National Park. Large areas of habitat were inundated by the formation of Warragamba Dam in 1933.	Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. Recruitment of juveniles appears to be most successful on bare silt deposits in rivers and streams. 1 The recorded elevation range for the species is from 30m ASL at Bents Basin to 750m ASL in the Kedumba population. Most of the individuals are around 60 to 300m ASL. 2 Occurs in open forest. Associated species at the Bents Basin site include Eucalyptus elata, E. bauerina, E. amplifolia, E. deanei and Angophora subvelutina. Understorey species include Bursaria spinosa, Pteridium esculentum and a wide variety of agricultural weeds. The Kedumba Valley site lists E. crebra, E. deanei, E. punctata, Leptospermum flavescens, Acacia filicifolia and Pteridium esculentum among its associated species.	n/a	n/a Identifiable throughout year by epicormic growth or juvenile foliage.	Yes	Suitable habitat is absent- no biodiversity credits are required
Deyeuxia appressa	*Deyeuxia appressa*	Endangered	Endangered	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas.	Given that D. appressa hasn't been seen in over 60 years, almost nothing is known of the species' habitat and ecology.;1 Flowers spring to summer and is mesophytic (grows in moist conditions).;2	N/A	December	YES	Suitable habitat is absent- no biodiversity credits are required
Dillwynia tenuifolia	*Dillwynia tenuifolia*	Vulnerable	Not Listed	The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. Other populations in western Sydney are	At Yengo D. tenuifolia is reported to occur in disturbed escarpment woodland on Narrabeen sandstone. Associated tree species include Eucalyptus eximia , E. punctata , E. sparsifolia and Callitris endlicheri . The shrub layer is dominated by	N/A	August;September;October	NO	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				recorded from Voyager Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities outside the Cumberland Plain include the Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains.	D. tenuifolia , Leucopogon muticus , Leptospermum parvifolium and Pultenaea microphylla (Maryott-Brown & Wilks 1993).;2 Flowering occurs sporadically through the year with a peak from from August to March depending on environmental conditions. Pollinators are unknown. The lifespan is estimated to be 20-30 years. It is thought a minimum of 3-4 years is required before seed is produced.;3 Seeds are hard coated and are persistent in the soil seed bank. Dispersal is likely to be localised and ants are the probable vectors;4 Killed by fire and re-establishes from soil-stored seed.;5 Abundance is influenced by past disturbance history e.g. fire. The high population densities at some recorded sites (200,000+ individuals) reflects prolific seed germination in response to fire.;6 "				
Acacia pubescens	*Downy Wattle*	Vulnerable	Vulnerable	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone.;1 Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.;2 Longevity is unknown, but clonal species have been known to survive for many decades.;3 Flowers from August to October. Pollination of Acacia flowers is usually by insects and birds. The pods mature in October to December.;4 Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low.;5 Acacia species generally have high seed dormancy and long-lived persistent soil seedbanks. It is thought that the species needs a minimum fire free period of 5 - 7 years to allow an adequate seedbank to develop.;6	N/A	January;February;March;April;May;June;July;August;September;October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required
Pommerhelix duralensis	*Dural Land Snail*	Endangered	Endangered	"The species is a shale-influenced-habitat specialist, which occurs in	The species has a strong affinity for communities in the interface region between shale-derived and sandstone-		January;February;March;April;May;June;July;August;September;October;November;December	NO	Suitable habitat is absent- no biodiversity

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes.	derived soils, with forested habitats that have good native cover and woody debris.;1 It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.;2 Migration and dispersal is limited, with overnight straight-line distances of under 1 metre identified in the literature and studies. The species is active from approximately one hour after dusk until dawn and no confirmed diurnal activity is reported. It exhibits no roost-site behaviour.;3 The species is known to aestivate, and secretes an epiphragm to protect against dessication.;4 The main food sources are hyphae and fruiting bodies of native fungi. It is possible other detritus may be consumed.;5 Reproduction rates are very low, with few eggs (about 32) per season. Mortality is 90% in the first year, and 99.8% within four-five years				credits are required
Pandion cristatus	*Eastern Osprey (breeding)*	Vulnerable	Not Listed	The Osprey has a global distribution with four subspecies previously recognised throughout its range. However, recent studies have identified that there are two species of Osprey - the Western Osprey (P. halietus) with three susbpecies occurring in Europe, Asia and the Americas and the Eastern Osprey (P. cristatus) occurring between Sulawesi (in Indonesia), Australia and New Caledonia. Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania.	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes.;1 Feed on fish over clear, open water.;2 Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. .;3 Incubation of 2-3 eggs, usually by the female, is about 40 days. Female remains with young almost until they fly, usually after about nine weeks in the nest.;4	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required

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				They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas.					
Cercartetus nanus	*Eastern Pygmy-possum*	Vulnerable	Not Listed	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes.	"Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities. ;1 Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.;2 Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests.;3 Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.;4 Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares.;5 Young can be born whenever	N/A	January;February;March;October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required

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					food sources are available, however most births occur between late spring and early autumn.;6 Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal.;7 Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.;8 "				
Callocephalon fimbriatum	*Gang-gang Cockatoo (breeding)*	Vulnerable	Endangered	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. ;1 In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands,particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.;2 May also occur in sub-alpine Snow Gum Eucalyptus pauciflora) woodland and occasionally in temperate rainforests.;3 Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 7 cm in diameter or larger in eucalypts and 3 metres or more above the ground.;4	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required
Calyptorhynchus lathami	*Glossy Black-Cockatoo (breeding)*	Vulnerable	Vulnerable	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia.	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak Allocasuarina littoralis) and Forest Sheoak A. torulosa) are important foods.;1 Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, Allocasuaraina diminuta, and A. gymnathera. Belah is also utilised and may be a critical food source for some populations.;2 In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah Casuarina cristata).;3 Feeds almost exclusively on the seeds of several species of she-oak Casuarina and Allocasuarina species), shredding the cones with the massive bill.;4 Dependent on large hollow-	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required

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					bearing eucalypts for nest sites. A single egg is laid between March and May.;5				
Grevillea juniperina subsp. juniperina	*Juniper-leaved Grevillea*	Vulnerable		Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town.	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. 1 Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest. 2 Associated canopy species within Cumberland Plain Woodland and Shale/Gravel Transition Forest include Eucalyptus tereticornis, E. moluccana, E. crebra, E. fibrosa and E. eugenioides. Understorey species include Bursaria spinosa, Dillwynia sieberi, Ozothamnus diosmifolius, Daviesia ulicifolia, Acacia falcata, Acacia parramattensis, Themeda australis, Aristida ramosa, Cymbopogon refractus, Eragrostis brownii, Cheilanthes sieberi, Dianella revoluta and Goodenia hederacea. 3 In Castlereagh Woodland on more sandy soils the dominant canopy species are Eucalyptus fibrosa, E. sclerophylla, Angophora bakeri and Melaleuca decora. Understorey species include Melaleuca nodosa, Hakea sericea, Cryptandra spinescens, Acacia elongata, Gonocarpus teucrioides, Lomandra longifolia and the threatened species Dillwynia tenuifolia, Pultenaea parviflora, Micromyrtus minutiflora and Allocasuarina glareicola.4 Flowering may occur sporadically throughout the year, but particularly between July and October. Flowers are reported to be bird pollinated although bees have also been observed visiting flowers. 5 Plants are killed by fire with regeneration solely from soil-stored seed. Fire leads to a sudden increase in the recruitment of seedlings. Germination experiments show that germination rates are improved by exposure to both smoke and heat. The frequency of fire is likely to be an important	N/A	N/A	No	Suitable habitat is absent- no biodiversity credits are required

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					factor. If fires are too frequent there may be insufficient time to build up seed in the soil to replace plants killed in the fire. 6 Physical disturbance of the soil appears to result in an increase in seedling recruitment. Has a tendency to colonise mechanically disturbed areas 7 Dense growth of blackthorn (Bursaria) can limit the ability of the species to spread. 8 Most prolific seeding occurs on plants more than 1m high.				
Pultenaea parviflora	Pultenaea parviflora	Endangered	Vulnerable	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce.	May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. 1 May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. 2 Eucalyptus fibrosa is usually the dominant canopy species. Eucalyptus globoidea, E. longifolia, E. parramattensis, E. sclerophylla and E. sideroxylon may also be present or co-dominant, with Melaleuca decora frequently forming a secondary canopy layer. 3 Associated species may include Allocasuarina littoralis, Angophora bakeri, Aristida spp. Banksia spinulosa, Cryptandra spp., Daviesia ulicifolia, Dodonaea falcata, Entolasia stricta, Hakea sericea, Lissanthe strigosa, Melaleuca nodosa, Ozothamnus diosmifolius, Styphelia laeta and Themeda australis. 4 Often found in association with other threatened species such as Dillwynia tenuifolia, Grevillea juniperina, Micromyrtus minutiflora and Persoonia nutans. 5 Flowering may occur between August and November depending on environmental conditions. Pollinators are unknown. 6 Current estimates are that reproductive maturity is not reached for 3-4 years, and peak reproduction until 5-6 years. The individual lifespan is estimated at about 20 years. 7	No	Sep-Nov	No	Suitable habitat is absent- no biodiversity credits are required

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					Killed by fire and re-establishes from soil-stored seed. There is no evidence of vegetative spread. Ants are implicated in the dispersal of the species as the seed has an aril. Germination can be prolific after a moderate to high intensity fire. 8 Populations range in number between 10 and more than 5000 individuals, with disturbance history often important in numbers at a site. This also influences the population structure, with fire-induced recruitment producing a more evenly-aged population than soil disturbances. Dominance at a site largely depends on competition from other shrubby plants.				
Pteropus poliocephalus	*Grey-headed Flying-fox (breeding)*	Vulnerable	Vulnerable	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations.	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.;1 Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.;2 Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.;3 Annual mating commences in January and conception occurs in April or May; a single young is born in October or November.;4 Site fidelity to camps is high; some camps have been used for over a century.;5 Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.;6 Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia , and fruits of rainforest trees and vines.;7 Also forage in cultivated gardens and fruit crops.;8	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required
Persoonia hirsuta	*Hairy Geebung*	Endangered	Endangered	Persoonia hirsuta has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Hilltop in the south west, Dombarton in the south	The Hairy Geebung is found in clayey and sandy soils in dry sclerophyll open forest, woodland and heath, primarily on the Mittagong Formation and on the upper Hawkesbury Sandstone.;1 It is usually present as isolated individuals or very small populations.;2 Plants are generally killed by all but the lowest intensity fire or partial		January;February;March;April;May;June;July;August;September;October;November;December	YES	Suitable habitat is absent- no biodiversity credits are required

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				east and the Blue Mountains to the west. Persoonia hirsuta has a large area of occurrence, but occurs in small populations or isolated individuals, increasing the species' fragmentation in the landscape.	burning. Fire may promote germination of soil-stored seed, although it may also kill some of the seedbank if it is of high severity. ;3 Extreme wet-dry weather cycles may also promote germination of soil-stored seed.;4				
Hibbertia puberula	*Hibbertia puberula*	Endangered	Not Listed	Recent work on this species (Toelken & Miller 2012) and its relatives have shown it to be widespread, but never common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath (Toelken & Miller 2012).	Flowering time is October to December, sometimes into January.;1 Occurs on sandy soil often associated with sandstone, or on clay.;2 Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently (2012) described subspecies also favours upland swamps.;3	N/A	October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required
Phascolarctos cinereus	*Koala*	Endangered	Endangered	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the	Inhabit eucalypt woodlands and forests.;1 Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.;2 Inactive for most of the day, feeding and moving mostly at night.;3 Spend most of their time in trees, but will descend and traverse open ground to move between trees.;4 Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.;5 Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-	Other;Presence of koala use trees - refer to Survey Comments field in TBDC	January;February;March;April;May;June;July;August;September;October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required

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				plains west of the Great Dividing Range.	ordinate males on the periphery.;6 Females breed at two years of age and produce one young per year.;7				
Miniopterus orianae oceanensis	*Large Bent-winged Bat (breeding)*	Vulnerable	Not Listed	Eastern Bentwing-bats occur along the east and north-west coasts of Australia.	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.;1 Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.;2 Maternity caves have very specific temperature and humidity regimes.;3 At other times of the year, populations disperse within about 300 km range of maternity caves.;4 Cold caves are used for hibernation in southern Australia.;5 Breeding or roosting colonies can number from 100 to 150,000 individuals.;6 Hunt in forested areas, catching moths and other flying insects above the tree tops.;7	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required
Miniopterus australis	*Little Bent-winged Bat (breeding)*	Vulnerable	Not Listed	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW.	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.;1 Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.;2 They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.;3 In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats Miniopterus schreibersii) and appears to depend on the large colony to provide the high temperatures needed to rear its young.;4 Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer.;5 Only five nursery sites /maternity colonies are known in Australia.;6	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required
Hieraaetus morphnoides	*Little Eagle (breeding)*	Vulnerable	Not Listed	The Little Eagle is found throughout the Australian mainland excepting the	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity

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				most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW.	interior NSW are also used.;1 Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.;2 Lays two or three eggs during spring, and young fledge in early summer.;3 Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.;4				credits are required
Tyto novaehollandiae	*Masked Owl (breeding)*	Vulnerable	Not Listed	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution.	Lives in dry eucalypt forests and woodlands from sea level to 1100 m.;1 A forest owl, but often hunts along the edges of forests, including roadsides.;2 The typical diet consists of tree-dwelling and ground mammals, especially rats.;3 Pairs have a large home-range of 1000 hectares or more, depending on prey availability.;4 Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.;5	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required
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*	Endangered Population		Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range.	Grows in vine thickets and open shale woodland.	N/A	Nov-Feb Use flowers to locate and identify. Flowering occurs in late spring to summer during normal to wet conditions. Species may reduce to the tap root under adverse conditions (drought, intensive mowing). Strongly recommend expert report to discount presence or absence if conditions do not meet requirements.	No	Suitable habitat is absent- no biodiversity credits are required
Persoonia nutans	*Nodding Geebung*	Endangered	Endangered	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. The species has a disjunct distribution, with the majority of populations (and 99% of individuals) occurring in the north of the species range in the Agnes Banks, Londonderry, Castlereagh, Berkshire Park	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest. 1	n/a	All year round	No	Suitable habitat is absent- no biodiversity credits are required

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				and Windsor Downs areas. Core distribution occurs within the Penrith, and to a lesser extent Hawkesbury, local government areas, with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown local government areas. The southern and northern populations have distinct habitat differences.	Peak flowering is from November to March with sporadic flowering all year round. 2 An obligate seed regenerator. Seed germination is promoted by fire and also by physical disturbance. Although listed as a short-lived species much of the ecology is poorly known. Maturity is expected in about 10 years. 3 Plants appear to set abundant fruit. Seed is likely to be dispersed, after consumption of the fruit, by large birds such as currawongs and large mammals such as wallabies, kangaroos and possums. 4 Abundance at a site appears to be related to disturbance history. Sites with higher abundance also appear to be more disturbed.				
Pomaderris prunifolia - endangered population	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	Endangered population		Known from only three sites within the listed local government areas, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown.	At Rydalmere it occurs along a road reserve near a creek, among grass species on sandstone. 1 At Rookwood Cemetery it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils. 2 Does not appear to spread vegetatively. The longevity is thought to be 10-25 years. 3 Buds are present for many months before flowers open. 4 Probably killed by fire.	n/a	Use flowers to identify. While this species is identifiable by foliage at any time of the year, it is most easily and reliably identified during flowering in Oct.	No	Suitable habitat is absent- no biodiversity credits are required
Pimelea curviflora var. curviflora	*Pimelea curviflora var. curviflora*	Vulnerable	Vulnerable	Confined to the coastal area of the Sydney and Illawarra regions. Populations are known between northern Sydney and Maroota in the north-west. New population discovered at Croom Reserve near Albion Park in Shellharbour LGA in August 2011. Formerly recorded around the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly.	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowalnd Grassy Woodland habitat at Albion Park on the Illawaraa coastal plain.;1 Flowers October to May.;2 Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. ;3 Likely to be fire tolerant species capable of resprouting following fire due to the presence of a tap root. Seedlings have been observed following fire.;4		January;February;March;October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
Pimelea spicata	*Spiked Rice Flower*	Endangered	Endangered	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama)	In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. 1 On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. 2 The co-occurring species in the Cumberland Plain sites are grey box (Eucalyptus moluccana), forest red gum (E. tereticornis) and narrow-leaved ironbark (E. crebra). Blackthorn (Bursaria spinosa) is often present at sites (and may be important in protection from grazing) and kangaroo grass (Themeda australis) is usually present in the groundcover (also indicative of a less intense grazing history). 3 In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites. 4 the IIllawarra populations usually occur in one of two communities - a woodland or a coastal grassland. Woodland sites are dominated by forest red gum (E. tereticornis) and stringybark (E. eugenioides), with a groundcover dominated by kangaroo grass (Themeda australis) and matrush (Lomandra longifolia). The grassland sites are dominated by kangaroo grass (Themeda australis) and matrush (Lomandra longifolia), with blady grass (Imperata cylindrica). A shrubby layer, where present, is dominated by coastal wattle (Acacia sophorae) and coast rosemary (Westringia fruticosa) with coast banksia (Banksia integrifolia). 5 Mature plants spread over short distances through underground rhizomes, and this can assist them to recover from disturbances like fire and irregular grazing. However, the age plants must be, and what proportion recover, is largely unknown. 6	n/a	All year round Use flowers to locate and identify as species is inconspicuous. Flowering is unpredictable and rain dependent. Survey 4 weeks after at least a 30 mm rainfall event. In drier times plants are often not visible above ground unless soils remain moist. Multiple surveys may be required. Survey at least 3 times, each at least a month apart unless found.	No	Suitable habitat is absent- no biodiversity credits are required

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					Flowers may be self-pollinating, although fruit production is variable. Fruit are not dispersed well, with most seedlings germinating close to the adult (within 30cm or so according to P. Hogbin). A soil seedbank develops and is maintained in the presence of a suitable disturbance regime.				
Pultenaea pedunculata	*Matted Bush-pea*	Endangered		Matted Bush-pea is widespread in Victoria, Tasmania, and south-eastern South Australia. In NSW however, it is represented by just three disjunct populations, in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn (where it is locally abundant). the Cumberland Plain occurrences were more widespread (Yennora, Canley Vale and Cabramatta were lost to development) and is now found at Villawood and Prestons, and north-west of Appin between the Nepean River and Devines Tunnel number 2 (Upper Sydney Water Supply Canal).	The Matted Bush-pea occurs in a range of habitats. NSW populations are generally among woodland vegetation but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area. 1 The ability of stems to creep and root from the nodes has made this species a very good coloniser of bare ground in many parts of its range. 2 Flowers appear in spring (August to December), with fruit maturing from October to January but sometimes persistent on the plant until April-May. Like other Pultenaea species, the seeds have an aril and are likely to be dispersed by ants. Few young plants have been seen (no seedlings) and the suggestion is that there will be germination after disturbance as well as after fire, although the fire response is unknown. 3 In the Cumberland Plain the species favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present. 4 In the Liverpool - Fairfield area the majority of occurrences are in lower-lying areas and often close to creek lines. Soils are moderately to poorly drained. By contrast, the Appin sites are on a plateau above the Nepean River, on soils that are not usually poorly drained. 5 On the Cumberland Plain the species is recorded from Cumberland Plain Woodlands, the shale-soil form of Shale	n/a	Sept-Nov	No	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
					Sandstone Transition Forests and Cooks River/Castlereagh Ironbark Forest. 6 Associated species in the Sydney area include include Eucalyptus moluccana, E. fibrosa, E. crebra, E. longifolia and Melaleuca decora. Understorey species include Bursaria spinosa, Ozothamnus diosmifolius, Acacia parramattensis, A. falcata, Indigofera australis, Dillwynia sieberi, Olearia viscidula, Kunzea ambigua, Opercularia diphylla, Astroloma humifusum, Glycine tabacina, Hardenbergia violacea, Wahlenbergia gracilis, Aristida vagans, Gahnia aspera, Lomandra filiformis, Cheilanthes sieberi and Themeda australis. At Villawood it has been recorded growing in the vicinity of the threatened species Acacia pubescens. 7 Southern Tablelands populations are at 560-620m ASL and on friable loam soils underlain by Tertiary basalt and Quaternary sediments. While in creek lines and broad valleys, the soils are not usually waterlogged. The species also occurs in gravelly road batters. 8 In the Windellama area on the Southern Tablelands, P. pedunculata generally grows in creek lines within grassy woodland dominated by Eucalyptus mannifera. E. dives and E. gregsoniana are also often present. A few populations occur within E. rossii - E. macrorhycha woodland. The threatened species Bossiaea oligosperma, Dillwynia glaucula and E. recurva occur in the vicinity. 9 On the far south coast the species favours sandy soils on headlands and slopes immediately above the beach. It can also occur in the rock crevices above the shoreline				
Litoria aurea	*Green and Golden Bell Frog*	Endangered	Vulnerable	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). 1 Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have	Semi-permanent/ephemeral wet areas (Within 1km of wet areas)	Nov-March	No	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands.	a grassy area nearby and diurnal sheltering sites available. 2 Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. 3 The species is active by day and usually breeds in summer when conditions are warm and wet. 4 Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. 5 Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. 6 Preyed upon by various wading birds and snakes.	Swamps (Within 1km of swamp) Waterbodies (Within 1km of waterbody)			
Ninox strenua	*Powerful Ow (breeding)l*	Vulnerable	Not Listed	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. Recent increases in population density across Sydney and some other semi-urban areas do not seem to be solely due to	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.;1 The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine Syncarpia glomulifera , Black She-oak Allocasuarina littoralis , Blackwood Acacia melanoxylon , Rough-barked Apple Angophora floribunda , Cherry Ballart Exocarpus cupressiformis and a number of eucalypt species. ;2 The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required

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				increased awareness of this flagship species.	Powerful Owls. Flying-foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. ;3 Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 ha can support a pair when prey are dense. Where hollow trees and prey have been depleted, the owls need up to 4000 ha.;4 Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him.;5 Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days.;6				
Pseudophryne australis	*Red-crowned Toadlet*	Vulnerable	Not Listed	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones.;1 Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.;2 Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter.;3 Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5.;4 Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg.;5 Disperses outside the breeding period, when they are found under rocks	N/A	January;February;March;April;May;June;July;August;September;October;November;December	NO	Suitable habitat is absent- no biodiversity credits are required

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					and logs on sandstone ridges and forage amongst leaf-litter.;6 Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.;7				
Anthochaera phrygia	*Regent Honeyeater* *(foraging)*	Critically Endangered	Critically Endangered	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.;1 Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast.;2 In the last 10 years Regent Honeyeaters have been recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago.;3 The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example the Lower Hunter Spotted Gum forests have recently	N/A	N/A	N/A	Suitable habitat is absent- no biodiversity credits are required

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					been demonstrated to support regular breeding events. Flowering of associated species such as Thin-leaved Stringybark Eucalyptus eugenioides and other Stringybark species, and Broad-leaved Ironbark E. fibrosa can also contribute important nectar flows at times. Nectar and fruit from the mistletoes Amyema miquelii, A. pendula and A. cambagei are also utilised. When nectar is scarce lerp and honeydew can comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. ;4 Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres. However, the exact nature of these movements is still poorly understood. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. To successfully manage the recovery of this species a full understanding of the habitats used in the non-breeding season is critical.;5 There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria.;6 An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female. Two or three eggs are laid and incubated by the female for 14 days. Nestlings are brooded and fed by both parents at an average rate of 23 times per hour and fledge after 16 days. Fledglings fed by both parents 29 times per hour.;7				
Grevillea parviflora subsp. parviflora	*Small-flower Grevillea*	Vulnerable	Vulnerable	Sporadically distributed throughout the Sydney Basin with sizeable populations around Picton, Appin and Bargo	"Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from	N/A	August;September;October;November	No	Suitable habitat is absent- no biodiversity credits are required

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				(and possibly further south to the Moss Vale area) and in the Hunter at in the Cessnock - Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast.	the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park.;1 Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. however, other communities occupied include Corymbia maculata - Angophora costata open forest in the Dooralong area, in Sydney Sandstone Ridgetop Woodland at Wedderburn and in Cooks River / Castlereagh Ironbark Forest at Kemps Creek.;2 Associated species in the Kurri Sand Swamp Woodland include Eucalyptus parramattensis subsp. decadens , Angophora bakeri and E. fibrosa with Acacia elongata , Dillwynia parvifolia , Melaleuca thymifolia , Grevillea montana , Eragrostis brownii and Aristida vagans . In the Shale Sandstone Transition Forest associated species include Eucalyptus fibrosa , E. punctata , Corymbia gummifera , Pultenaea scabra var. biloba , Kunzea ambigua , Allocasuarina littoralis and Themeda australis . At sites with a stronger sandstone influence Eucalytpus sclerophylla , E. piperita , E. oblonga , Grevillea diffusa , G. mucronulata , Acacia suaveolens and Persoonia pinifolia are found. Despite the range of associated communities several understorey species which are common to several of the known sites of Grevillea parviflora subsp. parviflora can be identified and include Allocasuarina littoralis , Daviesia ulicifolia , Kunzea ambigua , Banksia spinulosa , Leptospermum trinervium , Melaleuca nodosa , Pimelea linifolia , Themeda australis , Entolasia stricta and Eragrostis brownii .;3 G. parviflora subsp. parviflora has been recorded growing with several other threatened species including Acacia bynoeana (Heddon Greta), Dillwynia tenuifolia (Kemps Creek) and Persoonia bargoensis (S. of Appin and at Bargo).;4 Found over a range of altitudes from flat,				

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					low-lying areas to upper slopes and ridge crests. Hunter occurrences are usually 30-70m ASL, while the southern Sydney occurrences are typically at 100-300m ASL.;5 Often occurs in open, slightly disturbed sites such as along tracks.;6 Plants are capable of suckering from a rootstock and most populations demonstrate a degree of vegetative spread, particularly after disturbance such as fire. This can make counts of individual genets in a population very difficult, and stem counts are usually an acceptable means of assessment for management purposes.;7 Flowering has been recorded between July to December as well as April-May. Flowers are insect-pollinated and seed dispersal is limited. Seedling recruitment after fire is uncommon, and most recovery after disturbance appears to be resprouting from rhizomes.;8 Competition from tick bush (Kunzea ambigua) can affect recruitment and recovery, including spread, following disturbance.				
Eucalyptus glaucina	Slaty Redgum	V	V	Found in separate districts along the eastern seaboard of NSW, from near Casino, to Taree, south to Broke, and recently discovered on the eastern side of the Blue Mountains National Park near Warragamba Dam.	Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils	n/a	All year round Use buds and/or juvenile growth to detect and identify.	No	Suitable habitat is absent- no biodiversity credits are required
Petaurus volans	*Southern Greater Glider*	E	E	The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria.	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. 1 Shelter during the day in tree hollows and will use up to 18 hollows in their home range. 2 Occupy a relatively small home range with an average size of 1 to 3 ha. 3 Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. 4 Usually solitary, though mated pairs and offspring will share a den during the	n/a Hollow dependent species that will have large trees with hollows within its home range. Home range is < 5 ha and	All year round	No	Suitable habitat is absent- no biodiversity credits are required

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					breeding season and until the young are independent. 5 Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. 6 Very loyal to their territory.	typically 1 to 3 ha.			
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Two populations occur within a conservation reserve (Georges River National Park; Scheyville NP).	Occurs primarily on the Cumberland Plain along an ecological gradient from clay soils derived from Ashfield Shale to thin accumulations of humus rich sandy soils on Hawkesbury Sandstone sheets and rock shelves. Habitat ranges from grassy woodland on flat to gently sloping landscapes on shale soils, to open-forest on hilly landscapes on transitional soils, and woodland on the rims and steep sides of river valleys on sandstone soils. The species has also been recorded outside the Cumberland Plain in grassy woodland on Devonian slate. 1 All species of Pterostylis are deciduous and die back to fleshy, rounded underground tuberoids. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions. The above ground parts of the plant whither and die following seed dispersal and the plant persists as a tuberoid until the next year. 2 Typically occurs as scattered individuals or in small groups.	n/a	Use flowering material required to identify to species. Typically flowering late Sep - early Nov. Will sometimes flower later in Nov.	No	Suitable habitat is absent- no biodiversity credits are required
Wahlenbergia multicaulis - endangered population	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Endangered population	Endangered population	There are 13 known sites, two of which are in northern Sydney (Thornleigh and Mt Ku-Ring-Gai) with the remainder in western Sydney (Rookwood, Chullora, Bass Hill, Bankstown, Georges Hall, Campsie, South Granville and Greenacre). There are likely to be more sites than those listed here.	In Western Sydney most sites are closely aligned with the Villawood Soil Series, which is a poorly drained, yellow podsolic extensively permeated with fine, concretionary ironstone (laterite). However, the sites in Hornsby LGA are on the 'Hawkesbury' soil landscape. 1 Found in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs in damp, disturbed sites (with natural or human disturbance of various forms), typically amongst other herbs rather than in the open. 2	n/a	All year round Survey 2 months after 20 mm or more rainfall event, when local reference site (Rookwood cemetery) is also in flower. Will flower throughout the year, however flowering may be sparse in the cooler months and is dependant on seasonal conditions. Flowering is unlikely to be observed in drought conditions at most sites.	No	Suitable habitat is absent- no biodiversity credits are required

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					In Hornsby LGA it occurs in or adjacent to sandstone gully forest. In Western Sydney it is found in remnants of Cooks River/ Castlereagh Ironbark Forest. 3 Usually flowers throughout the year, although a late spring/early summer peak has been observed at some locations Creek. 4 Usually a perennial, particularly in protected situations which provide greater protection during the summer months. However, in more exposed situations, the species may be more annual in its life cycle due to exposure and/or lack of soil moisture. 5 Responds favourably to disturbance of soil in some situations with high exposure to sunlight. However, too much disturbance can eventually exhaust the seedbank and lead to local extinctions				
Lathamus discolor	*Swift Parrot (foraging)*	Endangered	Critically Endangered	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes.	Migrates to the Australian south-east mainland between February and October.;1|On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.;2|Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis* , Mugga Ironbark E. sideroxylon , and White Box E. albens .;3|Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana , Blackbutt E. pilularis , and Yellow Box E. melliodora .;4|Return to some foraging sites on a cyclic basis depending on food availability.;5|Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*.	n/a	n/a	No	Suitable habitat is absent- no biodiversity credits are required
Lophoictinia isura	*Square-tailed Kite (foraging)*	Vulnerable	Not Listed	The Square-tailed Kite ranges along coastal and subcoastal areas from	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered	n/a	n/a	No	Suitable habitat is absent- no biodiversity

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March.	watercourses.;1|In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.;2|Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.;3| Appears to occupy large hunting ranges of more than 100 square km.;4|Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.;5|				credits are required
Petaurus norfolcensis	*Squirrel Glider*	V		The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. 1 Prefers mixed species stands with a shrub or Acacia midstorey. 2 Live in family groups of a single adult male one or more adult females and offspring. 3 Require abundant tree hollows for refuge and nest sites. 4 Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	n/a	All year round Survey year round but sites with bipinnate acacia, autumn winter flowering trees and shrubs such as Eucalyptus robusta and Banksia sp (integrifolia etc) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	No	Suitable habitat is absent- no biodiversity credits are required
Haliaeetus leucogaster	*White bellied sea-eagle*	V		The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Breeding habitat is live large old trees within 1km	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. 1 Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. 2 Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).3 Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large	Dead trees	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	No	Suitable habitat is absent- no biodiversity credits are required

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				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. The differing diets of both species and distinctive adult feathers, should provide evidence of nest use, however; where prey items/feathers are absent, repeat visits to the nest until a bird is observed should be undertaken. Where a breeding site has been identified in accordance with the BAM, the species polygon buffer should be established by one of two methods where the breeding site is within an urban or peri-urban area, a circular polygon with a 250m radius from the breeding site is applied. Where the breeding site is 500m or more from an urban or peri-urban area, a circular polygon with a 500m radius from the breeding site is applied. The purpose of the buffers is to minimise	emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. 4 Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. 5 Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. 6 May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. 7 Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.				

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding. This includes habitat suitable for feeding/grooming/lookout perches and fledgling requirements. It does not account for foraging habitat as the White-bellied Sea Eagle forages on water. The polygons are in accordance with published literature on nesting requirements of the species (Debus 2008; Debus et al. 2014; Dennis et al. 2011; O'Donnell & Debus 2012; Threatened Species Section 2006). DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements). Where a development proposal seeks to undertake works near an identified breeding site, a site-specific assessment of viewsheds (based on the concept by Camp et al. 1997) should be undertaken if the planned works are within the species' breeding period					

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat and Ecology	Habitat Constraints	Optimal Survey (Months)	SAII Entity?	Likely to occur on-site and biodiversity credits required?
				(June – January). A maximum viewshed buffer with a 1000m radius should be applied from the breeding site, and where the buffer encompasses the proposed works, they should not proceed until post breeding period.					

4.5 Description of Impacts

4.5.1 Direct Impacts

Vegetation and Habitat Removal for the Proposed Development

The vegetation within Vegetation Zone 1 was considered to be in poor condition due to previous clearing and historical grazing within the roadside corridor.

Table 12. Vegetation Extent Impacted by the Proposed Development.

Vegetation Zone	PCT	Area Impacted (ha)
1	3320	0.2

Risk of runoff, erosion and sedimentation, during construction

Surface water quality may be affected during construction activities. Construction activities could potentially encourage soil erosion and increase the sediment loads in downstream areas. Further, accidental leaks/spills of oil, fuel, cement or other substances entering watercourses could pollute surface waters.

A Construction Environment Management Plan (CEMP) can be provided with the application addresses these issues es (prior to the release of the Construction Certificate).

Temporary noise, dust, light and vibration disturbance, during construction work

Impacts of noise, dust, light and vibration upon fauna are difficult to predict. Potential impacts may include effects on predator-prey interactions and changes to mating and nesting behaviour.

A Construction Environment Management Plan (CEMP) can be provided with the application addresses these issues (prior to the release of the Construction Certificate).

Minor hydrological changes

Hard surfaces created as a result of construction typically cause some hydrological changes; however, in this case, hydrological changes are expected to be very minor.

4.5.2 Indirect impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat

Table 13. Details of Indirect Impacts on Threatened Species and TEC's.

Indirect Impact	Extent and Duration	Effect on: Threatened Species and/or Threatened Ecological Communities (TEC's)	Effect on bioregional persistence of: Threatened Species and/or Threatened Ecological Communities (TEC's)
(a) inadvertent impacts on adjacent habitat or vegetation	The proposed development may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area (~10m) surrounding the proposal.	Nil	Edge effects will not be created and increase weed intensity and reduce vegetation integrity.
(b) reduced viability of adjacent habitat due to edge effects	The proposed development may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area (~10m) surrounding the proposal.	Nil	Edge effects will not be created and increase weed intensity and reduce vegetation integrity.
(c) reduced viability of adjacent habitat due to noise, dust or light spill	The proposed works are unlikely to significantly exacerbate any of these issues which are all currently in effect within surrounding lots, or otherwise unlikely to occur within the Subject Land.	Nil	Nil
(d) transport of weeds and pathogens from the Subject Land to adjacent vegetation	The proposed development may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area ~10m) surrounding the proposal. Active weed control efforts will be undertaken prior to and post construction.	Nil	Edge effects will not be created and increase weed intensity and reduce vegetation integrity.
(e) increased risk of starvation,	This issue is unlikely to occur on the Subject Land. It is unlikely that any threatened fauna relies on habitat	Nil	Nil

Indirect Impact	Extent and Duration	Effect on: Threatened Species and/or Threatened Ecological Communities (TEC's)	Effect on bioregional persistence of: Threatened Species and/or Threatened Ecological Communities (TEC's)
exposure and loss of shade or shelter	within the Subject Land, such that the proposed impacts will lead to increased risks from starvation, exposure, shade and shelter. All habitat resources removed will be replaced through implementation of the recommendations outlined in this report.		
(f) loss of breeding habitats	No hollow bearing trees are proposed for removal	Nil	The implementation of the actions prescribed in this report should see an increase in the availability of potential habitat for these threatened species within the Subject Land.
(g) trampling of threatened flora species	This issue is not likely to affect the Subject Land. No threatened flora species were identified within the Subject Land.	Nil	Nil
(h) inhibition of nitrogen fixation and increased soil salinity	This issue is not likely to affect the Subject Land.	Nil	Nil
(i) fertiliser drift	This issue is not likely to affect the Subject Land.	Nil	Nil
(j) rubbish dumping	This issue is not likely to affect the Subject Land.	Nil	Nil
(k) wood collection	This issue is not likely to significantly affect the Subject Land.	Nil	Nil
(l) bush rock removal and disturbance	No bush rock occurs on the Subject Land.	Nil	Nil
(m) increase in predatory species populations	It is unlikely that the proposed works will influence or alter predatory species populations.	Nil	Nil
(n) increase in pest animal populations	It is unlikely that the proposed works will influence or alter pest species populations.	Nil	Nil

Indirect Impact	Extent and Duration	Effect on: Threatened Species and/or Threatened Ecological Communities (TEC's)	Effect on bioregional persistence of: Threatened Species and/or Threatened Ecological Communities (TEC's)
(o) increased risk of fire	This issue is not relevant to the Subject Land as there is little identified bushfire hazard.	Nil	Nil
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	There are no specialist breeding or foraging habitats on the Subject Land. The Subject Land contains a stand nectar producing canopy trees which can provide intermittent nectar resources for several threatened fauna species.	Nil	Nil

4.5.3 Prescribed and Uncertain Impacts

This list of impacts includes all the impacts on biodiversity values not caused by direct vegetation clearing or development that have been prescribed by the Biodiversity Conservation Regulation 2017 (Table 14).

Table 14. Potential Prescribed or Uncertain Impacts of the Proposed Action.

Characteristic that may be Impacted	**Impacted by Development?** **Yes/No**	**If the characteristic is impacted:** ***All Assessment Questions from Section 9.2.1 of the BAM must be addressed***
Species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance	No	n/a
Habitat of threatened species or ecological communities associated with rocks	No	n/a
Habitat of threatened species or ecological communities associated with human made structures	No	n/a
Habitat of threatened species or ecological communities associated with non-native vegetation	No	n/a
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	No	Habitat connectivity continues to exist across the Subject Land. The small area of impact should not interrupt connectivity for any threatened fauna or flora species.
Movement of threatened species that maintains their life cycle	No	Habitat connectivity continues to exist across the Subject Land. It is unlikely that the small area of impact will interrupt movement of any threatened fauna or
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development).	No	n/a
Wind turbine strikes on protected animals	No	n/a
Vehicle strikes on threatened species of animals or on animals that are part of a TEC	No	n/a

4.6 Avoidance of Impacts

4.6.1 Impacts to PCT

The following vegetation (located outside of Certified-urban Capable Land) within the Project Area will be impacted by the proposed activity:

- 0.2ha of Cumberland Shale Plains Woodland that conforms to the BC Act listed Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC); and
- 4.29ha of Exotic Vegetation.

Local occurrence is defined as the ecological community that occurs within the study area (OEH 2018). However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated (OEH 2018).

State Vegetation Type Mapping (DPE 2022) and aerial vegetation mapping identified areas of Cumberland Plain Woodland in the Sydney Basin Bioregion (Cumberland Shale Plains Woodland). These areas, in addition to the field-validated vegetation mapped within the Project Area, form part of the local occurrence of this CEEC within the locality (Figure 9).

No areas of Cumberland Shale Plains Woodland mapped as occurring within 'Certified Land' was included in local occurrence calculations. It was calculated that the local occurrence of Cumberland Plain Woodland (located outside of Certified Land) for the Project Area was approximately 86.20ha. The removal of 0.2ha of non-certified Cumberland Plain Woodland within the Project Area constitutes approximately 0.26% of the local occurrence of this CEEC (BC Act).

A Test of Significance (5-part test) in accordance with Section 7.3 of the BC Act, was conducted to assess potential impacts from the proposed activity on Cumberland Plain Woodland (Appendix C).

Please refer to the SAII assessment for CPWL provided in Section 5.4.

Figure 11 Local Occurrence of Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act)

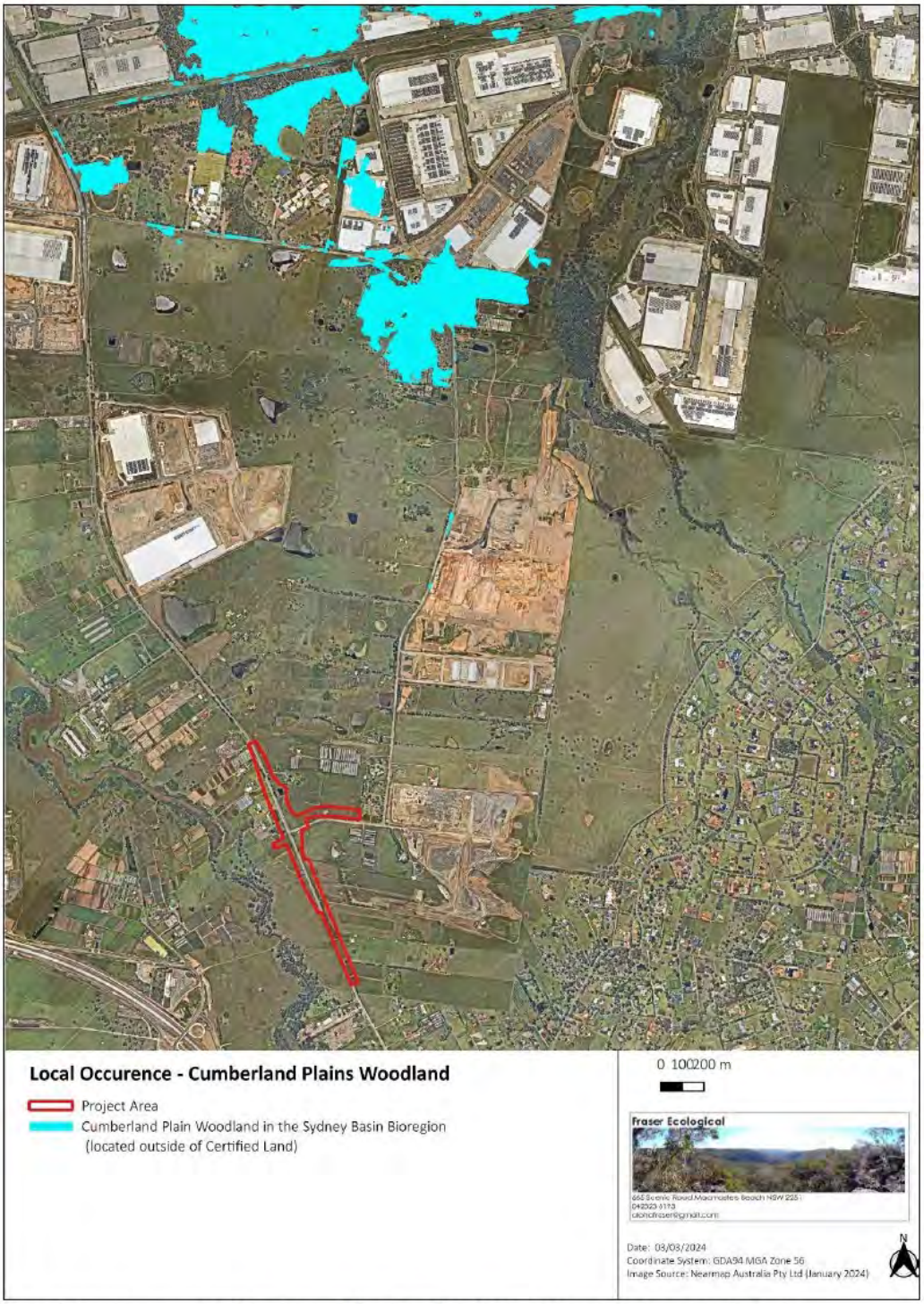

Figure 8. Local Occurrence of Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act).

4.7 Minimisation of Impacts

Several mitigation measures are proposed to minimise potential impacts; these are summarised in Table 15. These include measures to be implemented in the pre-construction, construction, and post-construction phases. It is considered that these measures would serve to minimise any potential direct or indirect impacts.

Table 15. Mitigation Measures Proposed to Minimise Potential Impacts

Action	Outcome / Measure	Risk and Consequence of Residual Impacts	Timing	Responsibility
Project location	The location of the proposed development has been positioned in order to avoid and minimise the potential resulting impacts on biodiversity values within the Subject Land, where possible.	Risk = High Consequence = Harm to native vegetation and native fauna	Pre-construction phase	Proponent
Project design	The proposed development has been designed to avoid and minimise impacts on native vegetation and habitat where possible within the Subject Land. Where this is not possible, mitigation measures have been designed and recommended to reduce potential ecological impact. While there will be some impact on native vegetation, this falls above the Biodiversity Offset Scheme threshold.	Risk = High Consequence = Harm to native vegetation and native fauna	Pre-construction phase	Proponent
Assign a Project Ecologist	Prior to the implementation of the activity, the proponent should commission the services of a qualified and experienced Ecologist with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist will be commissioned to: • Undertake any required targeted searches for	Risk = High Consequence = Harm to native vegetation and native fauna	Pre-construction phase	Proponent

Action	Outcome / Measure	Risk and Consequence of Residual Impacts	Timing	Responsibility
	threatened flora prior to vegetation clearing; • Undertake an extensive pre-clearing survey which includes targeted searches for threatened fauna • threatened flora and Priority Weeds, and delineating habitat-bearing trees and shrubs; • Undertake an additional targeted surveys for the threatened Cumberland Land Snail; • Undertake an extensive pre-clearing survey which includes targeted searches for threatened fauna (including potential *Litoria aurea* [Green and Golden Bell Frog] within soaks prior to removal); • Undertake an additional pre-clearing survey of culverts to be removed in case on inhabitation by microbat species; and • Supervise the clearing/modification of any aquatic habitat including creeks or dams in order to capture, treat and/or relocate any displaced fauna.			
Tree protection	Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on development sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ. A Minor Encroachment is less than 10% of the TPZ and is outside the SRZ. A Minor Encroachment is considered acceptable by AS-4970	Risk = High Consequence = Harm to native vegetation and native fauna. Proliferation of weeds.	Pre-construction phase	Proponent

Action	Outcome / Measure	Risk and Consequence of Residual Impacts	Timing	Responsibility
	when it is compensated for elsewhere and contiguous within the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods.			
Avoidance of hollow-bearing trees	No hollow-bearing trees were identified on the Subject Land.	Risk = High Consequence = Loss of fauna habitat. Loss of native vegetation.	Construction phase	Proponent
Avoidance of woody debris	Woody debris within the development footprint should be relocated, by the proponent to the area of native vegetation in the northern extent of the Subject Land.	Risk = low Consequence = Loss of fauna habitat.	Construction phase	Proponent
Erosion and sedimentation	Appropriate erosion and sediment control must be erected and maintained at all times during construction. As minimum such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).	Risk = low Consequence = Degradation of vegetation.	Construction phase	Construction Contractor
Erosion protection fencing	Temporary fencing should be erected around the extent of native vegetation to be retained in order to minimise any disturbance resulting from the proposed construction works.	Risk = high Consequence = Permanent damage or degradation of vegetation.	Construction phase	Construction Contractor
Storage and Stockpiling **(Soil and Materials)**	Allocate all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained. Avoid importing any soil from outside the Subject Land as this can introduce weeds and pathogens to the site.	Risk = moderate Consequence = Harm to native vegetation and native fauna	Construction phase	Construction Contractors
Vegetation replacement	Any roadside revegetation/landscape works should utilise tree species representative of the Cumberland Plain	Risk = low Consequence = Degradation of vegetation.	Post Construction phase	Landscape Contractors

Action	Outcome / Measure	Risk and Consequence of Residual Impacts	Timing	Responsibility
	Woodland community to ensure habitat for this community continues in the locality.			
Weed eradication and suppression	All priority weeds should be eradicated across all areas of the Subject Land. Very low weed invasion was recorded on the Subject Land. Any weeds should be continually supressed and prevented from re-establishing within retained native vegetation. The following three (3) Priority Weeds were identified within the Project Area: • *Olea europaea subsp. cuspidata (African Olive);* • *Rubus fruticosus species aggregata (Blackberry); and* • *Senecio madagascariensis (Fireweed).* All priority weeds should be removed in accordance with the Biosecurity Act 2015 and NSW WeedWise (DPI 2024). Environmental weeds should be managed with best practice techniques to improve the condition of the native vegetation within the Project Area.	Risk = moderate Consequence = Harm to native vegetation and native fauna habitat.	Construction phase and Post-construction phase	Proponent
Stormwater	The proposed development is unlikely to result in significant changes to stormwater runoff so it is expected there will be no exacerbated impact on native species of flora and fauna. Stormwater flow from future proposals and hard surfaces will be directed to newly installed water storage tanks. Prior to any release, all stormwater is to be piped through any tanks that may be required by the regulating authorities.	Risk = low Consequence = Harm to native vegetation and native fauna habitat.	Post-construction phase	Proponent Construction Architect

5 IMPACT SUMMARY

5.1 Impacts Which Require an Offset

The Tables below provide a summary of the impacts that require an offset, under the BAM.

Table 16. Vegetation Zones Requiring an Offset

Vegetation Zone	Total Area of Impact (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Number of Ecosystem Credits Required
1	0.2	11.5	0	0

Table 17. Threatened Species Requiring an Offset

Species	Area of Impacted Habitat (ha)	Number of Species Credits Required
0	**0**	**0**

5.2 Impacts Not Requiring an Offset

N/A

5.3 Identification of Areas Not Requiring Assessment

N/A

5.4 Serious and Irreversible Impacts (SAII's)

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- it will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
- it will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size
- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

These principles are set out in clause 6.7 of the Biodiversity Conservation Regulation 2017.Species and ecological communities with a 'very high' biodiversity risk weighting will be a potential serious and irreversible impact (SAII). These 'potential SAII entities' are identified within the BAM calculator (OEH 2018b).

The determination of serious and irreversible impacts on biodiversity values is to be made by the consent authority in accordance with the principles set out in the BC Regulation. To assist the consent authority, the guidance document Guidance to assist a decision-maker to determine a serious and irreversible impact includes criteria that enable the application of the four principles set out in clause 6.7 of the BC Regulation to identify the species and ecological communities that are likely to be the subject of serious and irreversible impacts.

One (1) threatened ecological community within the Subject Land have been identified as entities at risk of an SAII in the Threatened Biodiversity Data Collection (DPIE 2021d):

- **Cumberland Plain Woodland Threatened Ecological Community – Critically Endangered Ecological Community listed under the *Biodiversity Conservation Act 2016* in the Sydney Basin Bioregion;**

Due to the potential sensitivity of this ecological community to any impact, a determination of whether or not the proposed impacts are serious and irreversible is to be undertaken in accordance with Section 9.1 of the BAM (DPIE 2020a) as outlined in Table 18.

The removal of 0.2 ha of CPWL trees that already has a highly degraded understorey is unlikely to have a significant impact upon the local population of CPWL.

Table 18: Serious and Irreversible Impacts (SAII) assessment for CPWL CEEC

6 CONCLUSION

Due to the poor condition of the PCT 3320 CPWL vegetation (VIS = 11.5) and the relatively small area of impact the proposal (0.2 ha), the proposal does not require the retirement of ecosystem credits.

Cumberland Plain Woodland (CPWL) in the Sydney Basin Bioregion in the Sydney Basin Bioregion is listed as a Threatened Ecological Community (TEC) under the *BC Act 2016* and *EPBC Act 1999* and is listed as a SAII entity in the Threatened Biodiversity Data Collection (DPIE 2021d).

To assist the consent authority, the guidance document Guidance to assist a decision-maker to determine a serious and irreversible impact includes criteria that enable the application of the four principles set out in clause 6.7 of the BC Regulation to identify the species and ecological communities that are likely to be the subject of serious and irreversible impacts. The SAII assessment was provided in Section 5.4 and concluded that the proposal would not have a significant impact upon the local population of the CPWL CEEC.

One (1) mapped dam was also identified within the Subject Land. The dam occurs within the 'Certified Urban Capable Land' and does not require assessment under this BDAR.

As a precautionary measure we undertook targeted surveys for threatened Green and Golden Bell Frog (*Litoria aurea*). It was not recorded during surveys. Narla Environmental conducted site surveys for GGBF over the course of two (2) years within the known calling time for this species and no individuals were located.

The Assessment of Significance within Appendix C determined that:

- The proposed activity is will not lead to a long-term decrease in the size of an important population.
- The proposed activity will result in impacts to one (1) small dam and four (4) small roadsides soaks. These features may provide breeding or foraging habitat for the Green and Golden Bell Frog. These features however are in low condition, surrounded by degraded roadside vegetation. As such, any potential disturbance to this species is likely to be temporary and localised, with better condition habitat (Kemps Creek) being untouched in the surrounding locality.
- The proposed activity will not reduce the area of occupancy of an important population of species. Site assessments were conducted over the course of two (2) years within the known calling time for this species and no individuals were located.
- Although the proposed activity may see a temporary reduction in potential habitat for the Green and Golden Bell Frog, the habitat is in low condition, and is surrounded by degraded roadside vegetation, thus providing less than optimal habitat for this species.

Due to the lack of suitable habitat it is highly unlikely that any threatened species occur within the development impact area.

Proposed impact minimisation/ mitigation measures proposed in Section 4.7 included (but not limited) to the following:

1. Assigning a Project Ecologist to undertake pre-clearing surveys within the 'Urban certified' dams for threatened Green and Golden Bell Frog (*Litoria aurea*) as a precautionary measure
2. Stormwater management and sedimentation/ erosion control
3. Tree protection measure during construction
4. Use of locally native species in roadside revegetation works

Table 18: Serious and Irreversible Impacts (SAII) assessment for CPWL CEEC

No	Assessment Criteria	SAII Assessment Information
2a	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Evidence of reduction in geographic distribution 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)*	It is difficult to ascertain the 1970 extent; however, the CPWL Final determination estimates that there has been a 90% reduction in the total geographic extent of CPWL since European Settlement (ie since 1788). The CPWL Final Determination states the following in relation to a reduction in geographic extent: '*Only 6% of the original extent of the community remained in 1988 (Benson, D. & Howell, J. 1990 Proc. Ecol. Soc. Aust. 16, 115-127) in the form of small and fragmented stands. Although some areas occur within conservation reserves, this in itself is not sufficient to ensure the long term conservation of the Community unless the factors threatening the integrity and survival of the Community are ameliorated.*". *Based on aerial photography flown in November 1998, Tozer (2003) estimated the total extent of woody vegetation referred to as Cumberland Plain Woodland was 11 054 (±1 564) ha (upper and lower plausible bounds, sensu Keith et al. 2009), representing 8.8 (±1.2)% of the pre-European distribution of the community. Patches of the community lacking woody vegetation are very small in extent and can be considered to be included within the plausible bounds. For that part of the community's distribution to the east of the Hawkesbury-Nepean River, earlier mapping at coarser resolution by Benson & Howell (1990b) suggests a similar level of depletion, with an estimated 6 420 ha of 'Cumberland Plain Woodlands', representing 6% of the pre-European distribution east of the Hawkesbury-Nepean River. An update of Tozer's (2003) map, based on interpretation of imagery flown in January-March 2007 shows that the extent of Cumberland Plain Woodland east of the Hawkesbury – Nepean River had declined by 442±46 ha, a reduction of 5.2±0.6% in 9 years (NSW Scientific Committee & Simpson 2008). These estimates indicate that the geographic distribution of the community has undergone a very large reduction over a time frame appropriate to the life cycle and habitat characteristics of its component species.*
2bi	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes indicated by: change in community structure*	The CPWL Final Determination states the following in relation to the changein community structure: "*Remnants of CPWL have historically been subjected to a range of anthropogenic disturbances including logging, grazing by domesticated livestock and burning at varyingintensities (Benson and Howell 1994). These disturbances have affected thestructure and potentially the composition of remnants. For example, the density and average basal diameter of trees in remnants sampled by Benson and Howell (1994) suggested that the removal of large older trees has led to higher densities of smaller trees such that remnants typically have the structure of regrowth forest.*"

No	Assessment Criteria	SAII Assessment Information
2bii	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes indicated by: change in species composition*	
2biii	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes indicated by: disruption of ecological processes*	The CPWL Final Determination states the following in relation to the disruption of ecological processes: "*The threats to CPWL listed above are ongoing and likely to cause continuing declines in geographic distribution and disruption of biotic processes andinteractions.*" *The reduction in the geographic distribution of Cumberland Plain Woodland was initially due to tree-felling for timber and clearing for crops and pastures (Benson & Howell 1990a). Benson & Howell (1990b) estimated that the community had been reduced to approximately half of its pre-European extent by 1850. Following World War II, there was a marked acceleration in urban and industrial development, which continues to deplete the distribution of the community to the present day.* *These trends appear likely to continue into the future as the urban area continues to expand to accommodate Sydney's increasing population, which is projected to grow by 1.0-1.1 million people during the 20 years 2007-2026 and 2.2-3.3 million during the 50 years 2007-2056 (Australian Bureau of Statistics 2008). Recent draft plans to develop growth centres in north-west and south-west Sydney, for example, identify staged release of land for residential and employment development over the next 25 years.* *These areas contain approximately 2000 ha (one-fifth) of the estimated remaining Cumberland Plain Woodland based on Tozer (2003), of which about two-thirds will be available for development, the loss of which is planned for offsetting through voluntary land acquisition and/or the establishment of conservation agreements on lands outside the Growth Centres (Growth Centres Commission 2007) for the primary purpose of biodiversity conservation. While important examples of Cumberland Plain Woodland are represented within conservation reserves, much of the remaining area of the community occurs on private land or on public easements, where it is at risk from small-scale clearing associated with housing, industrial development and transport infrastructure.*

		There are significant logistic and technological constraints and time lags associated with efforts to restore the community (Wilkins et al. 2003; Nichols 2005; Nichols et al. 2005). 'Clearing of native vegetation' is listed as a Key Threatening Process under the Threatened Species Conservation Act 1995.
2biv	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes indicated by: invasion and establishment of exotic species*	The CPWL Final Determination (2009) states the following in relation to weed invasion: *Weed invasion also poses a major threat to Cumberland Plain Woodland. While very large numbers of weed species have invaded many different areas of the community, principal weed species include (Benson 1992; Tozer 2003; Benson & von Richter 2008).* *Several of these species, particularly grasses, form a dense ground layer capable of smothering indigenous plants, reducing both reproduction and survival, and inhibiting emergence and establishment of their seedlings. The propagules of weeds are spread into Cumberland Plain Woodland by stormwater, dumping of refuse, frugivorous birds and wind (Benson & Howell 1990b), making it difficult to abate the invasion process, especially for those species capable of establishing in sites that have been exposed to relatively little disturbance (J. Sanders, in litt. January 2008). Hill et al. (2005) found that high species richness and abundance of weeds was associated with remnants that either had a history of clearing and grazing, were in close proximity to creeks or downslope from sealed roads. They also found some relationship between weeds and elevated total soil phosphorus, conductivity and water retention capacity, but relationships with these soil properties were weak and varied between sites with different types of disturbance history.* *The dramatic recent expansion of African Olive poses the greatest invasive threat to Cumberland Plain Woodland. Initially introduced to south-western Sydney in the 1820s, it was generally confined to the Camden-Picton area until the 1970s and now occurs frequently throughout the distribution of the community (Tozer 2003; Cuneo & Leishman 2006). Roberts (1999) mapped approximately 1000 ha of Cumberland Plain Woodland (c. 10% of total remaining) which had a dense understorey of African Olive that was visible on aerial photographs flown in November 1997. Tozer (2003) recorded African Olive in 43% of 198 plots surveyed throughout the distribution of Cumberland Plain Woodland.* *Cuneo et al. (2009) found that 837 ha of Cumberland Plain Woodland in south-west Sydney was invaded by African Olive (8.5% of the area assessed). The species is highly fecund, with fleshy fruit spread widely by a range of frugivorous birds, and seedlings establish readily in relatively undisturbed bushland, as well as fragmented edges (Cuneo & Leishman 2006). As shrubs grow, their canopies cast deep shade and suppress and ultimately eliminate most native shrub and groundcover species.* *Cook et al. (2005) and Tozer (in litt. October 2007, based on data from Tozer 2003), both recorded strong inverse relationships between the cover*

		abundance of African Olive and the diversity and cover of native ground layer species. Other weeds that pose future threats to the community include Ailanthus altissima, Asparagus asparagoides, Acer negundo, Gleditsia triacanthos and Macfadyena unguis-cati (Benson & Howell 2002; J. Howell in litt. August 2007; J. Sanders in litt. January 2008; L. Harrold pers comm. 2009). The invasion and establishment of exotic weeds is resulting in a very large reduction in the ecological function of Cumberland Plain Woodland. 'Invasion of exotic perennial grasses' and 'Invasion and establishment of exotic vines and scramblers' are listed as Key Threatening Processes under the Threatened Species Conservation Act 1995.

No	Assessment Criteria	SAII Assessment Information
2bv	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes indicated by: degradation of habitat*	The CPWL Final Determination (2009) states the following in relation to the changeinCPWL composition: *"Some areas of Cumberland Plain Woodland subjected to a history of partial clearing and grazing have recently undergone a change in management to conserve the community. Examples include Mt Annan Botanic Garden, Scheyville National Park, Western Sydney Regional Park, Elizabeth Macarthur Agricultural Institute, Orchard Hills Defence Site and the former Australian Defence Industries site at St Marys. Experience from these areas suggests that the community is capable of some recovery, provided the soil has not been disturbed by earthworks, cultivation, 70ertilizer application or other means of nutrient or moisture enrichment (Benson & Howell 2002; Pellow 2003; Keith et al. 2005; J. Howell in litt. August 2007; J. Sanders in litt. January 2008). In contrast, restoration of Cumberland Plain Woodland has proved to be problematic on sites that have been exposed to such soil disturbance.* *At Western Sydney Regional Park, for example, Wilkins et al. (2003), Nichols (2005) and Nichols et al. (2005) studied the recovery of abandoned pastures that had been planted with more than 20 native tree and shrub species of Cumberland Plain Woodland. Over 10 years they found no evidence of convergence in species composition with nearby remnant stands of the community and the species composition of restored areas remained indistinguishable from untreated pastures. There was some evidence that restored vegetation had begun to develop more species-rich assemblages of moths and butterflies compared to untreated pastures, although after 10 years, it lacked a number of species characteristic of remnant woodland (Lomov et al. 2006).* *Ant communities also showed marked differences between restored and remnant vegetation although some ecological processes, such as pollination and seed dispersal, showed some evidence of development at restored sites (Lomov 2005). These results suggest that sites with a history of soil disturbance will be extremely slow to recover characteristics of Cumberland Plain Woodland, if at all, and that experimentation with alternative restoration technologies is required.* *As a large proportion of the former distribution of the community has either undergone similar histories of soil disturbance or are now occupied by urban development, opportunities for restoration of the community across significant areas appear limited.'* *Moderate to heavy grazing of Cumberland Plain Woodland by livestock and rabbits results in the decline and disappearance of palatable plant species, including shrubs and herbs, and compaction and erosion of topsoil, making re-establishment of a diverse native understorey problematic. The effects of such overgrazing may be exacerbated under drought conditions. Habitat degradation associated with overgrazing and erosion contributes to a large reduction in ecological function of the community.* *21. The soils of Cumberland Plain Woodland have undergone chemical*

		and structural modification associated with agricultural land uses. Trampling by livestock has resulted in localised areas of soil compaction, primarily around watering points. Research carried out at the University of Western Sydney found that mean soil inorganic nitrogen levels were two to three times higher in areas of former agricultural land use than in remnant woodland, but was unable to detect differences in other soil properties (E. C. Morris in litt. June 2007). Addition of carbon and burning reduced soil inorganic nitrogen and reduced growth of exotic ground layer species relative to native species, suggesting that elevated soil inorganic nitrogen could favour exotics to the detriment of natives in Cumberland Plain Woodland (E. C. Morris in litt. June 2007). Hill et al. (2005) found elevated levels of phosphorus and conductivity in former agricultural areas compared to remnant woodland, but did not examine soil nitrogen. The sources of nutrient addition to soils of Cumberland Plain Woodland include addition of fertilisers during previous agricultural land use, deposition of livestock dung, rubbish dumping and stormwater runoff from urban areas. Expansion of urban land uses across the Cumberland Plain is likely to increase urban runoff from sealed surfaces into remaining bushland fragments, resulting in further nutrient enrichment of soils and associated replacement of native flora by exotic species. Disruption of ecological processes and degradation of habitat associated with nutrient enrichment contributes to a very large reduction in ecological function of the community.
2bvi	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes indicated by: fragmentation of habitat*	The CPWL Final Determination states the following in relation to fragmentation of CPWL habitat: *Fragmentation of habitat associated with clearing has resulted in a very large reduction in the ecological function of Cumberland Plain Woodland. The remaining area of the community is severely fragmented, with more than half of the remaining tree cover mapped by Tozer (2003) occurring in patches of less than 80 ha and half of all mapped patches being smaller than 3 ha (Tozer in litt. October 2007). The integrity and survival of small, isolated stands is impaired by the small population size of many species, enhanced risks from environmental stochasticity, disruption to pollination and dispersal of fruits or seeds, and likely reductions in the genetic diversity of isolated populations (Young et al. 1996; Young & Clarke 2000). The impacts of fragmentation and associated processes are most evident in the loss of vertebrate fauna from the community (Farrell 2005; Farrell in litt. June 2007; Leary 2005; in litt, August 2007). As well, some invertebrate species, such as the Endangered Cumberland Land Snail, appear to be in decline, at least in the smaller fragments (M. Shea in litt. June 2007). The dieback of eucalypt canopies observed in stands of Cumberland Plain Woodland at Scheyville (D. Keith pers. comm. October 2008) may be a result of complex interactions involving insect attack, weed invasion, nutrient enrichment and drought, in which fragmentation also plays a role (Reid & Landsberg 2000; Wardell-Johnson et al. 2006). Despite their history of fragmentation, some very small and apparently degraded remnants may contain a surprisingly high diversity of species and important examples of rare species, particularly plants (James et al. 1999; Benson & Keith 1984; McBarron et al. 1988; Benson & Howell 1990a; Kirkpatrick & Gilfedder 1995). However, clearing and continuing degradation of these patches reduces the likelihood that all of these species will persist, particularly because a large proportion of species are known from very few locations which are not clustered in predictable ways (Benson & Howell 2002; Tozer 2003). Fragmentation also results in reduced fire frequencies within some patches, which may reduce the*

		viability of some native plant populations, and hence the diversity of species within the patches (Clarke 2000; Watson 2005)
2ci	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Evidence of restricted geographic distribution, based on the TEC's geographic range in NSW according to the: extent of occurrence*	The CPWL Final Determination states the following with respect to extent ofoccurrence in NSW: *Cumberland Plain Woodland is restricted to the Sydney Basin Bioregion (sensu Thackway and Cresswell) and is currently known to occur within the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion. Using map data from Tozer (2003), Cumberland Plain Woodland was estimated to occur within an extent of occurrence of 2810 km2, and an area of occupancy of just under 2 100 km2 based on 2 x 2 km grid cells, the spatial scale recommended by IUCN (2008) for assessing areas of occupancy for species.* *Small areas of Cumberland Plain Woodland have been recorded from Kemps Creek, Mulgoa and Windsor Downs Nature Reserves, Scheyville National Park, and Leacock, Rouse Hill and Western Sydney Regional Parks.* *13. Based on aerial photography flown in November 1998, Tozer (2003) estimated the total extent of woody vegetation referred to as Cumberland Plain Woodland was 11 054 (±1 564) ha (upper and lower plausible bounds, sensu Keith et al. 2009), representing 8.8 (±1.2)% of the pre-European distribution of the community. Patches of the community lacking woody vegetation are very small in extent and can be considered to be included within the plausible bounds.* *For that part of the community's distribution to the east of the Hawkesbury-Nepean River, earlier mapping at coarser resolution by Benson & Howell (1990b) suggests a similar level of depletion, with an estimated 6 420 ha of 'Cumberland Plain Woodlands', representing 6% of the pre-European distribution east of the Hawkesbury-Nepean River.* *An update of Tozer's (2003) map, based on interpretation of imagery flown in January-March 2007 shows that the extent of Cumberland Plain Woodland east of the Hawkesbury – Nepean River had declined by 442±46 ha, a reduction of 5.2±0.6% in 9 years (NSW Scientific Committee & Simpson 2008). These estimates indicate that the geographic distribution of the community has undergone a very large reduction over a time frame appropriate to the life cycle and habitat characteristics of its component species.* "*The distribution of Sydney Turpentine-Ironbark Forestis highly restricted.*

		The extent of occurrence (EOO) of STIF is 4,479 km2 based on a minimum convex polygon enclosing known occurrences of the community as interpreted in Sections 4.2 – 4.10 and using the method of assessment recommended by IUCN (Bland et al. 2017). The estimated area of occupancy (AOO) is 12 10 km x 10 km grid cells, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of1% (Bland et al. 2017)."
2cii	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Evidence of restricted geographic distribution, based on the TEC's geographic range in NSW according to the: area of occupancy*	The CPWL Final Determination states the following with respect to extent of occurrence in NSW: *Based on aerial photography flown in November 1998, Tozer (2003) estimated the total extent of woody vegetation referred to as Cumberland Plain Woodland was 11 054 (±1 564) ha (upper and lower plausible bounds, sensu Keith et al. 2009), representing 8.8 (±1.2)% of the pre-European distribution of the community. Patches of the community lacking woody vegetation are very small in extent and can be considered to be included within the plausible bounds.* *For that part of the community's distribution to the east of the Hawkesbury-Nepean River, earlier mapping at coarser resolution by Benson & Howell (1990b) suggests a similar level of depletion, with an estimated 6 420 ha of 'Cumberland Plain Woodlands', representing 6% of the pre-European distribution east of the Hawkesbury-Nepean River.* *An update of Tozer's (2003) map, based on interpretation of imagery flown in January-March 2007 shows that the extent of Cumberland Plain Woodland east of the Hawkesbury – Nepean River had declined by 442±46 ha, a reduction of 5.2±0.6% in 9 years (NSW Scientific Committee & Simpson 2008). These estimates indicate that the geographic distribution of the community has undergone a very large reduction over a time frame appropriate to the life cycle and habitat characteristics of its component species.*
2ciii	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Evidence of restricted geographic distribution, based on the TEC's geographic range in NSW according to the: number of threat-defined locations*	The Final Determination indicates that there is very little CPWL CEEC withinconservation reserves and "*Small areas of Cumberland Plain Woodland have been recorded from Kemps Creek, Mulgoa and Windsor Downs Nature Reserves, Scheyville National Park, and Leacock, Rouse Hill and Western Sydney Regional Parks*

No	Assessment Criteria	SAII Assessment Information
2d	*The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: Evidence that the TEC is unlikely to respond to management*	There is no information regarding evidence that the TEC is unlikely to respond to management. The *Department of Environment and Conservation (NSW). (2005) Document - Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland. Department of Environment and Conservation (NSW), Sydney* outlines theoretical and practical'best practice' guidance for the restoration of CPWL , including examples of small remnant patches.
3	*Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR or BCAR.*	It is difficult to ascertain the 1970 extent of the TEC when most studies have focussed on pre-European extent, therefore pre-European data is referenced in (2a). No information was able to be presented in relation to (2bv) and (2d).
4ai	*Include data and information on the impact on the geographic extent of the TEC by estimating the total area of the TEC to be impacted by the proposal: in hectares. Data and information should include direct impacts (i.e. from clearing) and indirect impacts where partial loss of the TEC is likely as a result of the proposal.*	The vegetation within this zone consisted of native canopy species such as *Eucalyptus tereticornis and Eucalyptus mollucanna* above a highly disturbed understory dominated by exotic grasses such as *Cenchrus clandestinus, Paspalum dilatatum and Chloris gayana.* It is considered to be in poor condition
4aii	*Include data and information on the impact on the geographic extent of the TEC by estimating the total area of the TEC to be impacted by the proposal: as a percentage of the current geographic extent of the TEC in NSW. Data and information should include direct impacts (i.e. from clearing) and indirect impacts where partial loss of the TEC is likely as a result of the proposal.*	The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH 2016a),Tozer (2013) and the Remnant Vegetation of the western Cumberland subregion (OEH 2013) mapping indicate approximately 10,000 ha of CPWL occurs within the Cumberland IBRA Subregion. This comprises fragmented patches of varying sizes. The conditions of these patches cannot be determined without ground truthing. Overall, the impact of the proposed development will result in the removal/ modification of 0.08ha of CPWL on the Cumberland subregion accounting for less than 0.001% of the extant area of the Cumberland IBRA Subregion. This will result in approximately 10,000ha of CPWL remaining within the Cumberland IBRA Subregion after the proposed development

4bi	*The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes of the TEC by: estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals.*	The total area of the CPWL CEEC patch in the locality is greater than 50 ha. This patch will not be fragmented by the proposal.

<table>
<tr><th>No</th><th>Assessment Criteria</th><th>SAII Assessment Information</th></tr>
<tr><td>4bii</td><td>The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes of the TEC by: describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:
• distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and
• estimated maximum dispersal distance for native flora species characteristic of the TEC, and
• other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development</td><td>The vegetation within this zone consisted of native canopy species such as Eucalyptus tereticornis and Eucalyptus mollucanna above a highly disturbed understory dominated by exotic grasses such as Cenchrus clandestinus, Paspalum dilatatum and Chloris gayana.

It is considered to be in poor condition

The proposal will not significantly contribute to the further environmental degradation or disruption of the biotic processes of the community as including the:

• distance between isolated areas of the TEC, and

• estimated maximum dispersal distance for native flora species characteristic of the TEC,

The removal of 0.2ha of canopy trees will not fragment community and prevent it from it functioning in dispersal of seed and pollen/ genetic material from canopy trees off the subject site.</td></tr>
<tr><td>4biii</td><td>The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes of the TEC by: 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.</td><td>The Vegetation Integrity (VI) of the CPWL CEEC vegetation is 11.5 and is made up of thefollowing scores for composition, structure and function:

<table>
<tr><th>Vegetation Zone</th><th>PCT</th><th>Total Area of Impact (ha)</th><th>Composition Condition Score</th><th>Structure Condition Score</th><th>Function Condition Score</th><th>Current Vegetation Integrity Score</th></tr>
<tr><td>1</td><td>3320</td><td>0.2</td><td>4.4</td><td>7.5</td><td>45.5</td><td>11.5</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.</td><td>N/A</td></tr>
</table>

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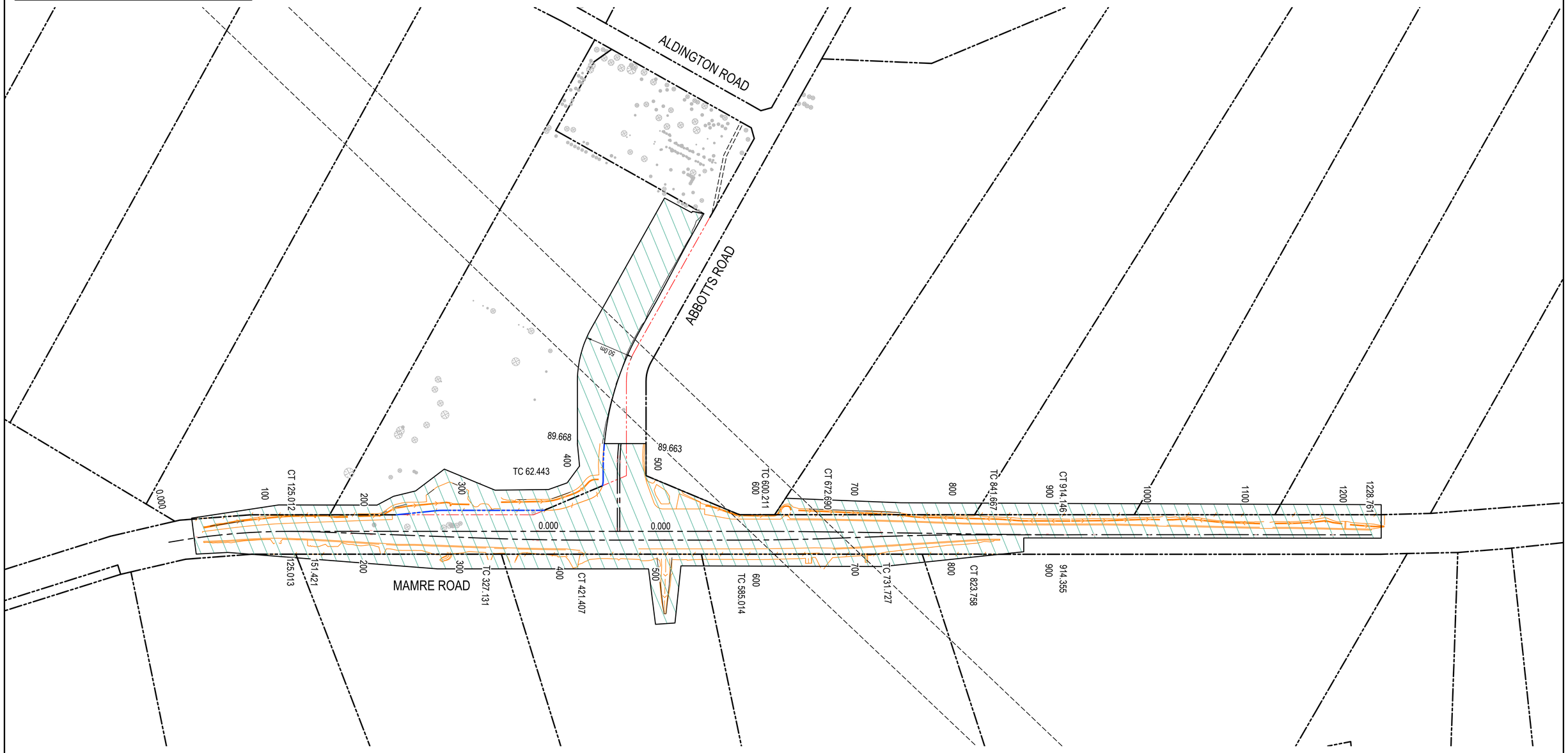
APPENDIX A SITE PLANS

LEGEND

- EXISTING BOUNDARY
- EXISTING BOUNDARY REMOVED
- PROPOSED BOUNDARY
- EXISTING EASEMENT
- EXISTING TREE
- FFA MAMRE AND ABBOTTS ROAD ASSESSMENT AREA



Issue	Description	Date
P3	ISSUED FOR FFA PERIMETER	04-03-24
P2	ISSUED FOR FFA PERIMETER	20-02-24
P1	ISSUED FOR FFA PERIMETER	16-02-24

100mm on Original

Bar Scale

0 50 100 150 200m

1 : 2000 @ A1

Client: FRASERS PROPERTY, ESR, Stockland, FIFECAPITAL

Scales	1 : 2000
Grid	GDA2020
Height Datum	AHD
Drawn	SK
Designed	EH
Checked	GV
Approved	

GDA2020

Project: MAMRE ROAD AND ABBOTTS ROAD

Title: FFA ASSESSMENT SCOPE

Civil Engineers and Project Managers
at&l
Level 7, 153 Walker Street
North Sydney NSW 2060
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9923 1055
www.atl.net.au
info@atl.net.au

Status: FOR INFORMATION
NOT TO BE ISSUED FOR CONSTRUCTION

A1

Project - Drawing No.: 21-843-SKC297

Issue: P3

Date Plotted: 4 Mar 2024 - 12:45PM File Name: F:\21-843 Aldington Road Design\6.0 Drgs\Civil\Sketches\21-843-SKC297 MAMRE AND ABBOTTS RD FFA ASSESSMENT.dwg

APPENDIX B PLOT DATA

BAM Site – Field Survey Form

Survey Name		Date	Zone ID	Recorders	
Mamre Rd & Abbotts Rd Intersection, Kemps Creek		20/5/2024	A	A Fraser	
Zone: 56	Datum: AMG	Plot ID:	Plot dimensions: 50x20 m		Photo #:
Easting: 295528	Northing: 6251648	IBRA region: Sydney Basin and Cumberland IBRA sub region	Midline bearing from 0 m:		
PCT 3320: Cumberland Shale Plains Woodland					Confidence H M L
			EEC: Y		Confidence H M L

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m^2 plot)	Sum values	
	Count of native richness	Cover
Trees	**2**	**10**
Shrubs	**0**	
Grasses etc.	**0**	
Forbs	**0**	
Ferns	**0**	
Other	**0**	
High threat weed cover		**50**

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m^2 plot)		
DBH	**#Tree Stems Count**	**#Stems with Hollows**
80 + cm	1	
50 – 79 cm	2	
30 – 49 cm	2	
20 – 29 cm	1	
10 – 19 cm		
5 – 9 cm		0
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	**Tally: 0**	**Total:** 0

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

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

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					**Bare ground cover %**					**Cryptogam cover %**					**Rock cover %**				
Subplot score % in each	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
	2	2	2	2	2															
Average of the 5 subplots	2%																			

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 7/6/23	27 Burlington Ave JILLIBY	**1**	A Fraser

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Abund	Stratum	Voucher	Photo #
TG	*Eucalyptus fibrosa*	N	12	7	C		
TG	*Melaleuca decora*	N	3	1	C		
	Cenchrus clandestinus	E	20	>20	G		
	Paspalum dilatatum	E	10	>20	G		
	Chloris gayana	E	10	>20	G		
	Sida rhombilfolia	E	10	>10	G		

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

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

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

APPENDIX C ASSESSMENT OF SIGNIFICANCE

Table A Assessment for significance for CPWL

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW)		
BC Act Status: Critically Endangered Ecological Community		
Background to Test	This Test of Significance (5-part Test) is required to assess impacts to Cumberland Plain Woodland in the Sydney Basin Bioregion that is being impacted by the proposed activity. However, as Part of the Project Area has been nominated as 'Certified-urban capable land' under the CPCP, only areas that are mapped as 'Excluded Land' or 'Avoided Land' are required to be assessed. Therefore, only 0.2ha of Cumberland Plain Woodland (CPW) will be assessed within this 5-part Test	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	The proposed activity is not likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. In total, 0.26% of the local occurrence of CPW. The removal of minimal low condition CPW is unlikely to have an adverse effect on the extent community such that its local occurrence is placed at risk of extinction.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The proposed activity is not likely to modify the composition of CPW substantially and adversely such that its local occurrence is likely to be placed at risk of extinction. It is not expected that composition of species will be substantially or adversely modified by the proposed activity. The removal of 0.2ha of CPW is approximately 0.26% of its local occurrence.
(c) in relation to the habitat of	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	In total, approximately 0.2ha of CPW is expected to be impacted by the proposed activity.

a threatened species or ecological community:	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The area proposed to be impacted consists of a small area of roadside vegetation that has already been fragmented from areas of surrounding habitat.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	All areas which support viable patches of CPW are important. However, the vegetation within the Project Area is highly modified due to historic clearing and edge effects. In total 0.2ha of modified vegetation will be removed. As such, it is not anticipated the removal of this vegetation will impact on the long- term survival of this community within the locality considering the extensive areas located outside of Certified Land.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The proposed activity is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat in the scope of the proposed activity within the Project Area for this CEEC: ▪ Clearing of native vegetation. The proposed activity will see a temporary increase in the impact on clearing of native vegetation.	
References: NSW Government (2017) NSW Legislation: Biodiversity Conservation act 2016 No 63, Schedule 4: Key Threatening Processes https://www.legislation.nsw.gov.au/acts/2016-63.pdf NSW Scientific Committee (2011) Cumberland Plain Woodland in the Sydney Basin Bioregion - Critically endangered ecological community listing		

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for *Litoria aurea* (Green and Golden Bell Frog)		
BC Act Status: Endangered		
Background to Test of Significance	This Biodiversity Conservation Act 2016 Test of Significance (5-Part Test) is for the removal of four (4) soaks which may provide habitat for following endangered species: ▪ *Litoria aurea* (Green and Golden Bell Frog).	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed activity is not likely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction. The proposed activity involves the removal of a small dam (Figure 6). Whilst these areas may potentially provide foraging and breeding habitat for the Green and Golden Bell Frog this habitat is considered suboptimal due to its highly disturbed nature located directly adjacent to a busy road. Furthermore, site assessments were conducted on consecutive years within the known calling time for this species and no individuals were located.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not applicable.
(c) in relation to the habitat of	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed activity involves the removal of a small dam (Figure 6) to facilitate the proposed works.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The small dam providing sub-optimal foraging and breeding habitat is proposed for removal and is already fragmented from other areas of habitat.

a threatened species or ecological community:	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	All areas which support viable Green and Golden Bell Frogs are important however, given the highly degraded and fragmented nature of the potential habitat within the Project Area, it is unlikely to consist of important habitat for the species. Better quality habitat will remain in close proximity at Kemps Creek.
(d) whether the proposed development or activity is likely to have an adverse effect on any	The proposed development is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria **for** ***Litoria aurea* (Green and Golden Bell Frog)**	
EPBC Act Status: Vulnerable	
Significant impact criteria An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:	
▪ Lead to a long-term decrease in the size of an important population;	The proposed activity is will not lead to a long-term decrease in the size of an important population. Site assessments were conducted over the course of two (2) years within the known calling time for this species and no individuals were located. The proposed activity will result in impacts to one (1) small dam. These features may provide breeding or foraging habitat for the Green and Golden Bell Frog. These features however are in low condition, surrounded by degraded roadside vegetation. As such, any potential disturbance to this species is likely to be temporary and localised, with better condition habitat (Kemps Creek) being untouched in the surrounding locality.
▪ Reduce the area of an occupancy of an important population	The proposed activity will not reduce the area of occupancy of an important population of species. Site assessments were conducted over the course of two (2) years within the known calling time for this species and no individuals were located. Although the proposed activity may see a temporary reduction in potential habitat for the Green and Golden Bell Frog, the habitat is in low condition, and is surrounded by degraded roadside vegetation, thus providing less than optimal habitat for this species.
▪ Fragment an existing important population into two or more populations;	The proposed activity will not fragment an existing important population into two or more populations. Site assessments were conducted over the course of two (2) years within the known calling time for this species and no individuals were located.
▪ Adversely affect habitat critical to the survival of a species;	The proposed activity will not adversely affect habitat critical to the survival of this species as the proposed works require the impacts to one (1) dam and four (4) roadside soaks, which are surrounded by degraded vegetation thus only providing sup-optimal potential habitat for this species.
▪ Disrupt the breeding cycle of an important population;	The proposed activity will not disrupt the breeding cycle of an important population. Site assessments were conducted over the course of two (2) years within the known calling time for this species and no individuals were located. Extensive potential breeding habitat in the form of higher condition dams and watercourses (Kemps Creek) will continue to exist post- construction, in the surrounding area.
▪ Modify, destroy, remove, isolate	The proposed activity will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Although the proposed activity will

or decrease the availability or quality of habitat to the extent that the species is likely to decline;	result in the removal of one (1) dam, this impact will not have a significant impact on the availability of habitat for the Green and Gold Bell Frog and will not lead to a decline in the species.
▪ Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;	Priority and environmental weeds were a significant issue within the Project Area and will be cleared and managed appropriately. No invasive species will be introduced into the Project Area as a result of construction works, thus there will not be further threats to potential Green and Gold Bell Frog habitat.
▪ Introduce disease that may cause the species to decline; or	The proposed landscaping may involve the importation of soil, compost or mulch which may be a potential source of chytrid fungus (a cause of amphibian chytrid fungus disease). If materials are to be imported for landscaping processes, they will be sterilised according to industry standards prior to importation to site.
▪ Interfere with the recovery of the species.	The proposed activity will not interfere with the recovery of the species. While potential sub-optimal breeding and foraging habitat, in the form of one (1) dam, will be impacted by construction works, it is considered highly unlikely that the removal of potential habitat will interfere with the recovery of the species. Potential impacts are to be mitigated through the measures outlined in this report including the requirement for a qualified Ecologist to be present on-site during clearing of this potential habitat to supervise works and provide assistance to any individuals of this species directly impacted.

References:

Department of the Environment (2014) Approved Conservation Advice for Litoria aurea (Green and Golden Bell Frog) http://www.environment.gov.au/biodiversity/threatened/species/pubs/1870-conservation-advice.pdf.

APPENDIX D QUALIFICATION, LICENSING AND CERTIFICATION

Alexander Fraser

alohafraser@gmail.com | 0423238193 | 665 The Scenic Rd Macmasters Beach, NSW 2251

Key skills

- 12+ years private ecological consulting (Fraser Ecological Consulting)
- 15 + years local government ecological assessment for DAs (Hornsby Shire Council – current employer)
- 10 + years Land & Environment Court expert witness experience
- 2 years state government ecological assessment (NSW OEH)
- High level botanical field identification skills, plot surveys and project management
- Fauna survey and field assistant experience
- Biodiversity Assessment Reporting (BDAR) preparation and Stewardship Site (BSAR) under the NSW BOS Credit Scheme

Qualifications

Bachelor Environmental Science (Honours) Southern Cross University

Certificate 3 Natural Area Restoration

Certificate 3 Vertebrate Animal Pest Control (NSW DPI, Orange)

NPWS Scientific Licence - S10445

Animal Ethics Authority - 11/4299

Accredited under the Biodiversity Assessment Methodology - BAM (Accreditation No. BAAS18156)

Practising member of NSW Ecological Consultants Association (ECA)

Summary

Alex Fraser (Principal Ecologist, Fraser Ecological) has extensive experience in DA related ecological assessment as both an assessor (Hornsby Shire Council) and private consultancy (Fraser Ecological) which actively and currently involve a wide array projects. Fraser Ecological is based locally on the Central Coast, however, project experience extends to South Coast, Blue Mountains, Mid-north Coast and mainly in the Sydney Basin Bioregion.

Previous work roles include ecological consulting for Parsons Brinckerhoff (large infrastructure), NPWS threatened species unit (biodiversity surveys), former NSW Department of Climate Change/ OEH (SIS DGRs and major projects assessment) and Hornsby Shire Council (DA assessment officer) have focussed primarily on ecological survey, development assessment, project management and policy development for consent authorities.

Alex offers high level botanical ID and field survey skills which includes targeted surveys and BAM plot surveys. Fraser Ecological has extensive experience in the preparation of over 15 BDARs under the new BC Act 2016 BOS credit trading scheme. Alex has experience dealing with consent authorities including Council, Crown Lands, Metropolitan Land Council, RFS, Biodiversity Conservation Trust and Department of Planning for major projects including SSDI proposals.

Fraser Ecological has established a wide network of ecological specialists including the Royal Botanic Gardens and Australian Museum as well academic institutions for expert advice when required. Alex is a current member of the North Sydney Regional Land Managers Group that includes staff from Central Coast Council, Northern Beaches, Ku-ring-gai Council, Hornsby Council (HSC), NPWS and Crown Lands) as project manager developing the Natural Area Recreation Strategy for HSC. Current main role at Council is development assessment and review of Flora and Fauna Reports and Biodiversity Assessment Reports.

Fraser Ecological has been engaged by various Councils (Central Coast, Ku-ring-gai, Liverpool City, Blacktown City Council, Hornsby Shire Council and Hawkesbury City Council) to undertake biodiversity assessments for major civil works projects. He is continuously providing biodiversity assessments for private clients for a range od development proposals across coastal and western NSW. We have also undertaken threatened flora and fauna species survey and monitoring for the NSW OEH Save our Species grants.

Key skills:

- Targeted flora and fauna surveys
- BAM plots in accordance with the BAM
- Ecological monitoring & Opportunity and Constraints mapping
- Preparation of BDARs, BAM calculator and credit reporting
- Retirement of credits for approved projects via BCT and brokers
- Establishment of stewardship sites and other offset packages
- Expert witness reporting and attendance in the LAEC
- Compliance investigations and auditing
- Preparation of Vegetation Management Plans
- Preparation of Nestbox Monitoring Plans

CERTIFICATE OF ACCREDITATION AS A BIODIVERSITY ASSESSMENT METHOD ASSESSOR under the *Biodiversity Conservation Act 2016* (NSW)

BAM Assessor		
Alexander Fraser		
Accreditation number	**Accreditation date (Date of issue)**	**Expiry Date of**
BAAS18156	17 October 2021	17 October 2024

The person named above is accredited under section 6.10 of the *Biodiversity Conservation Act 2016* (NSW) (**BC Act**) as a Biodiversity Assessment Method Assessor to apply the Biodiversity Assessment Method in connection with the preparation of biodiversity stewardship site assessment reports, biodiversity development assessment reports and biodiversity certification assessment reports pursuant to Part 6 of the BC Act.

The accreditation is in force until and including the Expiry Date. The accreditation is subject to the conditions set out in the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*, under the BC Act, and the conditions specified on the reverse of this certificate.

LUCIAN MCELWAIN

Manager Ecosytem Programs
Department of Planning, Industry & Environment

NOTES

- DPIE maintains a register of Accredited Biodiversity Assessment Method (BAM) Assessors accessible from the DPIE website.
- The BAM Assessor's accreditation expires on the Expiry Date unless renewed in accordance with the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*. It is the BAM Assessor's responsibility to monitor the Expiry Date of their accreditation, and apply for any renewal with sufficient time for the application to be processed prior to the Expiry Date.
- Words and expressions used in this accreditation instrument and which are also used in the Act have the same meaning.

SUMMARY OF CONDITIONS UNDER SCHEME

The following are conditions of all accreditations granted under the Scheme:

1. an accredited person must prepare Biodiversity Assessment Reports (and conduct surveys and other activities in connection with the preparation of such reports) in accordance with:
   a. the Biodiversity Assessment Method Manual,
   b. the Credit Calculator Operational Manual,
   c. Accredited Person Code of Conduct.
   d. this Scheme,
   e. any guidance materials published by the Department of Planning, Industry and Environment in connection with preparation of Biodiversity Assessment Reports or the application of the BAM
   f. any accreditation requirements notified by the Department of Planning, Industry and Environment to the accredited assessor from time to time.
2. an accredited person must maintain a detailed and up to date working knowledge of, and comply with, all relevant legislation.
3. an accredited person must maintain records of surveys and assessments, including field data sheets and targeted flora and fauna surveys, undertaken and used as part of the preparation of a Biodiversity Assessment Report, for at least ten years after certification of the relevant Biodiversity Assessment Report.
4. all records required kept by an accredited person must be in legible form, or in a form that can be readily be reduced to a legible form.
5. an accredited person must provide to the Department of Planning, Industry and Environment any information related to biodiversity assessment reports required to be provided by all accredited persons, or by a group of accredited persons, by way of a notice specified on a website maintained by it, in the form and within the time frames required in that notice.
6. an accredited person must comply with any scientific licence conditions relating to survey records.
7. an accredited person must possess, or operate under, an appropriate scientific licence as required for the type work, they are completing in the Biodiversity Offsets Scheme.

Note. Information that the Environment Agency Head (EAH) may require to be provided may include information collected during the application of the BAM such as site specific survey data.

Note. In addition to the conditions above, accredited persons must comply with obligations under the BC Act and regulations, including Part 6 Division 3 of the BC Act. Failure to comply with any of the conditions above may result in the EAH exercising the power to vary, suspend or cancel that accreditation under Part 5 of this Scheme.

ECA ECOLOGICAL CONSULTANTS ASSOCIATION of NSW Inc

2023 PRACTISING MEMBER

APPENDIX E BAM SUMMARY REPORTS

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00048564/BAAS18156/24/00048565	Proposal Name MAMRE AND ABBOTTS ROAD INTERSECTION KEMPS CREEK	BAM data last updated * 14/03/2024
Assessor Name Alex FRASER	Assessor Number BAAS18156	BAM Data version * 67
Proponent Names Grace Macdonald	Report Created 05/06/2024	BAM Case Status Finalised
Assessment Revision 1	Assessment Type Major Projects	Date Finalised 05/06/2024

* 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
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3320-Cumberland Shale Plains Woodland	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	0.2	0	0	0

BAM Biodiversity Credit Report (Like for like)

3320-Cumberland Shale Plains Woodland

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest This includes PCT's: 3319, 3320, 3448	-	3320_Poor	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

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00048564/BAAS18156/24/00048565

Proposal Name
MAMRE AND ABBOTTS ROAD INTERSECTION KEMPS CREEK

BAM data last updated *
14/03/2024

Assessor Name
Alex FRASER

Assessor Number
BAAS18156

BAM Data version *
67

Proponent Name(s)
Grace Macdonald

Report Created
05/06/2024

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Major Projects

Date Finalised
05/06/2024

* 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
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

BAM Biodiversity Credit Report (Variations)

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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
3320-Cumberland Shale Plains Woodland	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	0.2	0	0	0.00

3320-Cumberland Shale Plains Woodland

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest This includes PCT's: 3319, 3320, 3448	-	3320_Poor	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.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Grassy Woodlands	Tier 1	3320_Poor	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Variations)

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

BAM Candidate Species Report

Proposal Details

Assessment Id 00048564/BAAS18156/24/00048565	Proposal Name MAMRE AND ABBOTTS ROAD INTERSECTION KEMPS CREEK	BAM data last updated * 14/03/2024
Assessor Name Alex FRASER	Report Created 05/06/2024	BAM Data version * 67
Assessor Number BAAS18156	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 1	Date Finalised 05/06/2024	

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List of Species Requiring Survey

Name	Presence	Survey Months

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Refer to BAR
Brown Pomaderris	Pomaderris brunnea	Refer to BAR
Bush Stone-curlew	Burhinus grallarius	Refer to BAR
Camden White Gum	Eucalyptus benthamii	Refer to BAR
Cumberland Plain Land Snail	Meridolum corneovirens	Refer to BAR
Deyeuxia appressa	Deyeuxia appressa	Refer to BAR
Dillwynia tenuifolia	Dillwynia tenuifolia	Refer to BAR
Downy Wattle	Acacia pubescens	Refer to BAR
Eastern Osprey	Pandion cristatus	Refer to BAR

Eastern Pygmy-possum	Cercartetus nanus	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Green and Golden Bell Frog	Litoria aurea	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Refer to BAR
Hibbertia puberula	Hibbertia puberula	Refer to BAR
Juniper-leaved Grevillea	Grevillea juniperina subsp. juniperina	Refer to BAR
Koala	Phascolarctos cinereus	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Refer to BAR
Large-eared Pied Bat	Chalinolobus dwyeri	Refer to BAR
Little Bent-winged Bat	Miniopterus australis	Refer to BAR
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Marsdenia viridiflora subsp. viridiflora - endangered population	Geographic limitations
Masked Owl	Tyto novaehollandiae	Refer to BAR
Matted Bush-pea	Pultenaea pedunculata	Refer to BAR
Micromyrtus minutiflora	Micromyrtus minutiflora	Refer to BAR
Nodding Geebung	Persoonia nutans	Refer to BAR
P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	Pomaderris prunifolia - endangered population	Geographic limitations
Pimelea curviflora var. curviflora	Pimelea curviflora var. curviflora	Refer to BAR
Powerful Owl	Ninox strenua	Refer to BAR
Pultenaea parviflora	Pultenaea parviflora	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Refer to BAR
Slaty Red Gum	Eucalyptus glaucina	Refer to BAR
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	Refer to BAR

Southern Myotis	Myotis macropus	Refer to BAR
Spiked Rice-flower	Pimelea spicata	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Squirrel Glider	Petaurus norfolcensis	Refer to BAR
Swift Parrot	Lathamus discolor	Refer to BAR
Sydney Plains Greenhood	Pterostylis saxicola	Refer to BAR
Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Wahlenbergia multicaulis - endangered population	Geographic limitations
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Credit Summary Report

Proposal Details

Assessment Id
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Assessment Revision
1

Assessment Type
Major Projects

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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 Plains Woodland												
1	3320_Poor	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	7.9	7.9	0.2	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		0
											Subtotal	**0**
											Total	**0**

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

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00048564/BAAS18156/24/00048565	MAMRE AND ABBOTTS ROAD INTERSECTION KEMPS CREEK	14/03/2024
Assessor Name	**Report Created**	**BAM Data version ***
Alex FRASER	05/06/2024	67
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18156	Major Projects	Finalised
Assessment Revision		**Date Finalised**
1		05/06/2024

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black Falcon	Falco subniger	3320-Cumberland Shale Plains Woodland
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	3320-Cumberland Shale Plains Woodland
Black-necked Stork	Ephippiorhynchus asiaticus	3320-Cumberland Shale Plains Woodland
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3320-Cumberland Shale Plains Woodland
Diamond Firetail	Stagonopleura guttata	3320-Cumberland Shale Plains Woodland
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3320-Cumberland Shale Plains Woodland
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3320-Cumberland Shale Plains Woodland
Eastern Osprey	Pandion cristatus	3320-Cumberland Shale Plains Woodland
Flame Robin	Petroica phoenicea	3320-Cumberland Shale Plains Woodland
Gang-gang Cockatoo	Callocephalon fimbriatum	3320-Cumberland Shale Plains Woodland

Grey-headed Flying-fox	Pteropus poliocephalus	3320-Cumberland Shale Plains Woodland
Large Bent-winged Bat	Miniopterus orianae oceanensis	3320-Cumberland Shale Plains Woodland
Little Bent-winged Bat	Miniopterus australis	3320-Cumberland Shale Plains Woodland
Little Eagle	Hieraaetus morphnoides	3320-Cumberland Shale Plains Woodland
Little Lorikeet	Glossopsitta pusilla	3320-Cumberland Shale Plains Woodland
Regent Honeyeater	Anthochaera phrygia	3320-Cumberland Shale Plains Woodland
Rosenberg's Goanna	Varanus rosenbergi	3320-Cumberland Shale Plains Woodland
Scarlet Robin	Petroica boodang	3320-Cumberland Shale Plains Woodland
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	3320-Cumberland Shale Plains Woodland
Speckled Warbler	Chthonicola sagittata	3320-Cumberland Shale Plains Woodland
Spotted Harrier	Circus assimilis	3320-Cumberland Shale Plains Woodland
Spotted-tailed Quoll	Dasyurus maculatus	3320-Cumberland Shale Plains Woodland
Square-tailed Kite	Lophoictinia isura	3320-Cumberland Shale Plains Woodland
Swift Parrot	Lathamus discolor	3320-Cumberland Shale Plains Woodland
Turquoise Parrot	Neophema pulchella	3320-Cumberland Shale Plains Woodland
Varied Sittella	Daphoenositta chrysoptera	3320-Cumberland Shale Plains Woodland
White-bellied Sea-Eagle	Haliaeetus leucogaster	3320-Cumberland Shale Plains Woodland
White-throated Needletail	Hirundapus caudacutus	3320-Cumberland Shale Plains Woodland
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	3320-Cumberland Shale Plains Woodland

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Predicted Species Report

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00048564/BAAS18156/24/00048565

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Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	3320_Poor	3320-Cumberland Shale Plains Woodland	Poor	0.2	1	