

A landscape photograph showing a calm body of water, likely a pond or a slow-moving creek, reflecting the sky and surrounding vegetation. The water is dark and still, with some lily pads visible. The banks are covered in green grass and reeds. In the background, there are rolling hills under a clear blue sky. A few trees are scattered across the landscape, including a prominent bare tree on the right. The overall scene is peaceful and natural.

884-928 Mamre Road, Kemps Creek Biodiversity Development Assessment Report

FINAL REPORT

Prepared for Project Strategy on behalf of Altis Property Partners Pty Ltd

19 July 2021

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Glossary

Assessment Area	All land within 1500 m of the development site
BAM	NSW Biodiversity Assessment Method
BAM-C	BAM Calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	NSW <i>Biosecurity Act 2015</i>
BOS	Biodiversity Offsets Scheme
CIV	Capital Investment Value
CEMP	Construction Environmental Management Plan
DA	Development Application
DAWE	Commonwealth Department of Agriculture, Water and Environment
Development footprint	The area of land that is directly impacted by the proposal
Development site	The broader area, including 884-902 and 904-928 Mamre Road (Lot 53 DP 259135 and Lot 52 DP 259135), Kemps Creek in New South Wales (NSW) and a stretch of Mamre Road to the south of the lots.
DoIW	Directory of Important Wetlands
DPIE	NSW Department Planning Industry and Environment
DPI	NSW Department of Primary Industries
Ecosystem credit species	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development
EES	NSW Environment, Energy and Science Group
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan
LGA	Local Government Area
Locality	Area located within 10 km radius from the subject land

LPI	NSW Land and Property Information
Matters of NES	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
EES	NSW Environment, Energy and Science Group
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
SALIS	NSW Soil and Land Information System
SEARs	Secretary's Environmental Assessment Requirements
SEPP	NSW State Environmental Planning Policy
Species credits species	A class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates
SSD	State Significant Development
Subject land	The areas within or the combined areas of the development site, and any indirect and prescribed impacts.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
WM Act	NSW <i>Water Management Act 2000</i>

Summary

Altis Property Partners Pty Ltd proposes to develop a warehouse and distribution facility at 884-902 and 904-928 Mamre Road (Lot 53 DP 259135 and Lot 52 DP 259135), Kemps Creek in New South Wales (NSW) including a stretch of Mamre Road to the south of the lots (hereafter referred to as the development site) (Figure 1). The development will involve demolition of existing buildings, vegetation clearance, dam dewatering, construction of the facility, and road widening of Mamre Road.

The project is considered a State Significant Development (SSD) and will be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Vegetation will be removed as part of the project. As the project is considered an SSD, the Biodiversity Offset Scheme (BOS) applies in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (BC Act), and an assessment is required in accordance with the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a), and the BC Act. This Biodiversity Development Assessment Report (BDAR) has been prepared by Dr Caragh Heenan, Jake Schwebel, Heather Duff and Callan Wharfe; and reviewed by Rebecca Dwyer (Accredited Assessor BAAS#17067), to accompany the Environmental Impact Statement (EIS). This BDAR describes the outcome of the development assessment case (BAM-C 26481) conducted consistent with the BAM.

Field investigation, undertaken in accordance with the BAM, recorded 0.39 hectares of native vegetation within the subject land, representing no threatened ecological communities.

Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and detailed design, however impacts to vegetation are unavoidable due to road widening that meets Australian standards. Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct, indirect and prescribed.

Habitat for one threatened species was recorded within the subject land, and the vegetation integrity (VI) score of the vegetation to be impacted was calculated as 24.4 to 31.0. As such, in accordance with Section 10 of the BAM, offsets are required to be secured for the proposed development, including:

- 0.12 ha of PCT 835, consistent with the TEC *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).
- 0.04 ha of PCT 849, consistent with the TEC *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Critically Endangered, BC Act).
- 0.16 ha of Southern Myotis *Myotis macropus* habitat.

Removal of 0.04 hectares of Cumberland Plain Woodland meets the principles of a potential Serious and Irreversible Impact (SAIL) and therefore an assessment has been prepared.

The project is not considered likely to result in a significant impact to species or communities listed under the Environment Protection and *Biodiversity Conservation Act 1999* (EPBC Act), and as such a referral to the Minister of the Environment and Energy is not required.

Stage 1 – Biodiversity assessment

1 Introduction

Biosis Pty Ltd was commissioned by Project Strategy on behalf of Altis Property Partners Pty Ltd to undertake a biodiversity assessment for a proposed warehouse and distribution facility at 884-902 and 904-928 Mamre Road (Lot 53 DP 259135 and Lot 52 DP 259135), Kemps Creek, NSW.

The purpose of this assessment was to apply the NSW BAM (DPIE 2021a) to the proposed development, and provide Project Strategy, on behalf of Altis Property Partners Pty Ltd, with a Biodiversity Development Assessment Report (BDAR). The BDAR is to be submitted to the Minister for NSW Department of Planning, Industry and Environment (DPIE) as the approval authority as part of the EIS, under Part 4 of the EP&A Act, for the proposed development.

1.1 Project description

Altis Property Partners Pty Ltd proposes to develop 884-902 and 904-928 Mamre Road (Lot 53 DP 259135 and Lot 52 DP 259135), Kemps Creek (Figure 1) as a warehouse and distribution facility. The development will involve:

- Demolition of existing dwelling houses and associated outbuildings.
- Bulk earthworks involving dam dewatering, cut and fill works and pad construction.
- 16 Lot Torrens title staged subdivision.
- Construction of internal public estate roads of 24 m to 26.4 m wide and connections to existing and future local roads (including Mamre Road intersection works).
- Widening of Mamre Road to achieve compliance with Australian standards.
- Stormwater and drainage works including construction of onsite detention and bio retention basins.
- Landscape of bio retention basins and street tree planting.
- Infrastructure comprising civil works and utilities servicing.
- Construction of one warehouse and distribution centre on proposed Lot 2.

The proposed development satisfies the definition of a State Significant Development (SSD) pursuant to Schedule 1 Clause 12 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) as the Capital Investment Value (CIV) exceeds more than \$50 million.

Biosis previously undertook a biodiversity constraints assessment of the subject land which assessed nearby records of threatened flora, fauna or ecological communities (biota) listed under the Commonwealth EPBC Act, NSW BC Act and/or FM Act (Biosis 2019), which determined that Southern Myotis (Vulnerable, BC Act) may utilise the dams on site as low quality dispersal and foraging habitat (Biosis 2019).

The project has been assessed as triggering the NSW BOS through the following:

- As the project is considered an SSD, the Biodiversity Offset Scheme (BOS) applies in accordance with Section 7.9 of the BC Act.

The NSW BC Act requires that the BAM be applied to all proposals that trigger the BOS, and that a BDAR is required to be submitted to the approval authority.

1.2 Purpose of this assessment

This BDAR will:

- Address the BAM (DPIE 2020a) and the BOS.
- Identify how the proponent has avoided and minimised impacts to biodiversity.
- Identify any potential impact that could be characterised as serious and irreversible.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed development.
- Consider and assess the proposal in accordance with other relevant legislation such as the Commonwealth EPBC Act.

All biodiversity assessments have been undertaken in accordance with the BAM, and this BDAR has been prepared by Dr Caragh Heenan, Jake Schwebel, Heather Duff and Callan Wharfe; and reviewed by Accredited Assessor Rebecca Dwyer (#BAAS17067). This BDAR describes the outcome of the development assessment case (BAM-C 26481) conducted consistent with the BAM.

1.3 The subject land, development footprint and assessment area

The terms subject land, development footprint and assessment area are used throughout this BDAR and are defined as follows.

- The subject land is defined as the entirety of 884-902 and 904-928 Mamre Road (Lot 53 DP 259135 and Lot 52 DP 259135), as well as a stretch of road reserve adjacent and to the south of the lots. The subject land includes the combined areas of the development site, and any indirect and prescribed impacts. The subject land is described as:
 - The lots are located directly north of Mamre Road between Kemps Creek and St Clair, approximately 49 km west of the Sydney Central Business District (CBD).
 - The land is located in the Mamre Road Precinct 12 (Mamre Road), in Penrith Council Local Government Area (LGA) and the Greater Sydney Local Land Services (LLS) Region.
 - The land is zoned as IN1 General Industrial and SP2 Infrastructure under the provisions of *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (SEPP WSEA). *Penrith Local Environmental Plan 2010* (LEP) is not applicable to the land as the provisions of SEPP WSEA apply.
- The development footprint comprises the majority of Lot 53 DP 259135 and Lot 52 DP 259135, as well as a linear strip of road reserve for a 10 m setback. The development site is consistent with the development footprint.
- The assessment area includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land.

1.4 Sources of information

Sources of information used in the assessment included relevant databases, spatial data, literature and previous site reports.

In order to provide a context for the assessment area, records of flora and fauna from within five kilometres (the locality) were collated from the following databases and datasets were reviewed:

- Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - the database for the Atlas of NSW Wildlife, Environment, Energy and Science (EES), for species, populations and ecological communities listed under the BC Act.
- NSW BAM Calculator.
- Biodiversity values map.
- Native vegetation regulatory map.
- BAM Important Areas maps.
- PlantNET (The Royal Botanic Gardens and Domain Trust).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.

Other sources of biodiversity information relevant to the assessment area were sourced from:

- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (DPIE 2021a).
- Relevant vegetation mapping, including:
 - *Southeast NSW Vegetation Native Vegetation Classification and Mapping* (SCIVI) (OEH 2011).
 - *Native Vegetation Maps of the Cumberland Plain, Western Sydney* (Final Edition) (DECCW 2010).

The following reports were also reviewed and relied on to provide additional information:

- *Biodiversity Constraints Assessment for 884-904 Mamre Road, Kemps Creek* (Biosis 2019).

Basemap data was obtained from NSW Land and property information (LPI) 1:25,000 digital topographic databases, with cadastral data obtained from LPI digital cadastral database.

The following spatial datasets were utilised during the development of this report:

- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW).
- Spatial data associated with Southeast NSW Regional Native Vegetation Map (OEH 2011).
- NSW Soil and Land Information System (SALIS).
- Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:
 - Digital mapping with aerial photography showing 1:1000 or finer.
 - Site map as described in subsection 3.1.1 of the BAM.
 - Location map as described in subsection 3.1.2 of the BAM.
 - Landscape map with features including 1500 metre buffer, as described in section 3.1.3 of the BAM.

1.5 Legislative requirements

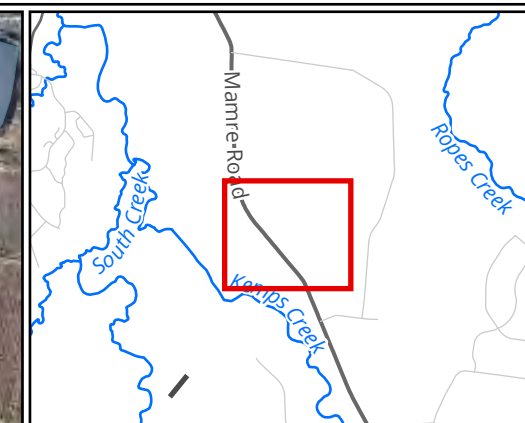
The project has been assessed against relevant biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999.*
- *Environmental Planning and Assessment Act 1979.*
- *Biodiversity Conservation Act 2016.*
- *Biosecurity Act 2015.*
- *Fisheries Management Act 1994.*
- *State Environmental Planning Policy (Western Sydney Employment Area) 2009.*
- *Mamre Road Precinct Draft Development Control Plan 2020 (DCP).*

Secretary Environmental Assessment Requirements (SEARs) have been issued for the project, which include the biodiversity requirements outlined in Table 1.

Table 1 SEARs requirement report section references

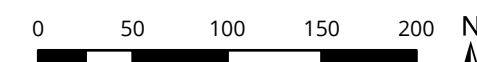
SEARs requirement	Report section
The EIS must include an assessment of the potential impacts of the development (including cumulative impacts) and develop appropriate measures to avoid, mitigate, manage and/or offset these impacts. The EIS must address the following specific matters:	-
• An assessment of the development's biodiversity impacts in accordance with the BAM including the preparation of a BDAR where required under the Act, except where a waiver for preparation of a BDAR has been granted.	• A BDAR has been prepared (current report).
• An assessment of the development's impacts on any ecosystem(s) associated with the existing farming dam due to dewatering.	• Section 6.3, Table 16. • Section 7, Table 18.



Legend

- Subject land
- Development site
- Development footprint

Figure 1 Subject land



Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 35483, Date: 19 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.aprx
Layout: 35483_BDAR_F1_SubjectLand

2 Landscape Context

This chapter describes the landscape and site context of the subject land, describing the landscape features present within the subject land and within a 1500 metre buffer, as required by the BAM (DPIE 2021a). Figure 3 shows the location of the subject land and landscape features within the 1500 metre buffer.

2.1 Subject land description

The subject land is defined as the entirety of 884-902 and 904-928 Mamre Road (Lot 53 DP 259135 and Lot 52 DP 259135), as well as a 460 metre stretch of road reserve adjacent and to the south of the lots. The lots are located directly north of Mamre Road between Kemps Creek and St Clair, approximately 49 kilometres west of the Sydney CBD.

The land is located in the Mamre Road Precinct 12 (Mamre Road), in Penrith Council LGA and the Greater Sydney LLS Region. The land is zoned as IN1 General Industrial and SP2 Infrastructure under the provisions of SEPP WSEA. LEP is not applicable to the land as the provisions of SEPP WSEA apply.

The surrounding land use is primarily rural, used for small scale agriculture and low density residential dwellings. The subject land contains several residential dwellings and associated agricultural sheds and infrastructure. Vegetation connectivity within and surrounding the subject land is poor, with the subject land mostly cleared of native vegetation and few mature trees in the landscape. The subject land contains planted crops, cleared urban and exotic grassland, and scattered roadside vegetation on the northern side of Mamre Road that has been subjected to disturbance. There are three man-made dams within the development footprint, and there are three mapped tributaries associated with South Creek and Kemps Creek. In addition, there are two mapped dams within the subject land outside of the development footprint that have prescribed impacts.

The subject land is within the Penrith 1:100k soil landscape (Bannerman & Hazelton 1990). Regional soil landscape mapping indicates that the south west of the subject land occurs on the Blacktown landscape of the Penrith region and the north east of the subject land occurs on the Luddenham landscape of the Penrith region (Bannerman & Hazelton 1990).

The Blacktown soils landscape is characterised by gently undulating rises on Wianamatta Group shales (Bannerman & Hazelton 1990). Dominant land uses for this landscape include intensive residential horticulture and animal husbandry. Common canopy species for the area included Forest Red Gum *Eucalyptus tereticornis*, Narrow-leaved Ironbark *E. crebra*, and Grey Box *E. moluccana*, however the region has been extensively cleared.

The Luddenham landscape of the Penrith region is characterised by undulating rolling low hills on Wianamatta Group shales, often associated with Minchinbury sandstone (Bannerman & Hazelton 1990). Soil of this landscape is highly susceptible to erosion, and much of the landscape has been extensively cleared. The composition of the soil is highly influential on the condition of the vegetation communities observed.

2.1.1 Native vegetation cover

Vegetation within the assessment area (within the 1500 metre buffer area) was assessed using aerial photographic interpretation, field survey results and existing vegetation mapping. Figure 4 provides the list of PCTs identified from existing vegetation mapping, and the current assessment, as occurring within the assessment area. Conservation status of the communities is also provided. The total area of the 1,500 metre buffer around the subject land is 1226 hectares, with the area of native vegetation mapped within the buffer

being 99 hectares. This is a native vegetation cover of 8 % (0-10 % class as defined in Section 3.2.3 of the BAM) and this value was entered into the BAM calculator. Cleared areas within the assessment area include 1,077 hectares.

Field assessment identified the presence of mapped PCT communities along the road reserve and the distribution was consistent with aerial imagery. Vegetation within the road reserve, however, is inconsistent with mapped vegetation of *Southeast NSW Vegetation Native Vegetation Classification and Mapping* (SCIVI) (OEH 2011) and *Native Vegetation Maps of the Cumberland Plain, Western Sydney* (Final Edition) (DECCW 2010). Both resources define the subject land as 'Cleared' and 'No native vegetation overstorey', respectively. However, field investigations by Biosis found patches of PCTs across the subject land within the road reserve.

2.1.2 Bioregions

The assessment area occurs within the Sydney Basin IBRA bioregion and the Cumberland IBRA subregion. The Sydney Basin Bioregion lies on the central east coast of NSW and covers an area of approximately 3,624,008 hectares. It occupies about 4.53 % of NSW and is one of two bioregions contained wholly within the state. The bioregion extends from just north of Batemans Bay to Nelson Bay on the Central Coast, and almost as far west as Mudgee. The bioregion is bordered to the north by the North Coast and Brigalow Belt South bioregions, to the south by the South East Corner Bioregion and to the west by the South Eastern Highlands and South Western Slopes bioregions. The Sydney Basin Bioregion is one of the most species diverse in Australia. This is a result of the variety of rock types, topography and climates in the bioregion (DPIE 2016).

2.1.3 Rivers and streams

The development site is located within the Greater Sydney LLS Region and the Hawkesbury catchment. The closest river-mouth is the Parramatta River (Sydney Harbour) located approximately 46 kilometres to the east of the development site. The closest major waterbody is Kemps Creek, located approximately 475 metres to the west of the site.

A tributary of South Creek is mapped towards the north eastern boundary, and two tributaries of Kemps Creek were identified crossing Mamre Road within the road reserve to the south of the subject land (Figure 1). In addition, three man-made dams were identified within the development footprint with one of the dams being associated with the tributary of South Creek.

Two additional dams, located east of the Mamre Road reserve vegetation, are considered in the current assessment as being subject to prescribed impacts, including impacts to water quality, water bodies and hydrological processes that sustain threatened entities. For the current assessment, this includes waterways within 200 metres of Southern Myotis habitat.

The overall condition of the three man-made dams on site was moderate with fringing vegetation mainly consisting of exotic grasses and herbs. Patches of low diversity of native colonizer species occur including Bullrush *Typha orientalis*, Slender Knotweed *Persicaria decipiens*, Swamp Dock *Rumex brownii*, *Juncus usitatus*, and Couch Grass. However these patches occur in isolation along the wetted perimeter of the dams, are small and narrow in nature, and interspersed with exotic grass species. They do not meet the requirements for consideration as native vegetation or conform to a PCT.

Vegetation have the potential to provide low quality dispersal, sheltering and foraging habitat for threatened biota including birds, microbats and frogs. Common aquatic fauna species that may utilise these dams include, Longfin Eel *Anguilla reinhardtii*, Eastern Long-necked Turtle *Chelodina longicollis* and Common Eastern Froglet *Crinia signifera*.

The riparian corridors within the subject land have been assessed in relation to the *Water Management Act 2000* (WM Act). DPI Water recommends riparian widths based on watercourse order under the Strahler method in order to protect waterways from damage such as erosion (Strahler 1964). The watercourses

mapped within the subject land are classified as a Strahler One and Strahler Two order stream, which may require a riparian corridor width of 10 metres and 20 metres from the 'top of bank' on either side, respectively (NRAR 2018). However, during the field survey, the flow of the South Creek tributary was observed to be disconnected due to the presence of the man-made dams. The tributaries of Kemps Creek are non-perennial and pass under Mamre Road via culverts. As the riparian corridors will be impacted by the development, a Controlled Activity Approval under s91 of the WM Act is required.

There are no Key Fish Habitats as mapped by the NSW Department of Primary Industries (DPI) within the development site (DPI 2013).



Photo 1 Large man-made dam at the eastern extent of the development site

2.1.4 Wetlands

The development site is not mapped as part of a wetland included in the DoIW of Australia (DoIW 2004). The nearest wetland is the Towra Point Estuarine Wetlands, located 38 kilometres to the south-east of the subject land.

The development site lies to the north-west (approximately 38 kilometres) to the Ramsar wetland Towra Point Nature Reserve.

2.1.5 Connectivity

Native vegetation occurs within the subject land along the south-western boundary in the road reserve. This vegetation is fragmented from surrounding remnant vegetation and does not provide connectivity for species that are restricted with mobility (Figure 2 and Figure 3).

The subject land is bounded to the south-west by Mamre Road and cleared lots on all other sides, such that mobile species that are able to traverse Mamre Road can disperse via fragmented patches along the Mamre Road reserve and paddock trees in adjacent lots to riparian vegetation 700 metres west of the subject land, located along Kemps Creek.

There is no remnant vegetation associated with the first and second order streams within the subject land and therefore little connection through riparian vegetation to higher order streams. In addition, the

waterways are disconnected non-perennial streams that are unlikely to provide habitat connectivity for frogs or other aquatic species.

2.1.6 Geological features

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the development site or within the assessment area.

2.1.7 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity or biodiversity values mapped within the development site.

2.1.8 NSW (Mitchell) Landscape

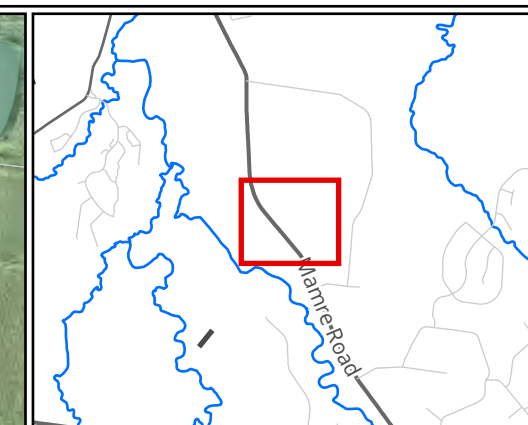
The development site occurs within the Cumberland Plain (Cpl) Mitchell Landscape. The Cumberland landscape group consist of low rolling hills and valleys with a general elevation of 30 to 120 metres and local relief of 50 metres, in a rain shadow area between the Blue Mountains and the coast, NSW. The landscape group primarily consists of horizontal Triassic shales and lithic sandstones, Tertiary river gravels and sands, Quaternary alluvium, pedal uniform red to brown clays, red and brown texture-contrast soils and yellow harsh texture-contrast soils. The composition of the soil is highly influential on the vegetation communities observed. As such, the landscape is associated with woodlands and open forest of Grey Box *Eucalyptus moluccana*, Forest Red Gum *Eucalyptus tereticornis*, Narrow-leaved Ironbark *Eucalyptus crebra*, Thin-leaved Stringybark *Eucalyptus eugenioides*, Cabbage Gum *Eucalyptus amplifolia* and Broad-leaved Apple *Angophora subvelutina*, Australian Boxthorn *Bursaria spinosa*, Swamp Oak *Casuarina glauca* and Paperbark *Melaleuca* spp. (Mitchell 2002).

2.1.9 Additional landscape features

There are no additional landscape features of relevance to the current assessment.

2.1.10 Hydrology

The site is not mapped as having Groundwater Vulnerability (LEP).



Legend

- Subject land
- Development site
- Development footprint
- Lot
- IBRA Region/Sub-region
- Habitat connectivity
- Mitchell Landscape (V3)**
 - Cpl, Cumberland Plain
 - Hac, Hawkesbury - Nepean Channels and Floodplains
- Strahler stream order**
 - 1
 - 2
- HydroLine stream order buffers**
 - 1
 - 2

Figure 2 Site map

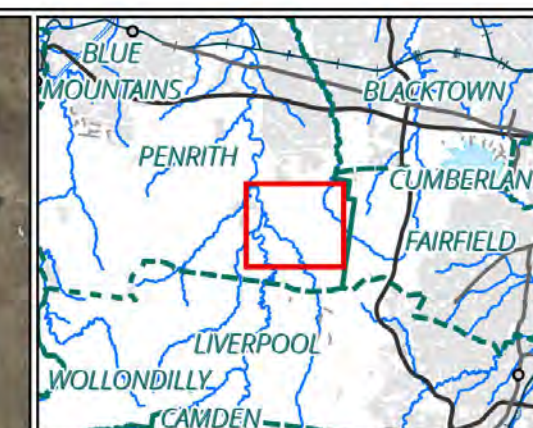
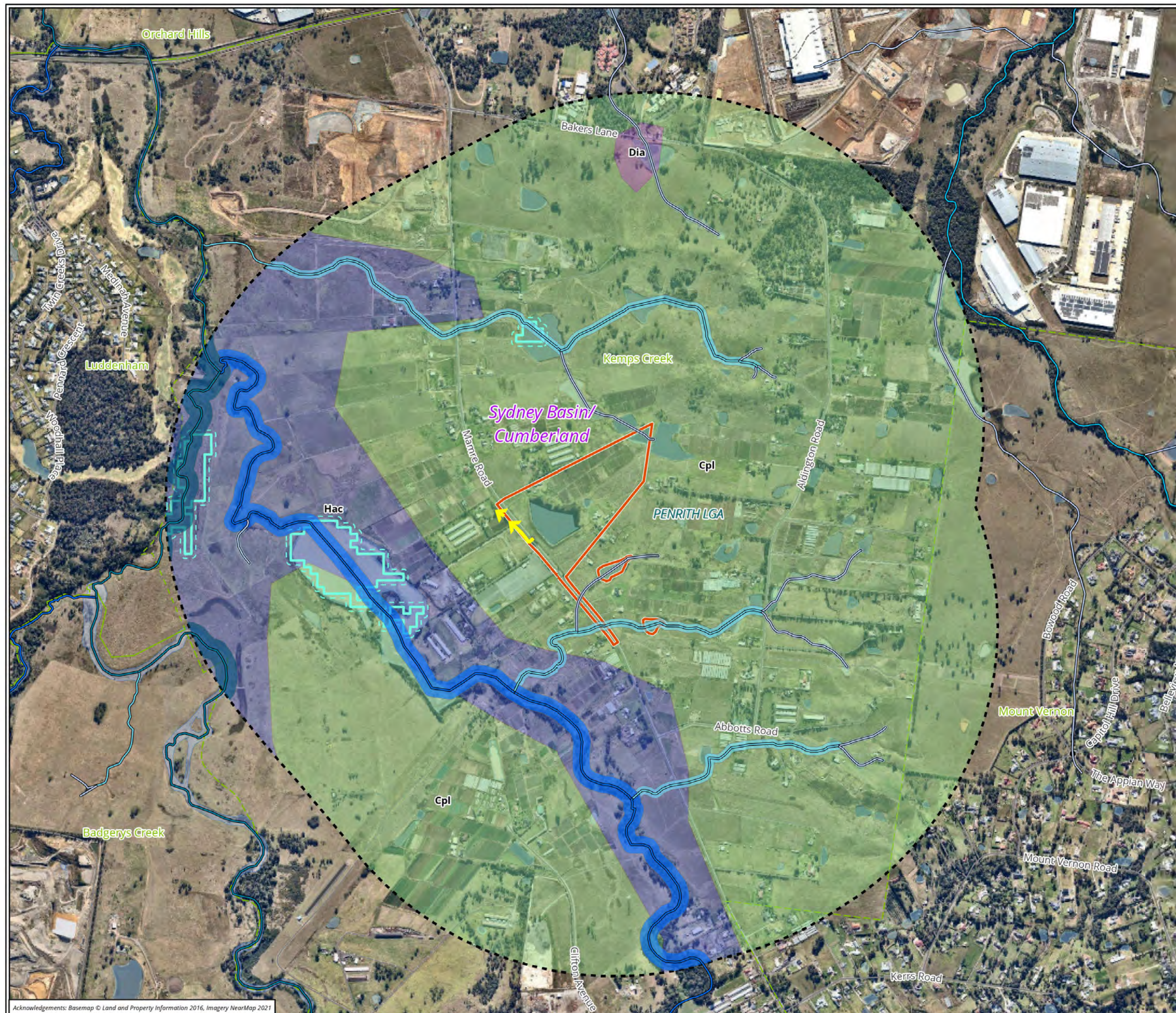
0 40 80 120 160

Metres

Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 35483, Date: 16 July 2021
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.aprx
Layout: 35483_BDAR_F2_SiteMap



Legend

- Subject land
- Assessment area
- IBRA Region/Sub-region
- Habitat connectivity
- Riparian buffers - Local wetlands
- Local wetlands

Mitchell Landscape (V3)

- Cpl, Cumberland Plain
- Dia, Sydney Basin Diatremes
- Hac, Hawkesbury - Nepean Channels and Floodplains

Strahler stream order

- 1
- 2
- 3
- 4
- 6

HydroLine stream order buffers

- 1
- 2
- 3
- 4
- 6

Figure 3 Location map

0 175 350 525 700

Metres

Scale: 1:16,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 35483, Date: 16 July 2021
 Drawn by: AM, Checked by: CBH, Last edited by: amackegard
 Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.aprx
 Layout: 35483_BDAR_F3_Location

3 Native vegetation

The development site supports 0.16 hectares of native vegetation with high levels of disturbance. The vegetation within the development site consists of two PCTs in low condition.

Patches of native vegetation are small, highly isolated, and subjected to high levels of weed ingress, consisting of low condition vegetation on the edge of a major roadway, which have undergone some degree historical ground disturbance, and are surrounded by exotic grass dominated paddocks.

3.1 Native vegetation and habitat assessment

3.1.1 Native vegetation extent

The extent of native vegetation, threatened ecological communities and vegetation integrity within the subject land was determined using the results of site investigations, previous studies undertaken at the site (Biosis 2019) and Section 4 of the BAM (DPIE 2020a).

Figure 4 provides a map of the native vegetation extent recorded within the development site and development footprint, as assessed during field investigations undertaken in July 2021. The figure includes all areas of native vegetation (native ground cover and areas with canopy) within the subject land. Areas not shown as native vegetation cover within Figure 4, are considered cleared / non-native vegetation, and are addressed further below.

3.1.2 Review of existing information

Existing information regarding native vegetation was reviewed to inform field investigations including:

- Regional vegetation mapping (OEH 2011, DECCW 2010).
- Existing site reports (Biosis 2019).
- Database searches.

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the subject land and development footprint.

3.1.3 Field investigation of biodiversity values

A systematic biodiversity assessment was conducted on 25 September 2019 by Laura Watts (Ecologist) as part of the original biodiversity constraints assessment (Biosis 2019), and 6 July 2021 by Callan Wharfe (Senior Ecologist and Offset Lead, accredited BAM Assessor #BAAS18138) and Jake Schwebel (Botanist), under the terms of Biosis' Scientific Licence issued by the EES under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 March 2022). Fauna survey was conducted under approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2022).

The BAM Assessment was overseen by Accredited Assessor Rebecca Dwyer (#BAAS17067).

The development site was surveyed in accordance with the BAM (DPIE 2020a), which involved:

- The identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in Southeast NSW Vegetation Native Vegetation Classification and Mapping (SCIVI) (OEH 2011) and Native Vegetation Maps of the Cumberland Plain, Western Sydney (Final Edition) (DECCW 2010).

- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020a), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to the Surveying threatened plants and their habitats (DPIE 2020b).
- Incidental observations using the “random meander” method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site.
- An assessment of the natural resilience of the vegetation of the site.
- Identifying and mapping fauna habitats (e.g. hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species’ habitat constraints.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW
- EPBC Act for significance within Australia.

Detailed field mapping and collection of GPS point locations were conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally ± 5 metres.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined and assigned. Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the Southeast NSW Vegetation Native Vegetation Classification and Mapping (SCIVI) (OEH 2011), Native Vegetation Maps of the Cumberland Plain, Western Sydney (Final Edition) (DECCW 2010) and NSW BioNet Vegetation Classification database (DPIE 2021a). Locations of floristic plots surveyed are shown on Figure 6.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.2 below.

3.1.4 Local data

No local data has been used for native vegetation assessment.

3.1.5 Non-native vegetation

The majority of the subject land is mapped as Urban Native/Exotic with no native over storey or mid storey cover, and therefore met the definition of non-native vegetation / cleared land and is not mapped as native vegetation (Figure 5).

Areas not shown as native vegetation cover within Figure 5, and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 5.1.1.5 of the BAM (DPIE 2020a). Non native vegetation which does provide habitat for threatened species is required to be assessed.

The majority of exotic species within the subject land are associated with built up suburban areas via introduction through human activity, mowing and vehicular movement. A number of priority weeds are well-established on site, including Blackberry *Rubus fruticosus* spp. *aggregate*, Common Prickly Pear *Opuntia stricta*, Fireweed *Senecio madagascariensis* and Peruvian Primrose *Ludwigia peruviana*.

Non-native vegetation has been assessed for threatened species, however it is highly disturbed and subjected to weed ingress, and does not provide habitat features suitable for threatened species.

Table 2 provides detailed descriptions of the non-native vegetation recorded within the subject land. Urban Native/Exotic recorded within the subject land are shown on Figure 5.

Table 2 Urban native/Exotic

Urban native/Exotic	
Common name	Urban Native/Exotic
Extent within subject land	16.69 ha (16.20 ha to be removed)
Description	Urban native/Exotic vegetation occurs across the subject land, with planted crops in the north of the subject land and exotic grassland across the remaining mapped areas. The Urban Native/Exotic vegetation is characterised by an absent canopy and midstorey, with groundcover dominated by exotic grass species including, Dallis Grass <i>Paspalum dilatatum</i>, Kikuyu Grass <i>Pennisetum clandestinum</i> and Couch Grass <i>Cynodon dactylon</i>, scattered occurrences of exotic herbs including Fireweed <i>Senecio madagascariensis</i>, Scotch Thistle <i>Onopordum acanthium</i> and Mustard Weed <i>Brassica oleracea</i>, and evidence of former cropping in the form of Spring Onions <i>Allium spp.</i>. This community does not conform to any NSW PCTs. Vegetation fringing the three dams present within the development site does, in patches, support a low diversity of native colonizer species including Bullrush <i>Typha orientalis</i>, Slender Knotweed <i>Persicaria decipiens</i>, Swamp Dock <i>Rumex brownii</i>, <i>Juncus usitatus</i>, and Couch Grass. However these patches occur in isolation along the wetted perimeter of the dams, are small and narrow in nature, and interspersed with exotic grass species. They do not meet the requirements for consideration as native vegetation or conform to a PCT.
Survey effort	Two BAM plots/transects (Figure 6). The vegetation integrity score was found to be 2.8. The Urban Native/Exotic included 115.0 % cover of exotic species and no cover of native species in BAM Plot 35483_01, and 100.5 % cover of exotic species and with 30 % cover of native species in BAM Plot 35483_02.

Urban native/Exotic

Urban native/Exotic



Photo 2 Exotic grassland within the subject land



Photo 3 Planted crops within the subject land

Urban native/Exotic

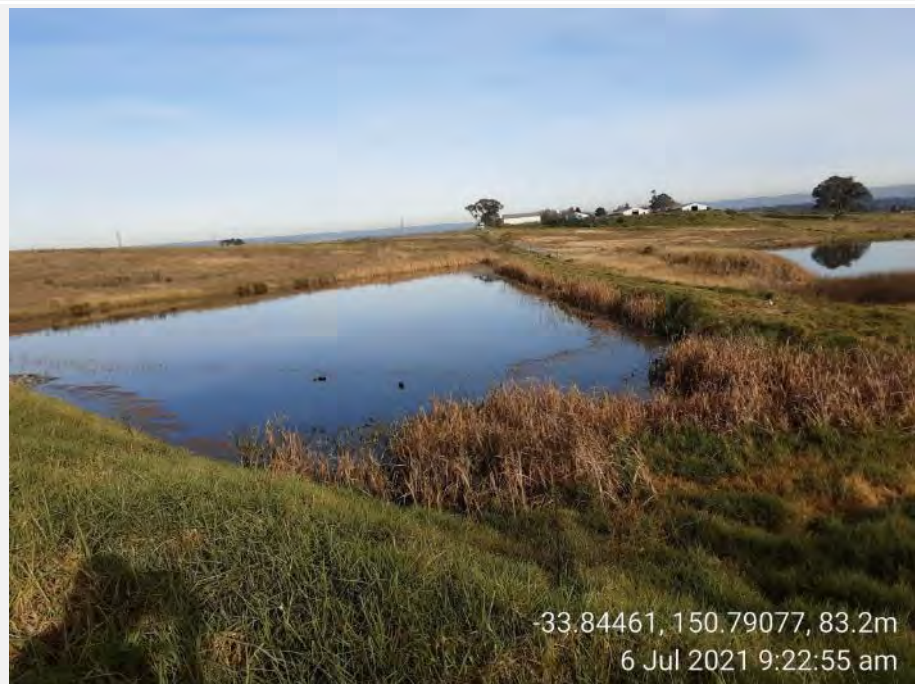


Photo 4 Small patches of bullrush surrounding the western dam



Photo 5 Native coloniser species surrounding the small central dam

3.1.6 Plant community types

The following Plant Community Types (PCT) were assessed as present within the subject land:

- PCT 835 *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion* (Table 3).

- PCT 849 *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion* (Table 4).

Table 3 to Table 4 provide detailed descriptions of the two PCTs recorded within the subject land. PCTs recorded within the subject land are shown on Figure 5.

Table 3 PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	
Common name	Cumberland River-flat Forest
Vegetation formation	Floodplain Wetlands
Vegetation class	Coastal Floodplain Wetlands
Extent within subject land	0.27 ha (0.12 ha to be removed)
Condition	This community at the subject land was recorded in a low condition state with native species dominating the canopy. The understorey consisted of scattered native shrubs, and was dominated by exotic grasses, forbs and woody weeds. The soil profile has also undergone historic disturbance from construction of the roadway, the piped waterway, and along the adjacent property boundaries.
Description	Cumberland River-flat Forest is characteristically recorded as an open eucalypt forest situated on broad alluvial flats of the Hawkesbury and Nepean river systems. This PCT typically includes Rough-barked Apple <i>Angophora floribunda</i> or Broad-leaved Apple <i>Angophora subvelutina</i> and one or both of Forest Red Gum <i>Eucalyptus tereticornis</i> and Cabbage Gum <i>Eucalyptus amplifolia</i> . The lower strata is typified by an occasional sparse to open small tree stratum of paperbark <i>Melaleuca spp.</i> and wattles <i>Acacia spp.</i> A sparse lower shrub layer features Blackthorn <i>Bursaria spinosa</i> . The ground layer is characterised by an abundant cover of Weeping Grass <i>Microlaena stipoides</i> with herbs and ferns. PCT 835 within the subject land was found to comprise dense stands of Broad-leaved Apple, with occasional Cabbage Gum, present along the Mamre Road reserve. The vegetation was found to be in a highly disturbed state with an absent midstorey. The understorey dominated by exotic grass, with occasional occurrences of characteristic native forbs including Kidney Weed <i>Dichondra repens</i> and Variable Glycine <i>Glycine tabacina</i> .
Survey effort	One BAM plot/transect (Figure 6).
Justification of PCT	The PCT within the subject land was found to occur on a lower, flatter floodplain area, surround two first order watercourses. Which combined with the occurrence of characteristic canopy species differentiated it from the PCT 849 vegetation, further to the north-west, which is present at slightly higher elevation, on a slightly steeper slope, and with drier edaphic conditions.
TEC Status	This PCT forms a component of TEC <i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> (Endangered, BC Act). This PCT does not meet the listing criteria for the Critically Endangered Ecological Community (CEEC), <i>River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria</i> , listed under the Commonwealth EPBC Act, as the PCT is highly

PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

	degraded and does not meet the minimum patch size requirement of 0.5 ha. Further information on TECs is provided in Section 3.1.7 below.
Estimate of percent cleared value of PCT (BioNet)	93 % (DPIE 2021a).
PCT 835 – Low condition	 Photo 6 PCT 835 vegetation along the Mamre Road reserve  Photo 7 Highly disturbed PCT 835 understorey vegetation

Table 4 PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	
Common name	Cumberland Shale Plains Woodland
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Extent within subject land	0.13 ha (0.04 ha to be removed)
Condition	This community at the subject land was recorded in a low condition state with native species dominating the canopy. The understorey consisted of scattered native shrubs, and was dominated by exotic grasses, forbs and woody weeds. The soil profile has also undergone historic disturbance from construction of the roadway, the piped waterway, and along the adjacent property boundaries.
Description	Cumberland Shale Plains Woodland typically exists as an open grassy woodland dominated by Grey Box <i>Eucalyptus moluccana</i>, Forest Red Gum <i>Eucalyptus tereticornis</i> and Ironbarks such as Narrow-leaved Ironbark <i>Eucalyptus crebra</i> and Red Ironbark <i>Eucalyptus fibrosa</i>. The lower strata is typified by a sparse to moderate cover of shrubs such as Blackthorn <i>Bursaria spinosa</i> and a high percentage of ground covers such as Kidney Weed and Weeping Grass <i>Microlaena stipoides</i>. PCT 849 within the subject land was found to comprise two slightly larger patches dominated by Forest Red Gum and occasional Grey Box and supporting occasional native species in the understorey, and a number smaller scattered patches of Grey Box with a highly weed infested understorey. The larger patches supported occasional occurrences of Blackthorn, Parramatta Green Wattle <i>Acacia parramattensis</i>, Fishweed <i>Einadia trigonos</i>, and Variable Glycine in the understorey, with all patches infested by Rhodes Grass <i>Chloris gayana</i>, African Olive <i>Olea europaea</i> subsp. <i>cuspidata</i> and a range of other exotic grasses and herbs.
Survey effort	One BAM plot/transect (Figure 6).
Justification of PCT	The PCT within the subject land was found to occur on slightly elevated and sloped ground above the floodplain further south-east, which combined with the occurrence of characteristic canopy and understorey species differentiated it from the PCT 835 vegetation.
TEC Status	This PCT forms a component of TEC <i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i> (Critically Endangered, BC Act). This PCT does not meet the listing criteria for the CEEC, <i>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest</i>, listed under the Commonwealth EPBC Act, as the PCT is highly degraded and does not meet the minimum patch size requirement of 0.5 ha. Further information on TECs is provided in Section 3.1.7 below.
Estimate of percent cleared value of PCT (BioNet)	93 % (DPIE 2021a).

PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

PCT 849 – Low condition



Photo 8 PCT 849 vegetation adjacent to Mamre Road



Photo 9 PCT 849 showing evidence of historical ground disturbance

PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion



Photo 10 PCT 849 highly degraded understorey vegetation

3.1.7 Threatened ecological communities

Vegetation within the subject land was found to represent two TECs listed under the NSW BC Act, as outlined in Table 5 below, and illustrated on Figure 8. The TECs do not represent EPBC Act listed TECs, as described in Section 3.1.6.

Table 5 Summary of BC Act TECs within the subject land

BC Act TEC	Listing status	Area (Ha)
<i>River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Endangered	0.27
<i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i>	Critically Endangered	0.13

3.2 Vegetation integrity assessment

3.2.1 Vegetation zones and patch size class

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM (DPIE 2020a). This resulted in two vegetation zones identified within the development footprint. Table 6 describes each of the zones, and provides details on the numbers of BAM floristic plots undertaken in each zone.

Patch size classes for each vegetation zone present within the subject land were assessed as per Section 4.3.2 of the BAM (DPIE 2020a) using a select process in ArcGIS. All native vegetation with a gap of less than 100 metres from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land.

Native vegetation within the subject land was mapped sequentially and it was found to form part of a very small patch of connecting vegetation with an area of approximately 0.32 hectares and 0.07 hectares. The connected vegetation comprises the isolated native vegetation patches within 100 metres of the vegetation to be impacted by the development.

The minimum patch size that was able to be entered into the BAM-C was 1 hectare.

Patch size classes for each vegetation zone are also outlined in Table 6 below.

Table 6 Vegetation zones within the subject land

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Vegetation zone area	Max. patch size development footprint
835_Low	835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.	Low	1	0.27 ha	0.32 ha (< 5 ha)
849_Low	849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.	Low	1	0.13 ha	0.07 ha (< 5 ha)

3.2.2 Vegetation integrity

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 m x 50 m quadrat and 50 m transect for assessment of site attributes and function.
- A 20 m x 20 m quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). A total of two BAM plots have been completed within the vegetation zones present development footprint, details are provided in Table 7 and shown on Figure 6.

BAM plot 35483_03 was undertaken within the PCT 849 vegetation on the northern side of Mamre Road which represented the largest patch of that vegetation type within and immediately adjacent to the impact site. The plot location itself was not within the area of direct impact, but the vegetation is representative of that being impacted by the project, and the plot location was the most suitable, given the constrained and narrow nature of the vegetation along the Mamre Road reserve.

Table 7 BAM plots completed within the subject land

BAM plot reference	Vegetation zone
35483_01	Urban Native/Exotic
35483_02	Urban Native/Exotic
35483_03	849_Low
35483_04	835_Low

Assessment of vegetation integrity was undertaken using standard benchmark data as outlined in the BAM and held in the BioNet Vegetation Classification database. A list of flora species was compiled for each BAM plot completed and is included in Appendix 3. Records of all flora species will be submitted to EES for incorporation into the Atlas of NSW Wildlife.

3.2.3 Vegetation integrity score

Plot data were entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Appendix 3, with vegetation integrity scores for each vegetation zones provided in Table 8.

Table 8 Vegetation zone integrity scores

Vegetation zone	Composition score	Structure score	Function score	Vegetation integrity score*	IBRA subregion
Urban Native/Exotic	0.2	5.8	15	2.8	Cumberland
835_Low	9.4	18.2	84.9	24.4	Cumberland
849_Low	10.4	36.9	77.9	31.0	Cumberland

*Benchmark (pristine) condition vegetation would receive a VI score of 100.

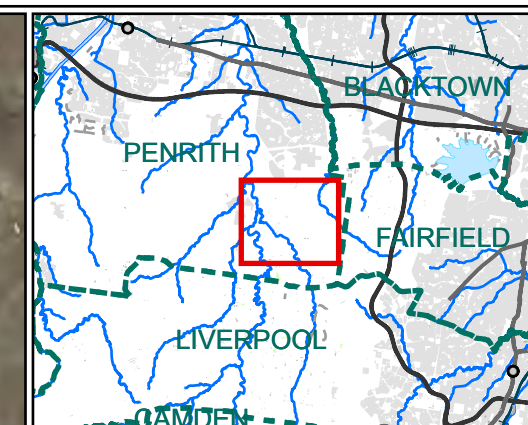
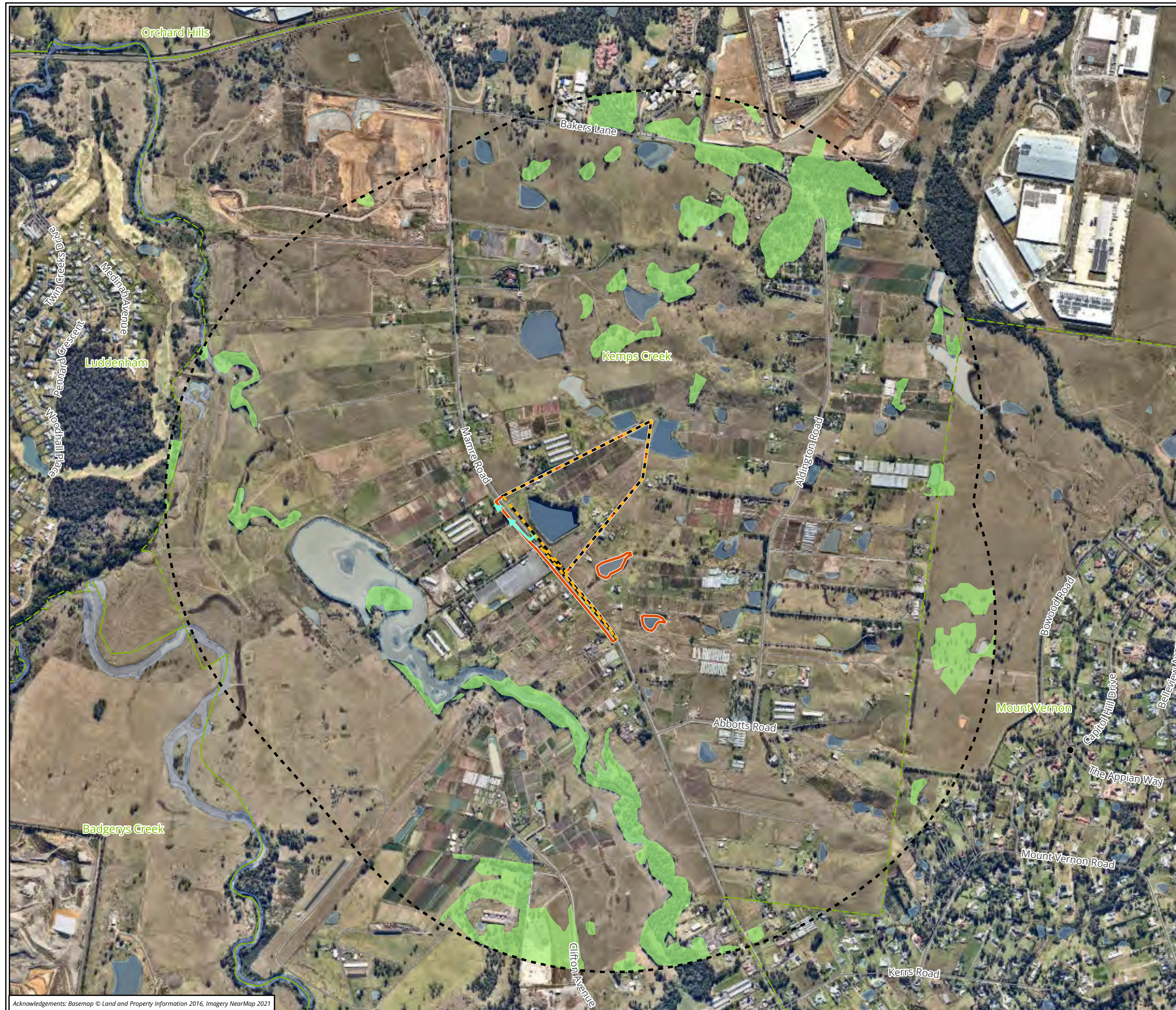
As outlined in Section 10.3.1 of the BAM, an offset is required for impacts on native vegetation where the vegetation integrity score is:

- ≥ 15 where the PCT is representative of an endangered or critically endangered ecological community.
- ≥ 17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community.
- ≥ 20 where the PCT is not representative of a TEC or associated with threatened species habitat.

As such, ecosystem credit offsets are required for vegetation zone 835_Low and 849_Low due to its VI score of ≥ 17 .

3.2.4 Scattered trees

No scattered/paddock trees were present within the subject land and therefore were not entered into the scattered tree calculator. Any proposed clearing of native vegetation that does not meet the definition of scattered trees was assessed with Section 4 of the BAM.



Legend

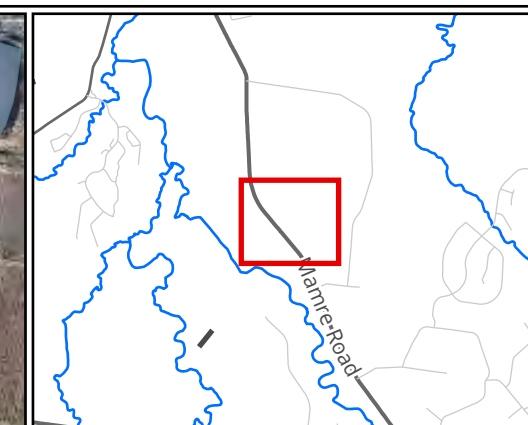
- Subject land
- Development site
- Development footprint
- Assessment area
- Habitat connectivity
- Native vegetation

Figure 4 Native vegetation extent

0 175 350 525 700
Metres
Scale: 1:16,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 35483,
Date: 16 July 2021,
Drawn by: JMS, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.mxd



Legend

- Subject land
- Development footprint
- Hollow-bearing tree

Plant Community Type

- Urban Native/Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- Cleared

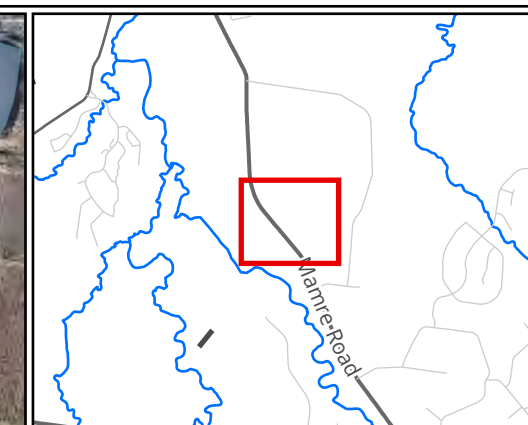
Figure 5 Vegetation within the subject land

0 50 100 150 200 N

Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 35483,
Date: 16 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.mxd



Legend

- Subject land
- Development site
- Development footprint
- BAM plot

Vegetation zones

- 835_Low
- 849_Low

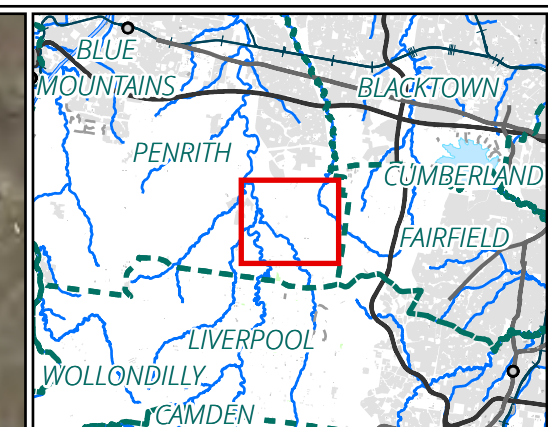
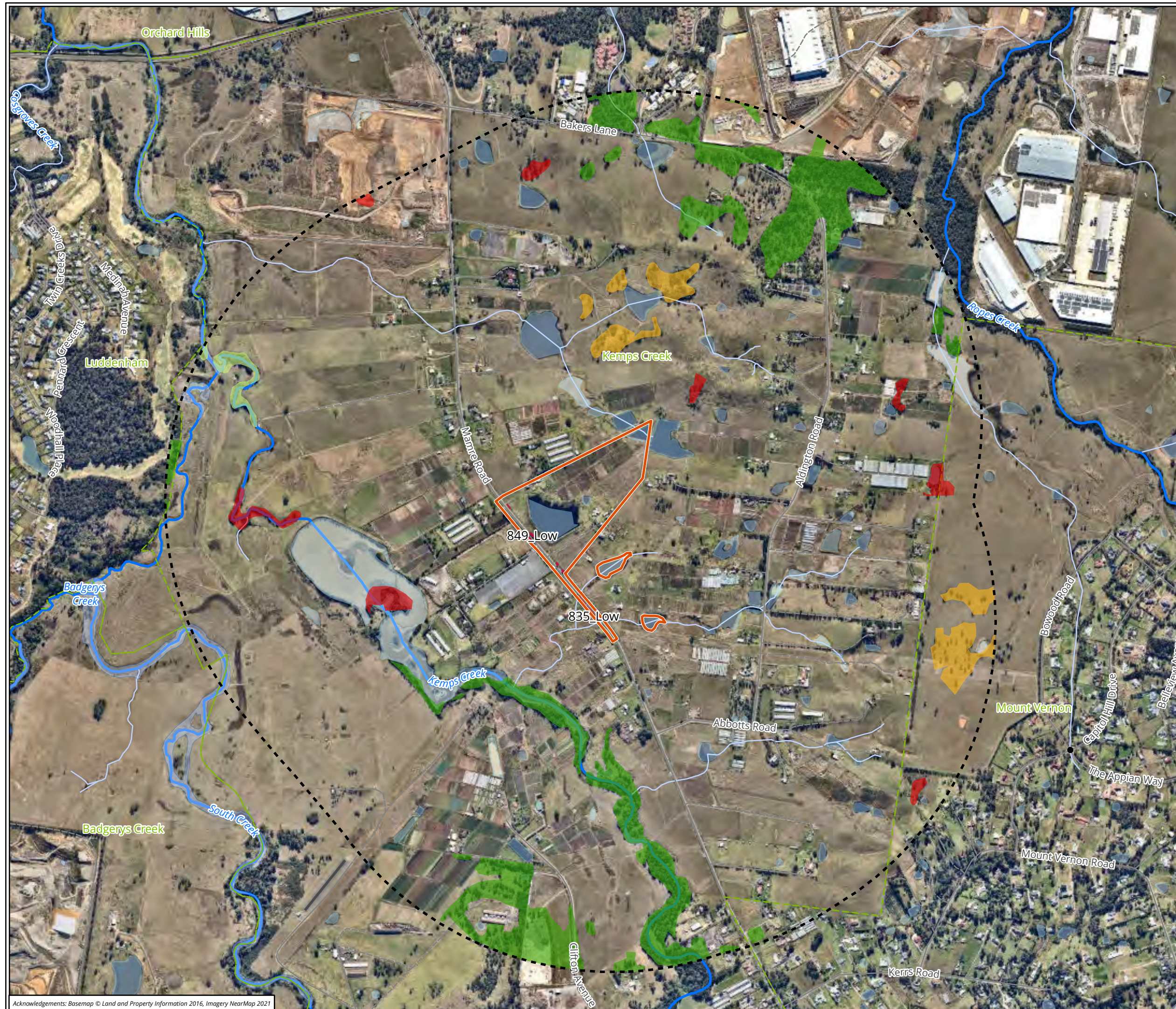
Figure 6 Vegetation zones and plot locations

0 50 100 150 200 N

Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



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Date: 16 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.mxd



Legend

Subject land

Assessment area

Patch size

- <5ha
- 5-<25ha
- 25-<100ha
- >=100ha

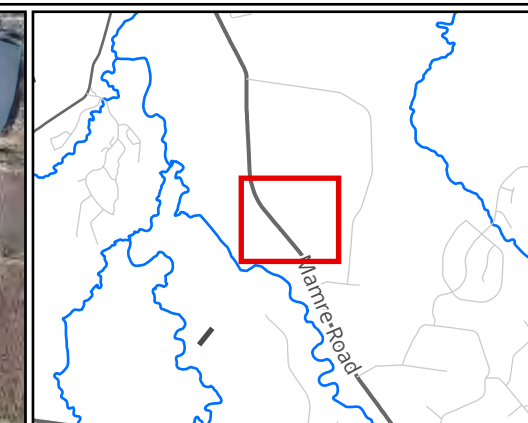
Figure 7 Patch size



Metres
Scale: 1:16,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 35483,
Date: 16 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR



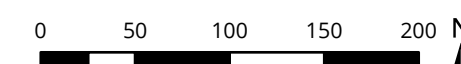
Legend

- Subject land
- Development site
- Development footprint

TECs - BC Act

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Figure 8 Threatened ecological communities within the subject land



Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



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4 Threatened species

4.1 Ecosystem credit species

A list of predicted species (ecosystem credit species) expected to occur within the subject land was generated as per Section 5 of the BAM. Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the Threatened Biodiversity Data Collection (TBDC). Table 9 lists the ecosystem credit species that could not be discounted, based on geographical restrictions or a lack of suitable habitat, from using the subject land on occasion.

These species were considered when prescribing management and mitigation measures for the project, and a number have been specifically considered as part of the assessment under the Commonwealth EPBC Act.

Table 9 Ecosystem credit species (predicted species) with potential to occur

Species name	Common name
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Botaurus poiciloptilus</i>	Australasian Bittern
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Circus assimilis</i>	Spotted Harrier
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Grantiella picta</i>	Painted Honeyeater
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Ixobrychus flavicollis</i>	Black Bittern
<i>Lathamus discolor</i>	Swift Parrot
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Miniopterus australis</i>	Little Bent-winged Bat
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat

Species name	Common name
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Ninox connivens</i>	Barking Owl
<i>Ninox strenua</i>	Powerful Owl
<i>Pandion cristatus</i>	Eastern Osprey
<i>Petroica boodang</i>	Scarlet Robin
<i>Petroica phoenicea</i>	Flame Robin
<i>Phascolarctos cinereus</i>	Koala
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Tyto novaehollandiae</i>	Masked Owl

4.2 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These species are identified as species credit species in the TBDC. A targeted survey or an expert report is required to confirm the presence of these species on the subject land, or alternatively the species can be assumed to be present (DPIE 2020a).

Appendix 2 provides the lists of species credit species predicted to occur within the subject land based on the IBRA subregion within which the project occurs, the native vegetation cover present within the 1500 metre buffer area, the PCTs present within subject land, and patch sizes listed in Table 6.

The potential for a species to occur within the subject land was assessed in accordance with Section 5.2 of the BAM and species with geographical restrictions, or habitat constraints not present, were not required to be assessed. A total of 22 fauna and 21 flora predicted species credit species have been excluded from occurring within the subject land based on a lack of suitable habitat, substantial degradation of existing potential habitat, and having never been recorded within 5 kilometres of the subject land.

A detailed assessment of potential for occurrence, and potential for impact, for all species credit species predicted to occur within the subject land is provided in Appendix 2. Species credit species considered to potentially occur within the subject land, and thus considered 'candidate species credit species' have been assumed present for the current assessment.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 10 (fauna species).

Threatened flora

Habitats for threatened flora species within the subject land are largely considered degraded due to the high degree of management, agriculture and nearby vehicular traffic. Open areas are typically dominated by exotic pasture grasses and herbaceous exotics. This comprises the habitats associated with all of the PCT 835 and PCT 849 vegetation within the subject land. The vegetation occurs as an isolated and edge effected linear

patch within the Mamre Road reserve. Therefore, no candidate flora species credit species were considered in this assessment and targeted survey was not undertaken, as outlined in Appendix 2.

Threatened fauna

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the proposed development contained microhabitats suitable to support the candidate fauna species credit species, as outlined in Appendix 2.

Habitat within the subject land is restricted to the Mamre Road reserve, which is highly degraded and subject to disturbance. No threatened biota were encountered during the site visit. Threatened microbats and birds may utilise the dams within the subject land as low-quality dispersal and foraging habitat. Birds observed adjacent to the subject land consist of generalist avifauna known to utilise the urban matrix and those utilising the adjacent dam as habitat.

The dams have emergent and fringing vegetation that potentially provides shelter, dispersal and foraging opportunities for threatened microbats, birds and frogs. Green and Golden Bell Frog was addressed in the biodiversity constraints assessment (Biosis 2019) as having potential habitat within the subject land, in the fringing and emergent vegetation surrounding the dams on site. However, the quality of the dams are poor. There are no records of Green and Golden Bell Frog within 5 kilometres of the subject land (EES 2021). The nearest record is 6.0 kilometres from the subject land from 1966, and the most recent record within the locality is from 2019, located 9.3 kilometres from the subject land. Nearby records connected to the subject land via waterways are 19 kilometres from the subject land, observed most recently in 2012. The habitat is of poor quality and there is poor waterway connectivity to localities that have recent records and therefore the likelihood of occurrence of this species is low.

The subject land is suitable for a range of microbats, including Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Southern Myotis, Yellow-bellied Sheath-tail-bat and Greater Broad-nosed Bat. These species are likely to forage above the site, but are not reliant on any terrestrial features, with the exception of Southern Myotis, which relies on hollow-bearing trees and waterways. There are 14 records of Southern Myotis within 5 kilometres of the subject land, where the nearest record is 1.6 kilometres from the subject land and the most recent record is from 2018. Habitat for Southern Myotis includes dams or waterways greater than 3 metres and all vegetation within 200 metres of the waterways (DPIE 2021b).

The development footprint includes three man-made dams, with two dams outside of the development footprint that occur within the subject land. Based on the presence of dams/waterways greater than 3 metres wide, there is a moderate likelihood of the dams forming potential foraging habitat for Southern Myotis (Churchill 2008, DPIE 2021b). Impacts to the dams cannot be offset and are therefore defined as prescribed impacts under Section 6 of the BAM (DPIE 2020a). There are several other dams/waterways suitable for Southern Myotis within 5 kilometres of the subject land so the dams are not a limiting resource, and therefore the impact on foraging habitat is considered negligible.

One hollow-bearing tree which forms potential nesting and roosting habitat for threatened microbats, such as Southern Myotis, was recorded in the subject land within the Mamre Road reserve. The vegetation is within 50 to 170 metres of the dams. The removal of non-native vegetation to facilitate the proposal is not considered to adversely impact Southern Myotis.

Table 10 provides a list of candidate fauna species credit species considered in this assessment, each species' required survey period and the relevant method of assessment.

Table 10 Candidate fauna species credit species

Species name	Common name	Survey period	Method of assessment
<i>Myotis macropus</i>	Southern Myotis	October-March	Assumed present

4.2.1 Threatened species survey details

Targeted threatened species surveys of the subject land were not undertaken for the current assessment.

Fauna habitat assessments

Fauna habitat assessment was undertaken to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Table 10 and Appendix 2. Habitat assessments focussed on the presence of the following features within the subject land:

- Habitat trees including large and/or hollow-bearing trees, stick nests, availability of flowering shrubs and canopy/understorey feed tree species.
- Soil type and presence of cliffs, overhangs and other rocky areas.
- Condition and type of native vegetation and the presence of exotic species.
- Presence and condition of pools and waterways.
- Quantity of ground litter and woody debris.
- Searches for indirect evidence of fauna (i.e. feathers, tracks and scats).
- General degradation of the site as a result of past and current disturbances such as vegetation clearing and industrial land management practices.
- Topography and landscape morphology.

Habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 11.

Table 11 Habitat features with potential to support threatened species credit species

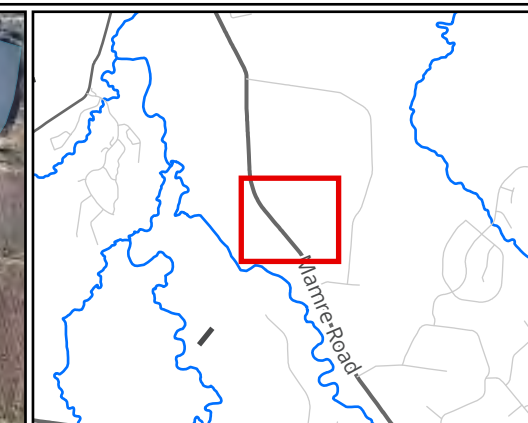
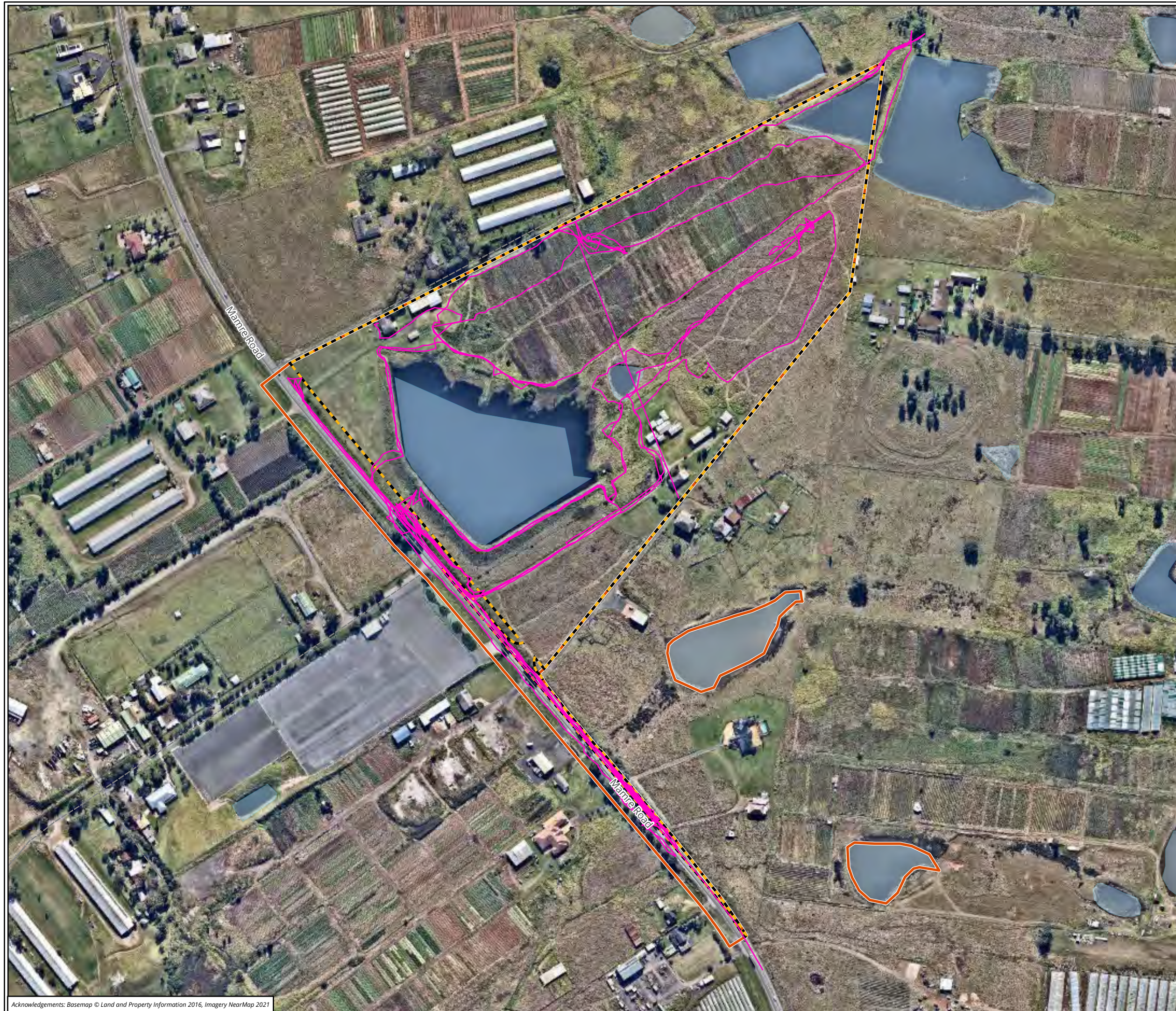
Habitat feature	Presence within the development footprint
Hollow-bearing trees	One habitat tree supporting a large trunk hollow (150-400 mm diameter) was present within the subject land. This tree has the potential to provide roosting and/or nesting habitat for microbats including the threatened Southern Myotis, but it does not provide roosting habitat for Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>, Barking Owl <i>Ninox connivens</i>, Powerful Owl <i>Ninox strenua</i>, or Masked Owl <i>Tyto novaehollandiae</i>. The hollow-bearing tree is present in the narrow and highly degraded patch of PCT 835 present along Mamre Road. This vegetation patch is subject to significant edge effects and on-going disturbance from the heavy traffic volumes (including heavy vehicles) using Mamre Road on a daily basis. This vegetation does not support breeding habitat for any potential candidate species credit species. Two additional hollow-bearing trees were present to the north-east of the subject land, however these will not be impacted by the development. These trees are isolated paddock trees, separated from other patches of vegetation, with one tree present as a dead stag. They do not form breeding habitat for threatened species.

Habitat feature	Presence within the development footprint
Feed tree species	Tree species identified as Koala <i>Phascolarctos cinereus</i> use trees within the Central Coast Koala management area, which includes the subject land, were detected during the assessment. However, there are no Koala records within the subject land or locality, and Penrith LGA is not included in Schedule 1 of Koala Habitat Protection SEPP. Trees and shrubs providing food resources for smaller mammals such as Squirrel Glider <i>Petaurus norfolcensis</i> were not recorded.
Caves and rocky overhangs	There are no caves or rocky overhangs within the subject land. Three culverts were recorded in the subject land along Mamre Road, which do not provide potential roosting sites for microbats, as they contain some standing water and large volumes of debris.
Rocky outcrops and sandstone crevices	There are no rocky outcrops or sandstone crevices within the subject land.
Major and minor watercourses and waterbodies (i.e. dams)	Mapped minor watercourses in the development footprint include first and second order tributaries associated with South Creek and Kemps Creek. While tributaries associated with Kemps Creek had standing surface water, the South Creek tributary was disconnected through modification of the dam to the north-east of the development footprint. The vegetation along these systems do not provide suitable habitat for threatened amphibians. Artificial waterbodies (i.e. farm dams) throughout the development footprint and impact assessment area were not identified as providing potential habitat for threatened amphibians.
Woody debris and leaf litter	Woody debris and leaf litter recorded within the subject land occur in highly degraded, heavily weed infested, narrow, small and isolated patches of vegetation along the Mamre Road reserve. These vegetation patches have also been subject to historical ground disturbance during the road and culvert construction and ongoing disturbance from adjoining properties. These areas do not provide habitat for Cumberland Plain Land Snail <i>Meridolum corneovirens</i> or Dural Land Snail <i>Pommerhelix duralensis</i> as they do not provide suitable leaf litter or woody debris in a natural state, as the vegetation is degraded and isolated.

Field capture of detailed fauna habitat information allowed for confirmation of presence/absence of habitat features and microhabitats for a range of candidate threatened species across surveyed portions of the development footprint and impact assessment area. Fauna habitat assessments were captured using ArcGIS polygons attributed with specific habitat criteria that allowed for planning of further targeted survey for select species, or the exclusion of the potential for occurrence of various candidate species from the subject land.

4.2.2 Incidental flora and fauna surveys

No threatened species were recorded during incidental surveys undertaken as part of the current assessment.



Legend

- Subject land
- Development site
- Flora survey

Figure 9 Targeted species mapping

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System:
GDA 1994 MGA Zone 56



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4.2.3 Local data

No local data has been used for threatened species assessment.

4.2.4 Expert reports

Sections 5.2 and 5.3 of the BAM outlines that an expert report may be obtained instead of undertaking a species survey for a project, where the expert report is prepared by a person who, in the opinion of the Environment Agency Head, possesses specialised knowledge based on training, study or experience to provide an expert opinion in relation to the biodiversity values to which an expert report relates (DPIE 2020a).

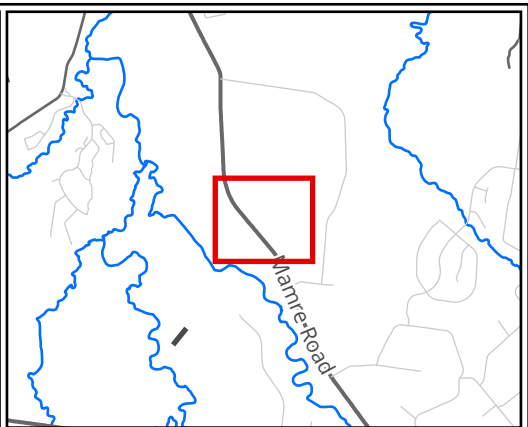
No species experts were utilised.

4.2.5 Threatened species summary and polygons

Table 12 provides details of threatened species impacted by the project and outlines the attributes that comprise the threatened species polygons. The presence of threatened species impacted by the project is illustrated on Figure 10.

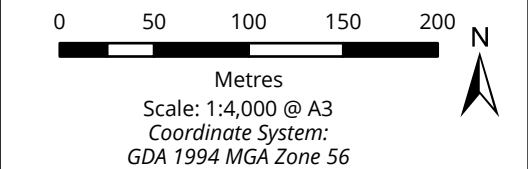
Table 12 Threatened species polygons within the development footprint and impact assessment area

Threatened species	Impact (ha)	Unit of measure	Biodiversity risk weighting	Polygon attributes
Fauna				
Southern Myotis <i>Myotis macropus</i>	0.16 ha	Area	2	PCT 835 and PCT 849 within 200 m of waterbodies, with 3 m or wider stretches, suitable for species' foraging activities (DPIE 2021b).



- Legend**
- Subject land
 - Development site
 - Development footprint
 - Southern Myotis habitat

Figure 10 Threatened species polygons



Stage 2 – Impact assessment (biodiversity values)

5 Avoid and minimise impacts

This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with BAM, including an analysis of alternatives:

- Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.
- Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.
- Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location.
- Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.
- Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.
- Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal.

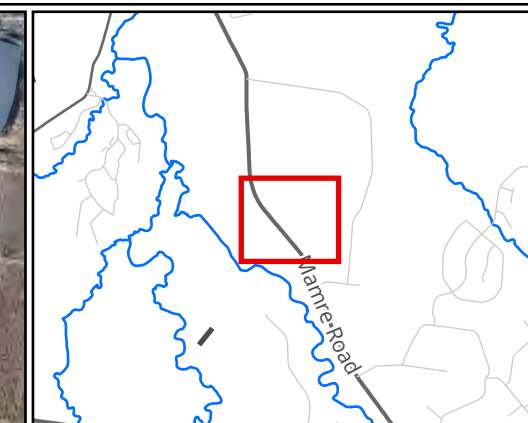
5.1 Actions to avoid/minimise project impacts

The principal means to reduce impacts on biodiversity values within the development site is to avoid and/or minimise the removal of native vegetation and fauna habitat.

Figure 11 shows the final development footprint, while Figure 12 shows alternative footprints considered to avoid or minimise impacts on biodiversity values, the final proposal footprint (including construction and operation) as well as demonstrating indirect impact zones where applicable is shown in Figure 13.

While impacts to vegetation were originally to be avoided by a regular access road to the site, the requirement to widen Mamre Road, and the subsequent location has been set by the precinct DCP. The road widening upgrades are required to achieve compliance with the Australian standards, therefore changes to the design are not permitted. The road widening is a project that is earmarked for upgrade by the NSW Government, and therefore the native vegetation will be removed as part of the NSW Government's infrastructure upgrades of Mamre Road. The clearance of the vegetation will be brought forward through the current proposal.

Opportunities to avoid impacts are limited due to the small, isolated and nature of the biodiversity values present within the subject land, and their occurrence along the Mamre Road reserve. Impacts will be minimised through standard construction and environmental management mitigation measures (such as pre-clearance inspections and hollow-bearing tree clearance supervision).



Legend

- Subject land
- Development site
- Development footprint
- Hollow-bearing tree

TECs - BC Act

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Vegetation zones

- 835_Low
- 849_Low

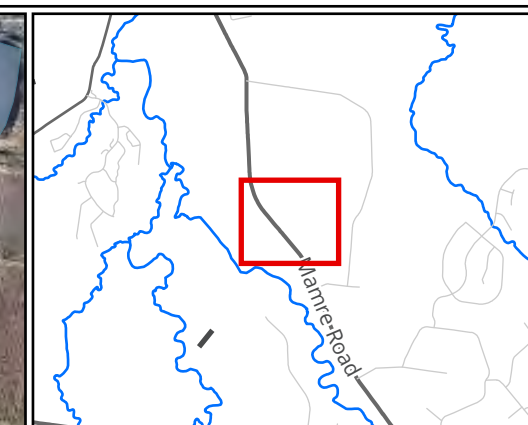
Figure 11 Final development footprint



Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



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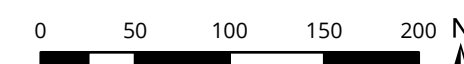


Legend

TECs - BC Act

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Figure 12 Alternate options and avoidance



Metres
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Coordinate System:
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6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020a). The following direct and indirect impacts are unable to be avoided in progressing the proposed development.

6.1 Direct impacts

Direct impacts include vegetation clearing calculated from the area of proposed lot boundaries, roads and easements for service infrastructure.

Direct impacts arising from the project include:

- Removal of 0.16 ha of native vegetation comprising 0.12 ha of low condition PCT 835, and 0.04 ha of low condition PCT 849.
- Removal of 0.16 ha of Southern Myotis habitat.

These impacts will be permanent and will occur from the outset of the development. Mitigation measures outlined in Section 5.1 above will help to minimise the potential impacts to biodiversity values that remain present within the subject land.

A summary of PCTs/zones directly impacted is demonstrated in Table 13.

Table 13 Summary of direct impacts to vegetation

Zone	PCT	TEC	Area within subject land (ha)	Area impacted (ha)	VI Score
-	Urban Native/Exotic	-	16.20	16.69	2.8
835_Low	835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act)	0.27	0.12	24.4
849_Low	849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act)	0.13	0.04	31.0

Table 14 Summary of direct impacts species credit habitat or individuals

Species	Sensitivity	Area (ha)
Southern Myotis	High Sensitivity to Potential Gain	0.16

6.1.1 Loss of hollow bearing trees

One hollow-bearing tree containing one large (150-400 mm diameter) trunk hollow will be removed as part of the development. This tree has the potential to provide roosting and/or nesting habitat for Southern Myotis, but it does not provide roosting habitat for Gang-gang Cockatoo, Barking Owl, Powerful Owl, or Masked Owl. The tree is present in the narrow and highly degraded patch of PCT 835 present along Mamre Road. This vegetation patch is subject to significant edge effects and ongoing disturbance from the heavy traffic volumes (including heavy vehicles) using Mamre Road on a daily basis.

6.2 Indirect impacts

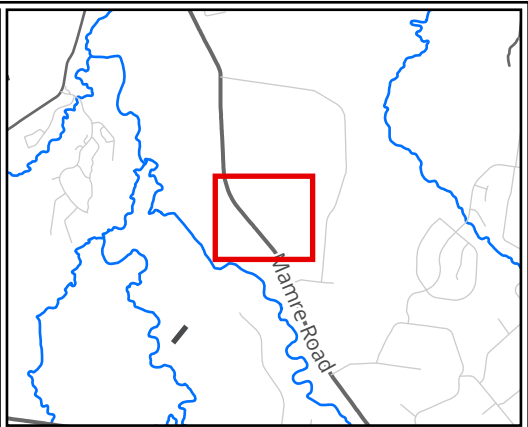
Potential indirect impacts arising from the project are outlined and addressed in Table 15 and shown in Figure 14.

Table 15 Avoidance and minimisation of impact

Indirect impact	Assessment / likelihood of occurrence
Inadvertent impacts on adjacent habitat or vegetation.	Impacts to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of a Construction Environmental Management Plan (CEMP) detailing best practice environmental protection measures, strict water quality practices and stormwater controls, and by ensuring any lighting is directed towards the developed area, rather than towards the adjacent retained habitats.
Reduced viability of adjacent habitat due to edge effects.	Adjacent habitats are currently subject to a high degree of edge effects due to prior clearing and surrounding existing residential and agricultural land use. Since 0.16 ha of isolated patches of vegetation, is to be removed from the subject land, an increase to edge effects is not expected to occur to the remnant vegetation surrounding the subject land, as a result of the proposed development.
Reduced viability of adjacent habitat due to noise, dust or light spill.	It is predicted that the adjacent habitat will be impacted in a small way by noise, dust and light spill, during construction and operation of the future development of the subject land. However, this will be managed via best practices outlined in a CEMP. The development is to be a warehouse and logistics hub serviced by heavy, medium and light vehicular traffic. Currently, the site is rural. The proposal may therefore result in a change to the functioning of the development site and the amount or type of vehicular traffic, noise and light pollution. Indirect impacts from lighting may affect foraging of threatened microbats, but impacts are not considered significant as it is highly unlikely that species abundance will be diminished.
Transport of weeds and pathogens from the site to adjacent vegetation.	Weeds occurring within the subject land are common with those occurring within adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur, but will be managed by biosecurity measures outlined in the CEMP.

Indirect impact	Assessment / likelihood of occurrence
Increased risk of starvation, exposure and loss of shade or shelter.	The habitat present in the subject land is considered marginal for most fauna species given the disturbed condition, however is potential habitat for Southern Myotis. The proposed future development will not result in an increased risk of starvation, exposure and loss of shade or shelter to native species due to the small total area of vegetation being removed, and the very small proportion of commensurate habitats available in the immediate vicinity.
Loss of breeding habitats.	No specialist breeding habitat will be impacted by the proposed future development. Retained vegetation in adjacent riparian corridors to the west of the subject land provides higher quality habitat and will not be reduced by the proposed works.
Trampling of threatened flora species.	No threatened flora species were found, or are considered likely to occur, within the subject land, and thus trampling of threatened flora species is unlikely.
Inhibition of nitrogen fixation and increased soil salinity.	Any future excavations or soil disturbance resulting from the future development of the subject land would be largely restricted to areas having undergone significant previous disturbance through agriculture and vehicular traffic. As such it is not considered likely that the future development of the subject land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
Fertiliser drift.	The site has a long history of agriculture over its total extent. The proposal will cease these activities and not contribute to fertiliser drift into surrounding areas with future practices. No fertiliser is proposed to be used.
Rubbish dumping.	Standard environmental controls for the development would ensure potential impacts are minimised. Works would follow an approved Waste Management Plan.
Wood collection.	Future development proposed within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future industrial use of the subject land, future landholders are not expected to be likely to undertake wood collection within the retained vegetation to a level that it will have a detrimental effect. Unauthorised access and collection of wood is expected to be minimal.
Removal and disturbance of rocks, including bush rock.	The subject land does not support bush rock.
Increase in predators.	The subject land is already largely cleared and heavily fragmented. The remaining vegetation clearance proposed by the development, and proposed land use, is unlikely to increase predatory species populations.

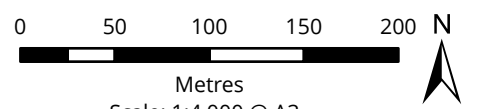
Indirect impact	Assessment / likelihood of occurrence
Increase in pest animal populations.	The subject land occurs in a semi-residential area with impacts including introduced domestic pets such as Cats <i>Felis catus</i> currently occurring within the locality. Pest animals such as Rats <i>Rattus rattus</i> and European Rabbit <i>Oryctolagus cuniculus</i> are also widely spread within the Penrith region and are likely to occur across the locality. The proposal will not result in an increase in available habitat for these species and is unlikely to lead to an increase in pest animal populations. Suitable waste disposal implemented during and post construction will further reduce the resources available for pest species.
Changed fire regimes.	The subject land is largely cleared of vegetation. Appropriate asset protection zones and fire mitigation systems will be implemented for the future development and the proposal will not result in an increased risk of fire.
Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds.	The proposal will impact 0.16 ha of heavily fragmented foraging habitat for Southern Myotis. The proposal is unlikely to constitute significant disturbance, as there are higher quality patches of foraging habitat in the locality.
Fragmentation of movement corridors.	Movement corridors are currently restricted in width and availability through the locality. The project will result in the removal of 0.16 ha of native vegetation that fringes the subject land to the south-west. The removal of vegetation along the Mamre Road reserve (south of the subject land) is already heavily fragmented and is unlikely to further fragment movement corridors from the north-west and south-east. Remnant vegetation exists to the west of Mamre Road which will remain intact and not be fragmented.



Legend

- Subject land
- Development site
- Development footprint
- Prescribed impacts

Figure 13 Prescribed impacts



Scale: 1:4,000 @ A3
Coordinate System:
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6.3 Prescribed impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 16 below and shown in Figure 13.

Table 16 Assessment of prescribed impacts

Prescribed impact	Assessment / likelihood of occurrence
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No areas of geological significance occur within the locality. The development will not impact on threatened species or ecological communities associated with karst, caves, crevices or cliffs.
Occurrences of human-made structures and non-native vegetation	Several human-made structures will be impacted by the development, however no threatened species or communities associated with human-made structures will be impacted by the development.
Corridors or other areas of connectivity linking habitat for threatened entities	As the subject land is already largely cleared, the removal of 0.16 ha of native vegetation is expected to have little impact on the connectivity of threatened species habitat as Southern Myotis are likely use the subject land for foraging only. The subject land is highly fragmented and does not provide suitable connectivity for threatened species. There is higher quality vegetation within the locality, located south-west of the subject land near Kemps Creek, which provides further connectivity to vegetation through riparian corridors.
Water bodies or any hydrological processes that sustain threatened entities	Five dams (three to be impacted and two that will not be impacted) and three creek tributaries occur within the subject land. The dams provide foraging habitat for threatened species, including Southern Myotis. Removal of the three dams within the development footprint are not considered likely to have a significant or substantial impact on threatened species. The features appear to be of low foraging quality for fauna as they are highly modified due to the construction of dams, and are heavily degraded due to surrounding agricultural use of the landscape. Several larger creeks, rivers and dams occur within the locality, providing higher quality foraging habitat. The proposed works are not expected to further impact hydrological process within the subject land. The dams within the development footprint will be decommissioned and backfilled as part of the project and Biosis recommend that a dam dewatering is implemented, whereby all rescued fauna are relocated to adjacent dams and/or waterways. A suitable location within the Hawkesbury River catchment area is to be investigated prior to the dam dewatering process.
Protected animals that may use the proposed wind farm development site as a flyway or migration route	There are no wind turbines involved in this project.

Prescribed impact	Assessment / likelihood of occurrence
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Current residential and agricultural use of the subject land means that vehicles in the area are common and would not be increased by the development of the subject land.

6.4 Impacts considered uncertain

There are no impacts considered uncertain for the current assessment.

6.5 Impacts to Groundwater Dependent Ecosystems (GDE)

Assessment of the potential for the subject land to support groundwater dependant ecosystems (GDEs) was undertaken using the Australian Government's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM 2019). The subject land is not mapped as supporting GDEs associated with an aquifer in Appendix 8 of the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (DPI 2012). The subject land is not mapped as having Groundwater Vulnerability (LEP 2014).

6.6 Aquatic habitat impacts relating Fisheries Management Act matters

There are no aquatic habitat impacts relating to the *Fisheries Management Act 1994*.

6.7 Impacts to Matters of National Environmental Significance (MNES)

An assessment of the impacts of the proposed development on Matters of National Environmental Significance (MNES), against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the proposed development to the Commonwealth Minister for the Environment is required. MNES relevant to the proposed development are summarised in Table 17.

Table 17 Assessment of the proposed development against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	No threatened species listed under the EPBC Act are predicted to occur within the subject land.	No potential for impact.
Threatened ecological communities	There are two TECs within the subject land, however they do not meet the condition criteria for listing under the EPBC Act.	No potential for impact.
Migratory species	Migratory species are unlikely to occur within the subject land given in location in the landscape.	No direct impact is expected to any migratory listed species.
National Heritage Places	There are no National Heritage Places within the subject land.	No potential for impact.
Wetlands of international importance (Ramsar sites)	The closest Important Wetland to the subject land is Towra Point Nature Reserve, which is situated approximately 38 km east of the subject land.	No potential for impact.

7 Mitigation and management of impacts

Identification of measures to mitigate or manage impacts has been undertaken in accordance with the BAM (DPIE 2020a), including considerations such as:

- Techniques, timing, frequency and responsibility.
- Identification of measures for which there is risk of failure.
- Evaluation of the risk and consequence of any residual impacts.
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna.
- Indirect impacts on native vegetation and habitat.
- Mitigating prescribed biodiversity impacts.
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

Table 18 Measures to mitigate and manage impacts

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
<i>Displacement of resident fauna</i>	All vegetation is to be inspected immediately prior to removal, by a qualified ecologist, to confirm absence of resident fauna.	No direct impact to resident fauna during vegetation removal.	Immediately prior to vegetation removal.	Qualified ecologist and construction contractor.
<i>Indirect impacts on native vegetation and habitat</i>	Install appropriate stormwater and erosion controls on site to avoid impacts to nearby waterways via stormwater collection systems.	No further degradation to retained vegetation and habitats.	Ongoing/throughout earthworks.	Construction contractor.
	Impacts resulting from the proposed external lighting installation is recommended, and can be adapted from Part 4 (good lighting design principles) of the Dark Sky Planning Guideline (DPE 2016), including:	No indirect impact to fauna in retained vegetation and habitats.	Ongoing	Construction contractor.

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	- Installing light fitting shields with an opaque cover, mounted horizontally across the top of the lighting module. These shielding attachments allow only the downward projection of light. - Direct lights downwards and avoid shining directly onto the public amenities, which have the potential to reflect light skywards. - Utilise low beam angles that are close to vertical where possible to minimise light glare.			
<i>Mitigating prescribed biodiversity impacts</i>	Dam dewatering is to be undertaken to ensure that any fauna within the dams is salvaged and relocated (an ecologist would only be required on site when dam water levels are below 1/3 capacity).	No direct impact to resident fauna during dam dewatering.	Immediately prior to dam dewatering.	Qualified ecologist and construction contractor.
<i>Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain</i>	Implementation of an appropriate CEMP during works.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.

7.1 Adaptive management strategy

Construction and operational management plans will all contain an adaptive management component. Adaptive management strategies will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which will trigger adaptive management actions and allow for effective and quick responses.

8 Impact summary

8.1 TECs and threatened species

This section outlines the impact summary for the project which has identified and assessed impacts on threatened species that are at risk of a SAIL including:

- Addressing all criteria for each TEC listed as at risk of an SAIL present on the subject land.
- Addressing all criteria for each threatened species at risk of an SAIL present on the subject land.
- Documenting assumptions made and/or limitations to information.
- Documenting all sources of data, information, references used or consulted.
- Clearly justifying why any criteria could not be addressed.
- Identification of impacts requiring offset.
- Identification of impacts not requiring offset.
- Identification of areas not requiring offset.

Figure 15 shows the extent of TECs at risk of an SAIL within the subject land.

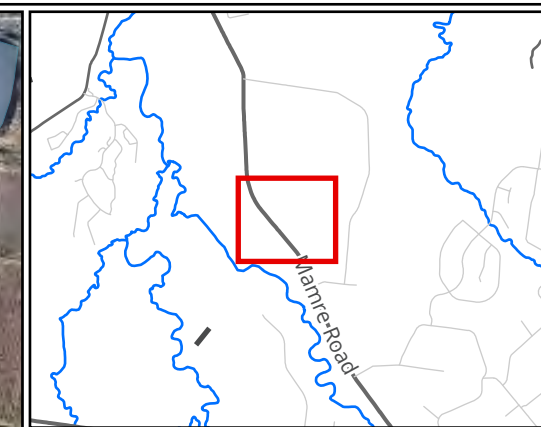
Figure 16 shows the location of impacts requiring offset, impacts not requiring offset and areas not requiring assessment.

8.2 Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation 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:

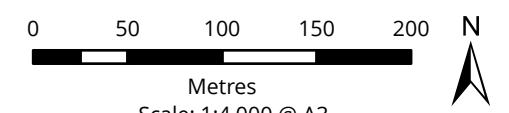
- a) Principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.*
- b) Principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.*
- c) Principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.*
- d) Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.*

One vegetation community considered to meet the above principles and may be impacted by the development is Cumberland Plain Woodland (BC Act). A detailed SAIL assessment is provided in Appendix 5.



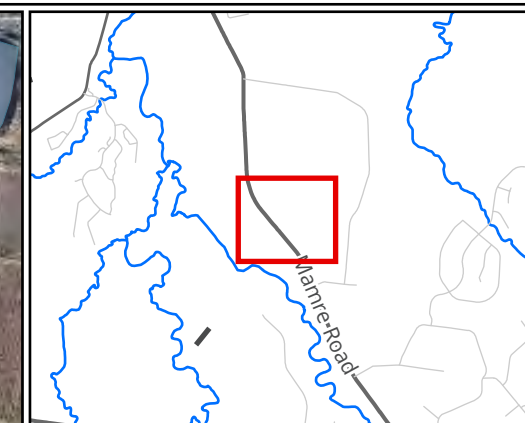
- Legend**
- Subject land
 - Development site
 - Development footprint
 - Indirect impacts

Figure 14 Estimated zones of indirect impact for the proposal



Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56
biosis

Matter: 35483,
Date: 16 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.mxd



Legend

- Subject land
- Development site
- Development footprint
- SAIL Entities

Figure 15 Serious and irreversible impacts

0 50 100 150 200

Metres

Scale: 1:4,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 35483,
Date: 16 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.mxd

8.3 Identification of impacts requiring offset

8.3.1 Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- a) ≥ 15 , where the PCT is representative of an EEC or a CEEC.
- b) ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- c) ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.

On this basis, offsets are required for vegetation zone 835_Low and 849_Low as they have a vegetation integrity score greater than 17.

The offset requirement for the proposal was calculated using the BAM Calculator. Table 19 provides a summary of the ecosystem credit offsets required for impacts from proposed development at the subject land.

Table 19 Offsets required (ecosystem credits)

Vegetation zone	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement
835_Low	0.12	Clearance	24.4	Yes	Yes	Yes	1
849_Low	0.04	Clearance	31.0	Yes	Yes	No	1
Total	0.16	-	-	-	-	-	2

8.3.2 Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM an offset is also required for the impacts of the proposals on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥ 17 .

The offset requirement for the proposal was calculated using the BAM Calculator. Table 20 provides a summary of the species credit offsets required for impacts from proposed development at the subject land.

Table 20 Offsets required (species credits)

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)	Biodiversity risk weighting	Credit requirement
PCT 835_Low	Southern Myotis	24.4	0.12	2	1
PCT 849_Low	Southern Myotis	31.0	0.04	2	1
Total	-	-	0.16	2	2

Species polygons for the above one species credit species impacted by the project are illustrated in Figure 16 below.

8.4 Identification of impacts not requiring offset

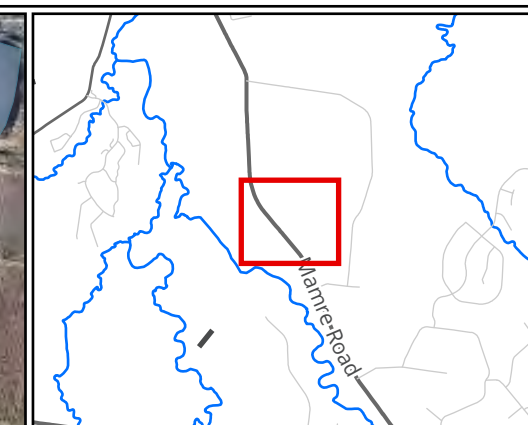
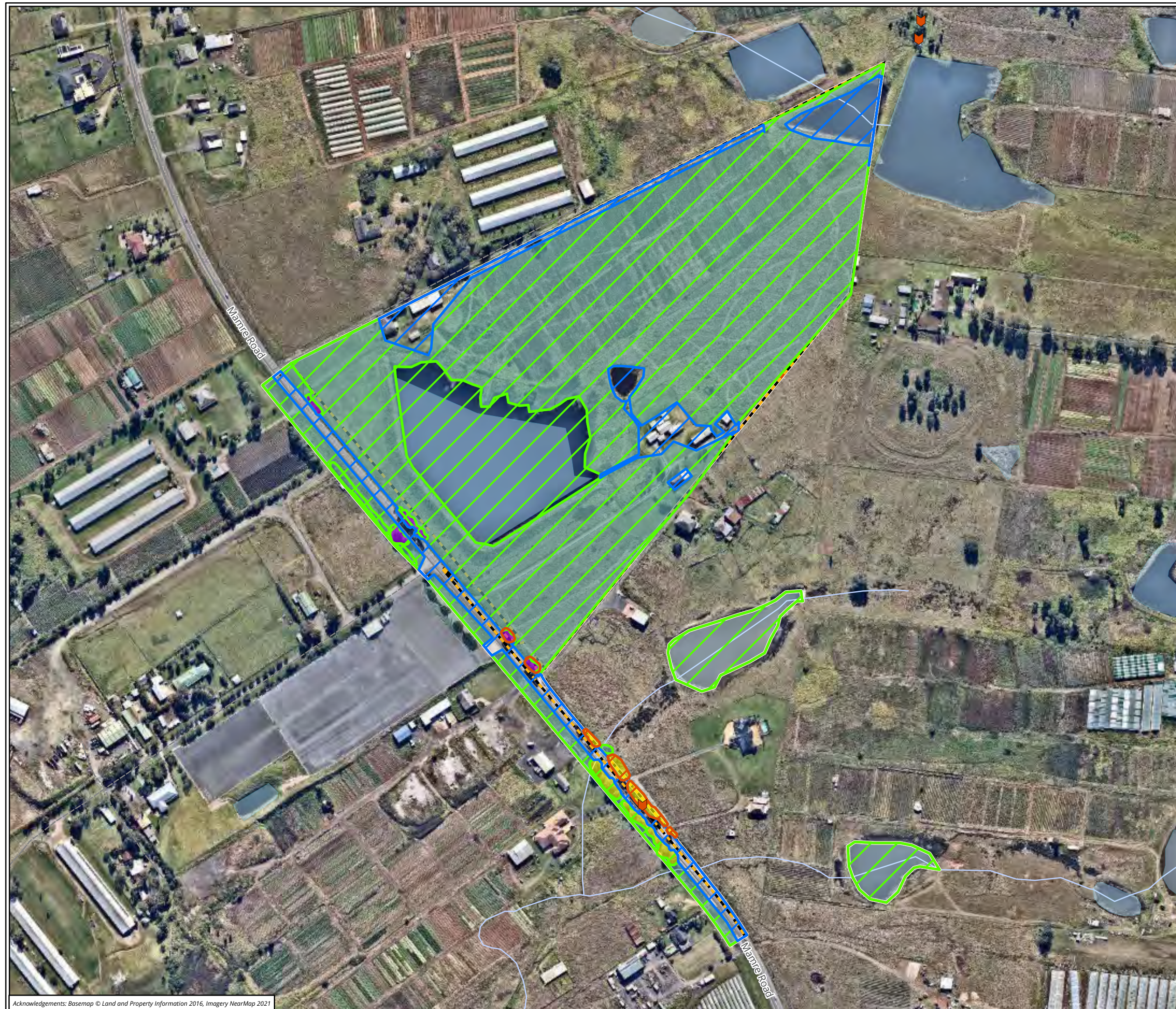
Following assessment the following impacts do not require offsetting in accordance with BAM:

- Removal of 16.20 hectares of Urban Native/Exotic vegetation.

8.5 Identification of areas not requiring assessment

Following assessment the following areas do not require assessment in accordance with BAM:

- Removal of 1.20 hectares of cleared land.



Legend

- Subject land
- Development site
- Development footprint
- Hollow-bearing tree

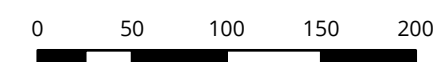
Offset requirements

- Impacts requiring offset
- Impacts not requiring offset
- Areas not requiring assessment

Plant Community Type

- Urban Native/Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

Figure 16 Impacts requiring offset, not requiring offset, not requiring assessment



Metres
Scale: 1:4,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 35483,
Date: 19 July 2021,
Drawn by: AM, Checked by: CBH, Last edited by: amackegard
Location: P:\35400s\35483\Mapping\35483_MamreRd_BDAR.mxd

9 Biodiversity credit report

Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to one vegetation zone at the subject land. A biodiversity credit report is provided on the following pages.

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026481/BAAS17067/21/00026482	Mamre Road Kemps Creek	10/06/2021
Assessor Name	Report Created	BAM Data version *
Rebecca Elizabeth Dwyer	19/07/2021	45
Assessor Number	BAM Case Status	Date Finalised
BAAS17067	Open	To be finalised
Assessment Revision	Assessment Type	
1	Major Projects	

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAI	Ecosystem credits

BAM Credit Summary Report

Cumberland riverflat forest											
1	835_Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	24.4	24.4	0.12	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00		1
									Subtotal		1
Cumberland shale plains woodland											
2	849_Low	Cumberland Plain Woodland in the Sydney Basin Bioregion	31	31.0	0.04	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	1
3	849_Exotic	Cumberland Plain Woodland in the Sydney Basin Bioregion	2.8	2.8	16.2	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	0
									Subtotal		1
									Total		2

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Species credits
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BAM Credit Summary Report

<i>Myotis macropus / Southern Myotis (Fauna)</i>								
835_Low	24.4	24.4	0.12	Vulnerable	Not Listed	2	False	1
849_Low	31.0	31.0	0.04	Vulnerable	Not Listed	2	False	1
							Subtotal	2

References

- Bannerman SM & Hazelton PA 1990. *Soil Landscapes of the Penrith 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney NSW.
- Biosis 2019. *Biodiversity Constraints Assessment for 884-904 Mamre Road, Kemps Creek*, Report for Altis Property Partners. Authors: Watts. L. Biosis Pty Ltd, Sydney, NSW. Project no. 30860.
- BOM 2019. *GDE Atlas Home: Water Information: Bureau of Meteorology, Bureau of Meteorology: Climate Data Online*, accessed 9 July 2019, <http://www.bom.gov.au/water/groundwater/gde/>.
- Churchill S 2008. *Australian Bats*, 2nd edn, Allen & Unwin, Sydney, NSW.
- Cropper S 1993. *Management of Endangered Plants*, CSIRO Publications Victoria, Melbourne, Victoria.
- DECCW 2010. *Cumberland Plain vegetation mapping project*, accessed 25 September 2019, <http://www.environment.nsw.gov.au/surveys/GetHoldOfMapsDataAndReports.htm>.
- DoE 2013. Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999, accessed 19 May 2019, Australian Government Department of the Environment. Canberra, Australian Capital Territory.
- DoIW 2004. *Directory of Important Wetlands of Australia*, Department of the Environment and Energy.
- DPE 2016. *The Dark Sky Planning Guideline*, New South Wales Department of Planning and Environment.
- DPI 2012. *Risk assessment guidelines for groundwater dependent ecosystems*, New South Wales Government Department of Primary Industries.
- DPI 2013. *Policy and Guidelines for Fish Habitat Conservation and Management*, NSW Department of Primary Industries.
- DPIE 2013. *Remnant vegetation of the western Cumberland subregion*, 2013 Update. VIS_ID 4207.
- DPIE 2016. *The Native Vegetation of the Sydney Metropolitan Area - Version 3.1*, Office of Environment and Heritage, NSW.
- DPIE 2019. *Giant Burrowing Frog - profile*, New South Wales Government Department of Planning, Industry and Environment, <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10398>.
- DPIE 2020a. *Biodiversity Assessment Method (BAM)*, Department of Planning, Industry & Environment, <https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-2020>.
- DPIE 2020b. *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method*, State of NSW and Department of Planning, Industry and Environment, NSW, accessed 11 June 2020, <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf>.

- DPIE 2021a. *NSW BioNet Vegetation Classification database, BioNet*, <https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx>.
- DPIE 2021b. *NSW BioNet Threatened Biodiversity Profile Data Collection*, <https://data.nsw.gov.au/data/dataset/9125a0e2-a575-40d4-83b0-45d985420d0e>.
- DPIE 2021c. *BAM - Important Areas mapping portal*, https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas.
- EES 2021. *BioNet the website for the Atlas of NSW Wildlife*, <http://www.bionet.nsw.gov.au/>.
- Harden GJ 1992. *Flora of New South Wales*, NSW University Press, Kensington, NSW.
- Harden GJ 1993. *Flora of New South Wales*, NSW University Press, Kensington, NSW.
- Harden GJ 2000. *Flora of New South Wales*, Revised Edition, NSW University Press, Kensington, NSW.
- Harden GJ 2002. *Flora of New South Wales*, Revised Edition, NSW University Press, Kensington.
- Mitchell P 2002. *NSW ecosystems study: background and methodology*, NSW National Parks and Wildlife Service, Hurstville.
- NRAR 2018. *Guidelines for Controlled Activities on Waterfront Land—Riparian Corridors*, NSW Department of Industry, accessed 2 December 2019, https://www.industry.nsw.gov.au/_data/assets/pdf_file/0004/156865/NRAR-Guidelines-for-controlled-activities-on-waterfront-land-Riparian-corridors.pdf.
- OEH 2011. Southeast NSW Native Vegetation Classification and Mapping - SCIVI. VIS_ID 2230.
- OEH 2017. *Biodiversity Assessment Method (BAM)*, New South Wales Office of Environment and Heritage, <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-170206.pdf>.
- Penman T, Mahony M, & F Lemckert 2004. 'Two hundred and ten years looking for the Giant Burrowing Frog', *Australian Zoologist*, 32, 4.
- Strahler A 1964. 'Quantitative geomorphology of drainage basins and channel networks' in Chow V (ed.), *Handbook of Applied Hydrology*, McGraw-Hill, New York.
- Threatened Species Scientific Committee 2016. Approved Conservation Advice (incorporating listing advice) for the Illawarra and south coast lowland forest and woodland ecological community.
- Tozer M, Turner K, Keith D, Tindall D, Pennay C, Simpson C, MacKenzie B, & Beukers P 2010. 'Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands', *Cunninghamia*, 11: 359–406.

Appendices

Appendix 1 Survey methods

Appendix 1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1992, Harden 1993, Harden 2002). All doubtful species names were verified with the on-line Australian Plant Name Index (Australian National Botanic Gardens 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Appendix 3.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the DEE (Commonwealth of Australia 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

Appendix 1.2 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by EES (SL100758, expiry date 31 March 2022). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Rebecca Dwyer (#BAAS17067).

Appendix 1.3 Limitations

Field surveys were undertaken in accordance with the BAM. Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The field survey was conducted in winter during sunny and mild weather, which is not a suitable time to determine the presence of most threatened flora species. However, there are no candidate flora species credit species that were considered in the current assessment due to the high level of disturbance to vegetation, therefore no further flora surveys are required. There was only one candidate fauna species credit species, which has been assumed present as the current assessment was prepared outside of the survey period and no targeted survey was undertaken.

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein in regards to this and all other species' likelihood of occurrence within the subject land.

Database searches, and associated conclusions on the likelihood of species to occur within the assessment area, are reliant upon external data sources and information managed by third parties.

Appendix 2 BAM Candidate species assessment

Table A. 1 Threatened flora species assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
<i>Acacia bynoeana</i> Bynoe's Wattle	VU	EN	Yes	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.
<i>Acacia pubescens</i> Downy Wattle	VU	VU	Yes	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain	Low	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly disturbed. Field investigation was undertaken during the required survey period and the species was not detected.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Woodland, usually within roadside and bushland remnants. Grows on shale, sandstone, alluvium and gravelly soils, often including ironstone.					
<i>Allocasuarina glareicola</i>	EN	EN	No	Small, depauperate shrub restricted to a few populations in the Richmond district with an outlier population at Voyager Point in Liverpool. Grows in Castlereagh Woodlands, Cumberland Dry Sclerophyll Forest, Sydney Hinterland Dry Sclerophyll Forest, Sydney Sand Flats Dry Sclerophyll Forests. Grows in lateritic soil.	Negligible	No	No	No	Existing vegetation is degraded and subject to disturbance. The PCTs in the subject land do not align with associated PCTs for the species. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.
<i>Caladenia tessellata</i> Thick Lip Spider Orchid	VU	EN	Yes	Small orchid recorded from the Wyong, Ulladulla and Braidwood regions with the Kiama and Queanbeyan populations believed to be extinct. Found in a wide variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Woodlands and	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly disturbed. There have been no sightings within 5 km of the study area.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Subalpine Woodlands. Grows on clay loam or sandy soils.					
<i>Callistemon linearifolius</i> Netted Bottle Brush	-	VU	Yes	Shrub recorded from the Georges River to the Hawkesbury River, north of the Nelson Bay area and south at Coalcliff in the Illawarra region. Grows on the coast and adjacent ranges in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly disturbed. There have been no sightings within 5 km of the study area.
<i>Cynanchum elegans</i> White-flowered Wax Plant	EN	EN	Yes	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly disturbed. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
<i>Dillwynia tenuifolia</i> (Kemps Creek population)	-	VU	Yes	Low, spreading shrub restricted to the Cumberland Plain in Western Sydney. Grows in scrubby or heathy areas within a variety of communities including Castlereagh Ironbark Forest, Shale Gravel Transition Forest, Castlereagh Scribbly Gum Woodland and Sydney Hinterland Dry Sclerophyll Forests. Grows on tertiary alluvium, laterised clays and in shale-sandstone transitions.	Low	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed.
<i>Eucalyptus benthamii</i> Camden White Gum	VU	VU	Yes	Tall tree confined to the lower Nepean area with two major subpopulations located at Kedumba Valley in Blue Mountains National Park and at Bents Basin State Recreation Park. Grows along valley floors within riparian flood zones at elevations between 30 – 300 m in Central Gorge Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Eastern Riverine Forests and Coastal Valley	Negligible	No	No	No	No major rivers or riparian flood zones exist within this study area, habitat is highly deraded. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Grassy Woodland Grows in sandy, alluvial soils.					
<i>Genoplesium baueri</i> Bauer's Midge Orchid	EN	EN	No	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates	Negligible	No	No	No	Existing vegetation is degraded and subject to disturbance. The PCTs in the subject land do not align with associated PCTs for the species. There have been no sightings within 5 km of the study area.
<i>Grevillea juniperina</i> subsp. <i>juniperina</i> Juniper-leaved Grevillea	-	VU	Yes	Spreading to erect medium sized shrub endemic to Western Sydney with a distribution spanning from Blacktown, Erskine Park, Londonderry and Windsor and outlying populations at Kemps Creek and Pitt Town. Grows at elevations <50 m in Cumberland Plain Woodland, Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland, Shale/Gravel Transition Forest, Sydney Sand	Low	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. Field investigation was undertaken during the required survey period and the species was not detected.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy to clay loam soils and red pseudolateritic gravels derived from Wianamatta Shale and Tertiary Alluvium.					
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	VU	VU	No	Low spreading to erect shrub sporadically distributed throughout the Sydney Basin, most notably in the Picton, Appin and Bargo regions, in the Cessnock - Kurri Kurri area and isolated populations from Putty to Wyong and Lake Macquarie. Grows in Shale Sandstone Transition Forest, Kurri Sand Swamp Woodland, <i>Corymbia maculata</i> - <i>Angophora costata</i> Open Forest in the Dooralong Area, Sydney Sandstone Ridgetop Woodland at Wedderburn and Cooks River/Castlereagh Ironbark Forest at Kemps Creek. Grows in sandy or light clay soils including tertiary alluviums over thin shales and lateritic ironstone gravels.	Low	No	No	No	Existing vegetation is degraded and subject to disturbance. The PCTs in the subject land do not align with associated PCTs for the species.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
<i>Haloragis exalata</i> subsp. <i>exalata</i> Square Raspwort	VU	VU	No	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.	Negligible	No	No	No	The PCTs in the subject land do not align with associated PCTs for the species and habitat is absent from the subject land. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.
<i>Hibbertia</i> sp. Bankstown	CE	CE	Yes	Prostrate shrub with one population restricted to Bankstown Airport. Grows in a highly modified habitat with surrounding native vegetation composition reminiscent of Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland and associated with Cumberland Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, and Coastal Floodplain Wetlands. Grows in sandy tertiary alluvial soils with a high silt content.	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. There have been no sightings within 5 km of the study area.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>	EX	-	No	Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone. May be an early successional species that benefits from some disturbance. Possibly out competed when overgrown by some species such as <i>Cynodon dactylon</i> .	Low	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed.
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> (Population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas)	-	EN	Yes	Grows in vine thickets and open shale woodland. A climber with twining stems to 4 m high. Young stems with hairs, older stems and most leaves without.	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. There have been no sightings within 5 km of the study area.
<i>Persicaria elatior</i> Tall Knotweed	VU	VU	Yes	Erect herb found growing in south-eastern NSW at Mount Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in	Negligible	No	No	No	Low potential for habitat in the wetlands present onsite, vegetation is highly degraded and largely exotic. There have been no sightings within 5 km of the study area and the species was not found during the field investigation

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.					
<i>Persoonia bargoensis</i> Bargo Geebung	VU	EN	Yes	Erect, bushy shrub restricted to a small area on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands south-west of Sydney. Grows in woodland, forest and disturbed areas in transitional soils in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands and North Coast Wet Sclerophyll Forests. Grows in heavy well drained,	Negligible	No	No	No	Existing vegetation is degraded and subject to disturbance. The PCTs in the subject land do not align with associated PCTs for the species. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				loamy or gravelly soils derived from Wianamatta Shales and Hawkesbury Sandstone.					
<i>Persoonia hirsuta</i> Hairy Geebung	EN	EN	Yes	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the west. Grows at elevations between 350 - 600 m in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment Wet Sclerophyll Forests. Grows in sandy soils on sandstone substrates.	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly degraded. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.
<i>Persoonia nutans</i> Nodding Geebung	EN	EN	No	Erect or spreading shrub with a disjunct distribution restricted to the Cumberland Plain between Richmond in the north and Macquarie Fields in the south with core distribution	Low	No	No	No	Existing vegetation is degraded and subject to disturbance. The PCTs in the subject land do not align with associated PCTs for the species. Field investigation was undertaken during the required survey period

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				occurring in the Penrith and to a lesser extent, Hawkesbury regions. Grows in Cumberland Dry Sclerophyll Forests including Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River/Castlereagh Ironbark Forest and Shale-Sandstone Transition Forest as well as Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy soils derived from Aeolian or alluvial sediments as well as in tertiary alluviums to the south of its range.					and the species was not detected.
<i>Pilularia novae-hollandiae</i> Austral Pillwort	-	EN	Yes	Semi-aquatic fern with the only extant populations located at Lake Cowal and Oolambeyan National Park. Historical distribution ranged from Sydney, Khancoban, The Riverina near Albury and Urana. Grows in seasonally dry depressions, drainage lines, margins of marshes, shallow swamps and waterways in a	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. There have been no sightings within 5 km of the study area.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				variety of communities including Inland Riverine Forests, Inland Floodplain Swamps, Southern Tableland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons. Grows in mud amongst grasses and sedges.					
<i>Pimelea curviflora</i> var. <i>curviflora</i>	VU	VU	Yes	Small to medium sized shrub restricted to the coastal areas of Sydney between northern Sydney and Maroota with an outlying population at Croom Reserve near Albion Park in the Illawarra region. Grows on ridgetops and upper slopes amongst grasses and sedges in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Can be inconspicuous amongst grasses and sedges	Negligible	No	No	No	Potential habitat is absent from the subject land. There have been no sightings within 5 km of the study area.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				although easier to find in October to May when flowering. Grows on sandstone substrates in shale/lateritic soils and shale/sandstone transition soils.					
<i>Pimelea spicata</i> Spiked Rice-flower	EN	EN	Yes	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occurring in the Illawarra from Lansdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open Woodland Coastal Grasslands in the Illawarra region. Grows on well-structured clay soils.	Low	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. This site is also subject to high intensity ground disturbance. Field investigation was undertaken during the required survey period and the species was not detected.
<i>Pomaderris brunnea</i> Brown Pomaderris	VU	EN	Yes	Medium sized shrub with a distribution limited to the area around the Colo, Nepean and	Negligible	No	No	No	This species is restricted to waterways and potential habitat is degraded and highly managed.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Hawkesbury Rivers including the Bargo area and near Camden. Grows on floodplains and creeklines in a variety of communities including Sydney Hinterland Dry Sclerophyll Forests, Central Gorge Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grasslands and North Coast Wet Sclerophyll Forests. Grows in clay and alluvial soils.					There have been no sightings within 5 km of the study area.
<i>Pterostylis saxicola</i> Sydney Plains Greenhood	EN	EN	Yes	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern	Negligible	No	No	No	Potential habitat is degraded from the subject land. There have been no sightings within 5 km of the study area. **

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Tableland Wet Sclerophyll Forests. Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.					
<i>Pultenaea parviflora</i>	VU	EN	No	Small erect, branching shrub endemic to the Cumberland Plain from Windsor to Penrith east to Dean Park with outlying populations at Kemps Creek and Wilberforce. Found growing in Cumberland Dry Sclerophyll Forests including Castlereagh Ironbark Forest, Shale Gravel Transition Forest and Castlereagh Scribbly Gum Woodland, Sydney Coastal Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Southern Lowland Wet Sclerophyll Forests. Grows in soils derived from Wianamatta shale, laterite or alluvium.	Low	No	No	No	Existing vegetation is degraded and subject to disturbance. The PCTs in the subject land do not align with associated PCTs for the species.
<i>Pultenaea pedunculata</i> Matted Bush-pea	-	EN	Yes	Small prostrate, mat forming shrub restricted to three disjunct populations, in	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. There have been no

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Villawood, Prestons and north-west of Appin in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn. Found growing in a variety of habitats including intact woodland, creeklines, broad valleys, headlands, rock crevices, disturbed sites such as road batters and coastal cliffs in a variety of communities including Central Gorge Dry Sclerophyll Forests, South Coast Sands Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Temperate Montane Grasslands, Coastal Valley Grassy Woodlands and Southern Tableland Wet Sclerophyll Forests. Grows in a variety of soils including sandy clay soils, loam soils, transitional soils with ironstone nodule inclusions and soils derived from Wianamatta shale, laterite or alluvium.					sightings within 5 km of the study area.
<i>Syzygium paniculatum</i>	VU	EN	No	Small to medium sized	Negligible	No	No	No	Habitat is absent.. The PCTs in the

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
Magenta Lilly Pilly				rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.					subject land do not align with associated PCTs for the species. There have been no sightings within 5 km of the study area. Field investigation was undertaken during the required survey period and the species was not detected.
<i>Thesium australe</i> Austral Toadflax	VU	VU	Yes	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass <i>Themeda triandra</i> in a	Negligible	No	No	No	Potential habitat, restricted to the road reserve, is degraded and highly managed. There have been no sightings within 5 km of the study area.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.					
<i>Wahlenbergia multicaulis</i> (Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield)	-	EN	Yes	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. 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. Responds favourably to disturbance of soil in some situations with high exposure to sunlight. However, too much disturbance can eventually	Negligible	No	No	No	Potential habitat does not exist within the study area There have been no sightings within 5 km of the study area.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				exhaust the seedbank and lead to local extinctions.					

Table A. 2 Threatened fauna species assessment

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
<i>Anthochaera phrygia</i> Regent Honeyeater	CR	CR	Yes	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.	Negligible	No	Not required	No impact	The subject land is not included on the Important Areas map for the species (DPIE 2021c).
<i>Botaurus poiciloptilus</i> Australasian Bittern	EN	EN	No	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> spp. and <i>Eleocharis</i> spp. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a	Low	No	Not required	No impact	The habitat for this species is not present in the subject land, as it does not contain terrestrial or estuarine wetlands. While there are dams present in the subject land, observations are generally from brackish or freshwater wetlands with vegetation.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				flattened platform of reeds.					
<i>Burhinus grallarius</i> Bush Stone-curlew	-	EN	Yes	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 the south-east it is either rare or extinct throughout its former range. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.	Low	No	Not required	No impact	This species depends on vegetation with an open understorey and suitable fallen debris for cover and foraging (such as dead timber and logs). There is minimal fallen debris present in the subject land and considerable occurrence of exotic grasses. There have been no sightings within 5 km of the subject land.
<i>Calidris ferruginea</i> Curlew Sandpiper	CR	EN	No	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	Low	No	Not required	No impact	The habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. While there are dams present in the subject land, observations are generally from high quality freshwater wetlands. This species has not been observed within 5 km of the subject land. The species is

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
									not associated with the PCTs within the subject land.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	-	VU	Yes	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Transient	No	Not required	No impact	Old growth forests and woodland habitats preferred by the species are not present in the subject land. One hollow-bearing tree with a suitable sized hollow is present in the subject land, however it is a trunk hollow that is damaged and does not provide suitable habitat for the species. Presence is likely to be limited to transient foraging.
<i>Cercartetus nanus</i> Eastern Pygmy-possum	-	VU	Yes	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source.	Low	No	Not required	No impact	Habitat in the form of a hollow-bearing tree is present in the subject land, however it is degraded and unlikely to provide suitable habitat for the species. Foraging habitat in the form of banksias, and bottlebrushes are absent from the subject land. While there are some eucalypts, connectivity with the surrounding landscape is poor and

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				Soft fruits are eaten when flowers are unavailable and it also feeds on insects. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.					therefore the habitat is unlikely to provide sufficient resources.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	VU	VU	Yes	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock	Low	No	Not required	No impact	The subject land has low topographic relief and there are no rocky areas containing caves within 2 km of the subject land, therefore it is not considered to contain breeding habitat for the species. They forage in well-timbered areas containing gullies, under the forest canopy, therefore there is unlikely to be any suitable foraging habitat in the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.					
<i>Grantiella picta</i> Painted Honeyeater	VU	VU	No	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.	Negligible	No	Not required	No impact	Dry and open woodlands are present within the subject land, but there are no Mistletoe species. This species has not been observed within 5 km of the subject land.
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	-	VU	Yes	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion.	Low	No	Not required	No impact	This species nests on cliff ledges, headlands or at the top of large trees near coasts or rivers. Nests are usually in sight of large waterbodies. The breeding habitat for this species is present in the subject land as it contains mature tall open trees. There are several small dams present in the subject land, but these do not constitute sufficient breeding habitat. No nests or evidence of breeding were observed during the field investigations.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				Roosts and makes nest in trees.					
<i>Heleioporus australiacus</i> Giant Burrowing Frog	VU	VU	No	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250 m from breeding sites.	Low	No	Not required	No impact	This species is not known to occur within previously disturbed areas. It has also been reported as being potentially unwilling or unable to burrow into soil covered by grasses and crops (Penman, Mahony, & F Lemckert 2004). Whilst the species spends most of its time in heath, woodland and dry sclerophyll forest areas, these areas are typically within 300 m of breeding sites (DPIE 2019). There are some potential breeding sites located on site, however the disturbance to the area makes it unlikely habitat. This species has not been observed within 5 km of the subject land. The species is not associated with the PCTs within the subject land.
<i>Hieraaetus morphnoides</i> Little Eagle	-	VU	Yes	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless	Low	No	Not required	No impact	This species nests in tall living trees within a remnant patch of open eucalypt forest, which is present as habitat in the subject land, however no nests or evidence of breeding was observed during the field investigations.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.					
<i>Hirundapus caudacutus</i> White-throated Needle-tail	VU	-	No	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia.	Transient	No	Not required	No impact	The species has been recorded roosting in trees in forests and woodlands. The species does not breed in Australia and nearby sightings are likely vagrants. This species has not been observed within 5 km of the subject land. The species is not associated with the PCTs within the subject land.
<i>Lathamus discolor</i> Swift Parrot	CR	EN	Yes	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red	Negligible	No	Not required	No impact	The subject land is not included on the Important Areas map for the species (DPIE 2021c).

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.					
<i>Litoria aurea</i> Green and Golden Bell Frog	VU	EN	Yes	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks, although the species has also been	Low	No	Not required	No impact	Semi-permanent wet areas associated with a first order creekline are considered potential habitat for the species. There are several small dams and drainage easements in the subject land. This species has not been observed within 5 km of the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.					
<i>Lophoictinia isura</i> Square-tailed Kite	-	VU	Yes	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> , or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in	Low	No	Not required	No impact	Breeding habitat for this species includes large eucalypts in preferred vegetation types located along or near watercourses. No nests or evidence of breeding were observed during the field investigations.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				a tree fork or on large horizontal limbs.					
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	-	EN	Yes	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.	Low	No	Not required	No impact	Habitat for this species includes Cumberland Plain Woodland, Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and River-flat Eucalypt Forest. Cumberland Plain Woodland is present in the subject land, and there are historical records within 450 m of the subject land. Woody debris and leaf litter recorded within the subject land occur in highly degraded, heavily weed infested, narrow, small and isolated patches of vegetation along the Mamre Road reserve. These vegetation patches have also been subject to historical ground disturbance during the road and culvert construction and ongoing disturbance from adjoining properties. These areas do not provide habitat for Cumberland Plain Land Snail as they do not provide suitable leaf litter or woody debris, as the vegetation is degraded and isolated.
<i>Miniopterus australis</i>	-	VU	Yes	Occurs from Northern	Negligible	No	Not required	No	The subject land does not contain

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
Little Bent-winged Bat				Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.				impact	habitat features suitable for roosting or breeding (i.e. culverts, caves, mines or tunnels).
<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat	-	VU	Yes	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They	Negligible	No	Not required	No impact	The subject land does not contain habitat features suitable for roosting or breeding (i.e. culverts, caves, mines or tunnels).

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.					
<i>Myotis macropus</i> Southern Myotis	-	VU	Yes	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.	Medium	Yes	Not undertaken	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – Low level impacts	Breeding and foraging habitat was considered to be present within the subject land due to the presence of associated vegetation (including one hollow-bearing tree) within 200 m of the dams.
<i>Ninox connivens</i> Barking Owl	-	VU	Yes	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber	Low	No	Not required	No impact	Breeding habitat in the form of hollow-bearing trees are present in the subject land, however the hollow is degraded and does not provide suitable habitat for this species. Field

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.					investigations conducted during the required survey period (May to December) yielded no observations of breeding. There have been no sightings within 5 km of the subject land.
<i>Ninox strenua</i> Powerful Owl	-	VU	Yes	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.	Low	No	Not required	No impact	The species requires living or dead trees with hollows greater than 20 cm diameter for breeding habitat. A hollow-bearing tree with suitable dimensions is present in the subject land, however the hollow is degraded and does not provide suitable habitat for this species. Field investigations conducted during the required survey period (May to August) yielded no observations of breeding. There have been no sightings within 5 km of the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
<i>Numenius madagascariensis</i> Eastern Curlew	CR	-	No	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Negligible	No	Not required	No impact	The breeding habitat for this species is not present in the subject land, as it is over 5 km from coastal waterbodies. The species is not associated with the PCTs within the subject land.
<i>Pandion cristatus</i> Eastern Osprey	-	VU	Yes	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Negligible	No	Not required	No impact	Breeding habitat for this species consists of dead trees or artificial structures that are located within 100 m of a floodplain, with a preference for coastline, therefore the habitat is absent in the subject land. No nests or evidence of breeding were found during the field investigations. This species has not been observed within 5 km of the subject land. The species is not associated with the PCTs within the subject land.
<i>Petauroides volans</i> Greater Glider	VU	-	Yes	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and	Negligible	No	Not required	No impact	Habitat in the form of a hollow-bearing tree is present in the subject land, however it is degraded and of poor quality. This species has not been observed within 5 km of the subject land. The species is not

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.					associated with the PCTs within the subject land.
<i>Petaurus norfolcensis</i> Squirrel Glider	-	VU	Yes	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	Low	No	Not required	No impact	This species prefers Blackbutt-Bloodwood forest with a heath understorey and an Acacia midstorey, which is absent from the subject land. The species requires hollow-abundant vegetation for refuge or breeding sites. While one hollow is present, it is unlikely that there is sufficient abundance for the species, and the hollow is degraded. There have been no sightings within 5 km of the subject land.
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	VU	EN	No	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with	Negligible	No	Not required	No impact	Natural rocky escarpments, outcrops and cliffs, which are key habitat areas for this species, are absent from the subject land. This species has not been observed within 5 km of the subject land. The species is not associated with the

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.					PCTs within the subject land.
<i>Phascolarctos cinereus</i> Koala	VU	VU	Yes	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with varying home ranges.	Negligible	No	Not required	No impact	Native vegetation containing koala food trees are of poor quality, being heavily degraded by past disturbance and clearance. It is unlikely that the subject land is used by individuals for foraging habitat due to the poor-quality of the vegetation. There have been no sightings within 5 km of the subject land.
<i>Pommerhelix duralensis</i> Dural Land Snail	EN	EN	Yes	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-	Negligible	No	Not required	No impact	Habitat for this species includes forested habitats with native ground cover and woody debris, which exists within the subject land, however it is heavily degraded and subjected to disturbance, with little connectivity to surrounding patches of vegetation. There have been no sightings within 5 km of the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				derived soils, with forested habitats that have good native cover and woody debris. 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.					
<i>Pseudomys novaehollandiae</i> New Holland Mouse	VU	-	No	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals.	Negligible	No	Not required	No impact	Suitable habitat in the form of heathland understorey and vegetated sand dunes is absent from the subject land. This species has not been observed within 5 km of the subject land. The species is not associated with the PCTs within the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.					
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	VU	VU	Yes	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	Negligible	No	Not required	No impact	No camps (communal breeding/roosting sites) were identified within the subject land during the field investigations.
<i>Rostratula australis</i> Australian Painted Snipe	EN	EN	No	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and	Low	No	Not required	No impact	The habitat for this species is not present in the subject land, as it does not contain shallow inland

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC/FM							
				waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.					wetlands. While there are dams present in the subject land, observations are generally from freshwater wetlands. The species is not associated with the PCTs within the subject land.
<i>Synemon plana</i> Golden Sun Moth	CR	EN	No	The Golden Sun Moth is found in the area between Queanbeyan, Gunning, Young and Tumut. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands, with ground layer dominated by wallaby grasses of the genus <i>Austrodanthonia</i> .	Negligible	No	Not required	No impact	There is no habitat critical to the species within the subject land. This species has not been observed within 5 km of the subject land. The species is not associated with the PCTs within the subject land.
<i>Tyto novaehollandiae</i> Masked Owl	-	VU	Yes	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	Low	No	Not required	No impact	This species breeds in moist eucalypt forests and woodlands, and the species relies on medium sized hollows with close proximity to open habitat. While there is habitat present in the subject land in the form of hollow-bearing trees, the hollow is a trunk hollow that is significantly degraded and does not provide suitable habitat for this species.

Appendix 3 Flora

Appendix 3.1 BAM plot field data

Table A. 3 Flora species recorded in the subject land from BAM plots

Family	Scientific name	Common name	35483_01				35483_02				35483_03				35483_04			
			N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*
Alliaceae	<i>Allium</i> spp.	-	E	1	10	G	-	-	-	-	-	-	-	-	-	-	-	-
Myrtaceae	<i>Angophora subvelutina</i>	Broad-leaved Apple					-	-	-	-	-	-	-	-	N	80	50	C
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	-	-	-	-	E	0.1	1	G	E	0.1	5	M	E	0.2	20	G
Poaceae	<i>Avena fatua</i>	Wild Oats	-	-	-	-	-	-	-	-	-	-	-	-		2	20	G
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	-	-	-	-	-	-	-	-	E	2	20	G	E	0.2	10	G
Brassicaceae	<i>Brassica fruticulosa</i>	Twiggy Turnip	E	40	500	G	-	-	-	-	-	-	-	-	E	0.2	10	G
Brassicaceae	<i>Brassica</i> spp.	Brassica	E	30	200	G	-	-	-	-	-	-	-	-	-	-	-	-
Poaceae	<i>Bromus catharticus</i>	Praire Grass	-	-	-	-	-	-	-	-	E	0.5	20	G	-	-	-	-
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn	-	-	-	-	-	-	-	-	N	0.5	5	M	-	-	-	-
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	-	-	-	-	-	-	-	-	E	40	100	G	-	-	-	-
Caryophyllaceae	<i>Cerastium vulgare</i>	Mouse-ear Chickweed	E	1	10	G	-	-	-	-	-	-	-	-	-	-	-	-
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	HTE	1	10	G	-	-	-	-	HTE	5	50	G	HTE	10	100	G

Family	Scientific name	Common name	35483_01				35483_02				35483_03				35483_04			
			N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*
Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel	-	-	-	-	-	-	-	-	E	10	5	M	-	-	-	-
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	E	1	10	G	E	0.1	2	G	E	0.1	5	G	-	-	-	-
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	E	1	10	G	-	-	-	-	-	-	-	-	-	-	-	-
Poaceae	<i>Cynodon dactylon</i>	Common Couch	-	-	-	-	N	30	500	G	N	10	100	G	N	5	50	G
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	-	-	-	-	-	-	-	-	HTE	0.1	5	G	-	-	-	-
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	-	-	-	-	-	-	-	-	-	-	-	-	N	0.5	50	G
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	-	-	-	-	-	-	-	-	-	-	-	-	HTE	30	200	G
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed	-	-	-	-	-	-	-	-	N	0.1	10	G	-	-	-	-
Cyperaceae	<i>Eleocharis cylindrostachys</i>	-	-	-	-	-	-	-	-	-	N	0.1	20	G	-	-	-	-
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box	-	-	-	-	-	-	-	-	N	5	2	C	-	-	-	-
Myrtaceae	<i>Eucalyptus tereticornis</i> subsp. <i>tereticornis</i>	-	-	-	-	-	-	-	-	-	N	40	5	C	-	-	-	-
Apiaceae	<i>Foeniculum vulgare</i>	Fennel	-	-	-	-	-	-	-	-	E	0.1	5	M	-	-	-	-
Rubiaceae	<i>Galium aparine</i>	Goosegrass	-	-	-	-	E	0.1	20	G	-	-	-	-	-	-	-	-
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium	-	-	-	-	N	0.1	2	G	-	-	-	-	-	-	-	-
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine	-	-	-	-	N	0.1	5	G	N	0.1	5	G	N	0.1	10	G
Juncaceae	<i>Juncus usitatus</i>	-	-	-	-	-	-	-	-	-	N	0.1	20	G	-	-	-	-

Family	Scientific name	Common name	35483_01				35483_02				35483_03				35483_04			
			N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*
Asteraceae	<i>Lactuca serriola</i>	Prickly Lettuce	E	5	50	G	-	-	-	-	-	-	-	-	-	-	-	-
Brassicaceae	<i>Lepidium africanum</i>	Common Peppergrass	-	-	-	-	-	-	-	-	E	0.1	20	G	-	-	-	-
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	-	-	-	-	-	-	-	-	-	-	-	-	E	0.1	2	M
Malvaceae	<i>Malva parviflora</i>	Small-flowered Mallow	E	1	10	G	-	-	-	-	-	-	-	-	-	-	-	-
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	E	5	50	G	-	-	-	-	E	0.3	20	G	-	-	-	-
Poaceae	<i>Nassella neesiana</i>	Chilean Needle Grass	-	-	-	-	E	10	40	G	E	0.5	5	G	-	-	-	-
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	-	-	-	-	-	-	-	-	E	2	20	M	-	-	-	-
Oleaceae	<i>Olea europaea</i> subsp. <i>europaea</i>	Olive	-	-	-	-	-	-	-	-	-	-	-	-	E	0.2	5	M
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	-	-	-	-	HTE	90	500	G	HTE	10	50	G	-	-	-	-
Arecaceae	<i>Phoenix canariensis</i>	Canary Island Date Palm	-	-	-	-	-	-	-	-	-	-	-	-	E	0.1	1	M
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed	E	1	10	G	-	-	-	-	-	-	-	-	-	-	-	-
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	E	1	10	G	-	-	-	-	E	0.1	20	G	-	-	-	-
Poaceae	<i>Poa annua</i>	Winter Grass	E	1	10	G	-	-	-	-	-	-	-	-	-	-	-	-
Acanthaceae	<i>Pseuderanthemum variable</i>	Pastel Flower	-	-	-	-	-	-	-	-	-	-	-	-	N	0.2	20	G

Family	Scientific name	Common name	35483_01				35483_02				35483_03				35483_04			
			N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*	N. E or HTE	Cover	Abundance	Stratum*
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock	-	-	-	-	-	-	-	-	N	0.1	5	G	-	-	-	-
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	E	2	20	G	E	0.1	1	G	-	-	-	-	-	-	-	-
Poaceae	<i>Setaria pumila</i>	Pale Pigeon Grass	-	-	-	-	-	-	-	-	E	1	20	G	-	-	-	-
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	-	-	-	-	-	-	-	-	-	-	-	-	E	0.2	10	G
Solanaceae	<i>Solanum linnaeanum</i>	Apple of Sodom	E	1	10	G	-	-	-	-	E	0.1	5	G	-	-	-	-
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade	E	1	10	G	E	0.1	1	G	-	-	-	-	-	-	-	-
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	E	20	100	G	-	-	-	-	-	-	-	-	-	-	-	-
Commelinaceae	<i>Tradescantia fluminensis</i>	Wandering Jew	-	-	-	-	-	-	-	-	HTE	0.1	5	G	-	-	-	-
Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover	E	2	50	G	-	-	-	-	-	-	-	-	-	-	-	-
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	-	-	-	-	E	0.1	1	G	E	0.1	5	M	-	-	-	-
Fabaceae (Faboideae)	<i>Vicia sativa</i>	Common Vetch	-	-	-	-	-	-	-	-	E	0.1	5	G	-	-	-	-

* G = Ground, M = Mid storey, C = Canopy

Appendix 3.2 BAM plot data sheets

Table A. 4 BAM plot data sheets

Category	35483_01	35483_02	35483_03	35483_04
PCT	Urban Native/Exotic	Urban Native/Exotic	849	835
Area (ha)	16.20	16.20	0.13	0.27
Patch size	0	0	1	1
Condition class	Exotic	Exotic	Low	Low
Zone	56	56	56	56
Easting	-33.8462	-33.8461	-33.8489	-33.8522
Northing	150.7868	150.7896	150.7845	150.7876
Bearing	89	220	130	310
Composition				
Tree	0	0	2	1
Shrub	0	0	1	0
Grass	0	1	3	1
Forbs	0	1	2	2
Ferns	0	0	0	0
Other	0	1	1	1
Structure				
Tree	0.0	0.0	45.0	50.0
Shrub	0.0	0.0	0.5	0.0
Grass	0.0	30.0	10.2	5.0
Forbs	0.0	0.1	0.2	0.7
Ferns	0.0	0.0	0.0	0.0
Other	0.0	0.1	0.1	0.1
Function				
Large trees	0	0	5	4
Hollow trees	0	0	0	1
Litter cover	20.8	67.0	27	37
Length fallen logs	0.0	0.0	24	13
Tree stem 5-9	0	0	0	1

Category	35483_01	35483_02	35483_03	35483_04
Tree stem 10-19	0	0	1	1
Tree stem 20-29	0	0	1	1
Tree stem 30-49	0	0	1	1
Tree stem 50-79	0	0	1	1
Tree regeneration	0	0	0	0
High threat exotic	1.0	90.1	65.3	40.4

Appendix 3.3 Incidental flora

Table A. 5 Incidental flora species recorded at the subject land

Status	Scientific name	Common name
Native species		
-	<i>Acacia decurrens</i>	Black Wattle
-	<i>Einadia nutans</i>	Climbing Saltbush
-	<i>Eucalyptus</i> spp.	Gum
-	<i>Persicaria decipiens</i>	Slender Knotweed
-	<i>Typha orientalis</i>	Broad-leaved Cumbungi

Appendix 4 Fauna

Table A. 6 Fauna species recorded at the subject land

Status	Scientific name	Common name
Birds		
O	<i>Ardea ibis</i>	Cattle Egret
O	<i>Cisticola exilis</i>	Golden-headed Cisticola
O	<i>Corvus coronoides</i>	Australian Raven
O	<i>Egretta novaehollandiae</i>	White-faced Heron
O	<i>Elanus axillaris</i>	Black-shouldered Kite
O	<i>Fulica atra</i>	Eurasian Coot
O	<i>Gallinula tenebrosa</i>	Dusky Moorhen
O	<i>Hirundo neoxena</i>	Welcome Swallow
O	<i>Malurus cyaneus</i>	Superb Fairy-wren
O	<i>Neochmia temporalis</i>	Red-browed Finch
O	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant
O	<i>Phalacrocorax varius</i>	Pied Cormorant
O	<i>Platalea regia</i>	Royal Spoonbill
O	<i>Rhipidura leucophrys</i>	Willie Wagtail
O	<i>Streptopelia chinensis</i>	Spotted Turtle-Dove
O	<i>Threskiornis spinicollis</i>	Straw-necked Ibis
Frogs		
W	<i>Crinia signifera</i>	Common Eastern Froglet
W	<i>Limnodynastes peronii</i>	Striped Marsh Frog
Reptiles		
O	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake
O	<i>Lampropholis delicata</i>	Dark-flecked Garden Sun Skink

O = observed, W = heard call.

Appendix 5 SAI

Cumberland Plain Woodland TEC

PCT 849 identified within the study area is consistent with the TEC *Cumberland Plain Woodland in the Sydney Basin Bioregion*, listed as a CEEC under the NSW BC Act. However, the PCT within the study area does not meet the listing criteria for the CEEC under the EPBC Act, as the PCT is highly degraded and does not meet the minimum patch size requirement of 0.5 hectares.

The CEEC is listed in the BioNet Threatened Biodiversity Data Collection as a potential SAI entity in NSW. Given the absence of definitive impact thresholds stated for the CEEC, the potential for a SAI will be determined by the consent authority, guided by the additional assessment regarding this CEEC in Table A.7 below.

Table A. 7 Assessment of SAI for Cumberland Plain Woodland TEC

Information required (BAM Section 9.1.1)	Response
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAI.	Measures undertaken by the proponent to avoid and minimise impact to the CEEC (PCT 849) are provided in Section 5. The final development design is unable to avoid the mapped PCT 849 vegetation within the subject land. While impacts to vegetation were originally to be avoided by a regular access road to the site, the requirement to widen Mamre Road, and the subsequent location has been set by the precinct DCP. Opportunities to avoid direct impacts are limited due to the small, isolated and narrow of the CEEC present within the subject land, and its occurrence along the Mamre Road verge. Indirect impacts will be minimised through standard construction and environmental management mitigation measures outlined in a Biodiversity Management Plan prepared for the construction phase of the project (such as establishment of No-Go zones, the re-use of habitat features, and potentially seed collection and propagation dependent on construction timing). Unavoidable impacts to the CEEC will result in the removal of 0.04 ha of the CEEC in low condition.
2a. 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).	According to <i>Remnant vegetation of the western Cumberland subregion, 2013 Update</i>. VIS_ID 4207 (DPIE 2013), and <i>The Native Vegetation of the Sydney Metropolitan Area</i> (DPIE 2016) and <i>Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands</i> (Tozer et al. 2010), the current extent of Cumberland Plain Woodland (PCT 849 and PCT 850) within NSW is approximately 22,774 ha. The original extent of the CEEC is uncertain, but is estimated to have been between approximately 125,446 ha pre-European settlement (Threatened Species Scientific Committee 2016). This is a total reduction of approximately 82 % of the geographic distribution.

Information required (BAM Section 9.1.1)	Response
2b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes.	i. change in community structure and, ii. change in species composition An area of 0.04 ha of Cumberland Plain Woodland CEEC will be removed for the proposed development. The vegetation to be removed occurs as a highly modified form of the CEEC, lacking structural complexity and a limited floristic composition. Diagnostic tree species were limited to Forest Red Gum and occasional Grey Box, and supporting very occasional native species in the understorey. The understorey consisted of scattered native shrubs, and was dominated by exotic grasses, forbs and woody weeds. The soil profile has also undergone historic disturbance from construction of the roadway, the piped waterways, and along the adjacent property boundaries. The proposed works will alter the community structure and composition of the patch to be removed, however, the patch is already fragmented and degraded, with no connectivity to higher quality vegetation within the landscape, and a negligible potential to naturally regenerate. A larger patch (0.11 ha) in similar condition will be retained along the south-west boundary of the development site on Mamre Road. iii. disruption of ecological processes The proposed construction is unlikely to result in changes to surface water drainage patterns. Any potential sediment or erosion impacts will be managed appropriately through a CEMP. Furthermore, the patch of CEEC to be removed is providing very limited ecological function for species of flora and fauna that may occur within the patch, including on a transient basis, due to its highly degraded, isolated, edge effected, and weed infested nature. iv. invasion and establishment of exotic species Exotic species were recorded in moderate to high densities within the CEEC, with opportunistic herbaceous perennial species being observed throughout the vegetation type. Edge effects were present, with higher levels of weed ingress observed along the boundaries of the patch. The construction and operation of the development will be managed under a CEMP, and will include measures such as weed removal practices, disposal and hygiene practices, and chemical storage. v. degradation of habitat The CEEC to be removed contains no notable habitat features including hollows or rocky outcrops. A larger patch (0.11 ha) in similar condition will be retained along the south-west boundary of the development site on Mamre Road, and supports large trees providing perching opportunities and blossom for mobile aerial foraging species. The development will not impact on these larger trees, providing the highest quality (albeit still marginal) habitat in the location and therefore the development will not result in a degradation of habitat within the CEEC. vi fragmentation of habitat The vegetation to be removed is already highly fragmented and isolated within the landscape, therefore the proposed development will not result in fragmentation of the patch.

Information required (BAM Section 9.1.1)	Response
2c. evidence of restricted geographic distribution, based on the TEC's geographic range in NSW.	i extent of occurrence The CEEC occurs in two distinct fragmented patches within the subject land. An area of 0.13 ha of Cumberland Plain Woodland CEEC will be removed for the proposed development. A larger patch (0.11 ha) in similar condition will be retained along the south-west boundary of the development site on Mamre Road. ii. area of occupancy Cumberland Plain Woodland is recorded from within the Burragorang, Cumberland, Sydney Cataract and Yengo IBRA subregions. The CEEC occurs on soils derived from Wianamatta Shale, and throughout the driest part of the Sydney Basin. Before European settlement, was extensive across the Cumberland Plain, western Sydney. According to <i>Remnant vegetation of the western Cumberland subregion, 2013 Update</i>. VIS_ID 4207 (DPIE 2013), and <i>The Native Vegetation of the Sydney Metropolitan Area</i> (DPIE 2016) and <i>Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands</i> (Tozer et al. 2010), there is approximately 1591 ha of Cumberland Plain Woodland CEEC (PCT 849 and PCT 850) mapped as occurring within the following reserves (in the Cumberland IBRA subregion): • Bents Basin State Conservation Area. • Edmondson Regional Park. • Kemps Creek Nature Reserve. • Leacock Regional Park. • Mulgoa Nature Reserve. • Prospect Nature Reserve. • Rouse Hill Regional Park. • Scheyville National Park. • Upper Nepean State Conservation Area. • Western Sydney Regional Park. • Wianamatta Regional Park. • William Howe Regional Park. • Windsor Downs Nature Reserve. • Yellomundee Regional Park. Other remnants occurs as small and fragmented patches and scattered trees on private land. Identified threats include further clearing, grazing, weed invasion, selective logging, rubbish dumping, housing and hobby farm developments and physical damage from recreational activities. The CEEC within the subject land is not considered to be at the furthest extent of its geographic range in NSW. iii. number of threat-defined locations The CEEC is included in the <i>Cumberland Plain Recovery Plan</i> (DECCW 2011), a multi-entity recovery plan that has been prepared for 20 threatened species, populations and ecological communities that occur within the 'Cumberland Plain' region in western Sydney.

Information required (BAM Section 9.1.1)	Response
	The recovery plan has the following objectives: • To build a protected area network, comprising public and private lands, focused on the priority conservation lands. • To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation. • To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program. • To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner. The proposed development will directly impact upon 0.04 ha of the CEEC. However, the patch is already fragmented and highly degraded, with no connectivity to higher quality vegetation within the landscape, and a negligible potential to naturally regenerate. A larger patch (0.11 ha) in similar condition will be retained along the south-west boundary of the development site on Mamre Road. The project will not result in impacts likely to be adverse to any of the other objectives of the Cumberland Plain Conservation Plan, nor will it impact upon areas of high quality habitat which could support the CEEC into the future, and as such it is not expected that the project will interfere with the recovery of an ecological community. The project will be subjected to CEMP which will align the project with the critical actions described for the community. Therefore, the proposed actions area considered unlikely to interfere with recovery actions.
2d. evidence that the TEC is unlikely to respond to management	An area of 0.04 ha of low condition Cumberland Plain Woodland CEEC will be removed for the proposed development. The vegetation to be removed occurs as a highly modified form of the CEEC, lacking structural complexity and a limited floristic composition. Diagnostic tree species were limited to Forest Red Gum and occasional Grey Box, and supporting very occasional native species in the understorey. The understorey consisted of scattered native shrubs, and was dominated by exotic grasses, forbs and woody weeds. The soil profile has also undergone historic disturbance from construction of the roadway, the piped waterways, and along the adjacent property boundaries. The vegetation to be removed is also highly fragmented within the landscape, with no connectivity to higher quality vegetation, negligible potential to naturally regenerate, and limited area available to do so. A larger patch 0.11 ha) in similar condition will be retained along the south-west boundary of the development site on Mamre Road.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC, the assessor must record this in the BDAR or BCAR.	Not applicable.

Information required (BAM Section 9.1.1)	Response
4a. the impact on the geographic extent of the TEC, by estimating the total area of the TEC to be impacted by the proposal:	As discussed above, the current extent of Cumberland Plain Woodland within NSW is approximately 125,446 ha. The proposed development will result in the removal of approximately 0.04 ha of the CEEC from the subject land. The total area of the CEEC to be impacted by the proposal equates to 0.0001 % of the CEEC within NSW. The proposed development has the potential to result in indirect impact to a similar size patch of the CEEC to be retained along the south-west boundary of the development site on Mamre Road. However, mitigation measures including preparation of a CEMP will be implemented to avoid indirect impacts to this vegetation.
4b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes of the TEC.	i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of the development footprint or equivalent area for other types of proposals. According to Cumberland Plain West (DPIE 2020c), there are two remaining patches of the CEEC within 500 m of the development. The proposed works will impact on 0.04 ha of Cumberland Plain Woodland. At a local scale, the vegetation to be impacted within the development footprint is isolated and not contiguous with another patch. ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: - distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and - estimated maximum dispersal distance for native flora species characteristic of the TEC, and - other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development The closest mapped remnant patch of Cumberland Plain Woodland to the subject land, according to DPIE (2013), is approximately 218 m north. The proposed works will result in the removal of 0.04 ha, and is isolated and not contiguous with another patch. An unmapped larger patch of the CEEC (0.11 ha) will also be retained directly adjacent to the south-west boundary of the development site on Mamre Road. The proposed work will not increase the distance from the nearest patch of remnant vegetation. following construction, and flora species, currently able to disperse between patches, are considered likely to still be able to disperse between the patches. iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone. The CEEC occurs in one condition within the subject land.

Information required (BAM Section 9.1.1)	Response
	Low: • Composition condition score: 10.4 • Structure condition score: 36.9 • Function condition score: 77.9 • Presence of hollow-bearing trees: None • VI score: 31.0 The proposed works will result in the removal of 0.04 ha of low condition Cumberland Plain Woodland. A larger patch (0.11 ha) in similar condition will be retained along the south-west boundary of the development site on Mamre Road.