

Cherrybrook Station
State Significant Precinct - Planning Proposal
Biodiversity Development Assessment Report

FINAL REPORT

Prepared for Landcom

4 April 2022

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- NSW Office of Environment and Heritage for access to the BioNet Atlas of NSW Wildlife.
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- NSW Department of Primary Industries for access to indicative mapping of freshwater threatened species and fish populations.

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- Tobias Scheid and Byron Dale (assistance in the field)
- Jenny Beckius (mapping)

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Glossary

Assessment Area	Inclusive of the subject land and all land within 1500m of the subject land
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
CEMP	Construction Environmental Management Plan
DA	Development Application
DBH	Diameter at Breast Height
DEE	Commonwealth Department of the Environment and Energy
DAWE	Commonwealth Department of Agriculture, Water and Environment
Development footprint	The area of land that is directly impacted by the proposal within the Developable Government Land (DGL)
Development site	The Cherrybrook Station State Significant Precinct.
DGL	Developable Government Land (DGL)
DoIW	Directory of Important Wetlands
DPE	Department of Planning and Environment (formerly Department of Planning, Industry and Environment)
DPIE	NSW Department Planning Industry and Environment (now Department of Planning 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>
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan

LGA	Local Government Area
Locality	Area located within 10 kilometres radius from the subject land
LPI	NSW Land and Property Information
MNES	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
SEPP	NSW State Environmental Planning Policy
Species credit 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 broader area in which development site is located, including all direct and indirect impacts.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
TPZ	Tree Protection Zone
WM Act	NSW <i>Water Management Act 2000</i>

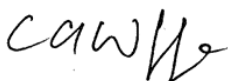
Certification and Declarations

I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020) and s6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

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

Signature: Callan Wharfe



Date: 04 April 2022

BAM Assessor Accreditation Number: BAAS18138

Summary

Landcom proposes to rezone and develop land within the Cherrybrook Station Government Land State Significant Precinct (SSP) surrounding the Cherrybrook Metro Station, adjacent to Bradfield Parade, Cherrybrook NSW (hereafter referred to as the development site). The project will involve rezoning of the development site to facilitate a mixed use local centre at Cherrybrook Station. The development site also contains 3.5 hectares of developable government lands (DGL) which will likely be subject to future development once rezoning has been approved. The DGL make up the subject land, and encompass any areas that could be directly or indirectly impacted by a future proposed development (Figure 1).

Biosis have previously undertaken assessment of the development site in 2016, however, due to legislative reforms the project is now required to be undertaken in accordance with the *Biodiversity Conservation Act 2016* (BC Act) and the associated Biodiversity Assessment Method (BAM) (DPIE 2020a).

As any future development within the subject land will likely be designated a State Significant Development, the development will be required to enter into the Biodiversity Offset Scheme (BOS). An assessment is therefore required in accordance with the BAM and the *Biodiversity Conservation Act 2016* (BC Act). In addition, vegetation within the subject land is designated within the Biodiversity Values Map (DPIE 2020b).

This assessment has been prepared to address the requirements of the *Study Requirements for Cherrybrook Station Government Land State Significant Precinct* issued by the NSW Department of Planning Industry and Environment (DPIE) (DPIE 2020c).

Field investigation, undertaken in accordance with the BAM, recorded 1.35 hectares of native vegetation (PCT 1237 *Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest* [PCT 1237]) within the subject land, with 1.31 hectares of this representing one state and federally listed threatened ecological community (TEC), *Blue Gum High Forest in the Sydney Basin Bioregion* (Blue Gum High Forest) listed as a Critically Endangered Ecological Community (CEEC) under both the BC Act and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Two threatened fauna species, Southern Myotis *Myotis macropus* (Vulnerable, BC Act) and Koala *Phascolarctos cinereus* (Vulnerable, BC Act and EPBC Act), were assumed to be present within the subject land based on their habitat requirements. A total of 18 threatened fauna species were also predicted to occur within the subject land based on the presence of PCT 1237, the patch size of the native vegetation and the percentage native vegetation cover within the 1500 metre buffer around the subject land.

No native vegetation or habitat is to be removed as a result of the rezoning of the development site, and this assessment was undertaken under the assumption that no native vegetation will be removed as the result of the future proposed development within the subject land. As such, in accordance with Section 10.3 of the BAM, offsets are not required for the proposed rezoning or future development of the site.

The project is not considered likely to result in a significant impact to species or communities listed under the EPBC Act, and as such a referral to the Commonwealth Minister of the Environment is not required.

Stage 1 – Biodiversity assessment

1 Introduction

This study relates to a proposal to develop land called the 'Cherrybrook Station Government Land State Significant Precinct' (the State Significant Precinct) by Landcom on behalf of the landowner, Sydney Metro. The State Significant Precinct is centred around Cherrybrook Station on the Metro North West Line. The Metro North West Line delivers a direct connection with the strategic centres of Castle Hill, Norwest, Macquarie Park and Chatswood. It covers 7.7 hectares of government-owned land that comprises the Cherrybrook Station, commuter carpark and station access road (Bradfield Parade) and vacant land to the east of the station (referred to as the Developable Government Land) (DGL). It is bound by Castle Hill Road (south), Franklin Road (south east) and Robert Road (north west).

Landcom proposes a site specific amendment to the Hornsby Local Environmental Plan 2013 (Hornsby LEP) for changes to zoning of the study area, as well as maximum building height and floor space ratio controls, to support the transport oriented development surrounding the Cherrybrook Metro Station. The key outcome of the land rezoning and future development will be:

- To facilitate a mixed use local centre at Cherrybrook Station.
- To deliver public benefit through the mixed use local centre, including through community facilities, affordable housing and quality open spaces.
- To deliver transport and movement initiatives and benefits, including reducing public transport usage and reducing car dependency.

As a State Significant Precinct, the Minister for Planning and Public Spaces (the Minister) has determined that it is of State planning significance and should be investigated for rezoning. This investigation will be carried out in accordance with study requirements issued by the NSW Department of Planning and Environment (DPE) in May 2020. These study requirements were prepared in collaboration with Hornsby Shire Council and The Hills Shire Council.

The outcome of the State Significant Precinct process will be new planning controls. This will enable the making of development applications to create a new mixed-use local centre to support Cherrybrook Station and the needs of the local community.

At the same time, DPIE is also working with Hornsby Shire and The Hills Shire Councils, as well as other agencies such as Transport for NSW, to undertake a separate planning process for a broader area called the Cherrybrook Precinct. Unlike the State Significant Precinct, the outcome of this process will not be a rezoning. Instead, it will create a Place Strategy that will help set the longer term future for this broader area. Landcom will be consulted as part of this process.

1.1 Project description

The proposed new planning controls for the State Significant Precinct are based on the investigations undertaken as part of the State Significant Precinct Study process. A Reference Scheme has also been prepared to illustrate one way in which the State Significant Precinct may be developed in the future under the proposed new planning controls.

The proposed planning controls comprise amendments to the Hornsby LEP 2013 to accommodate:

- Rezoning of the site for a combination of R4 High Density Residential, B4 Mixed Use and RE1 Public Recreation zoned land.

- Heights of between 18.5m – 22m.
- FSR controls of 1:1 – 1.25:1.
- Inclusion of residential flat buildings as an additional permitted use on the site in the B4 Mixed Use zone.
- Site specific LEP provisions requiring the delivery of a minimum quantity of public open space and a maximum amount of commercial floor space.
- New site-specific Design Guide addressing matters such as open space, landscaping, land use, built form, sustainability and heritage.

The Reference Scheme (Plate 1) seeks to create a vibrant, transit-oriented local centre, which will improve housing choice and affordability and seeks to integrate with Hornsby's bushland character. The Reference Scheme includes the following key components:

- Approximately 33,350m² of residential GFA, with a yield of approximately 390 dwellings across 12 buildings ranging in height from 2 to 5 storeys (when viewed from Bradfield Parade).
- A multi-purpose community hub with a GFA of approximately 1,300m².
- Approximately 3,200m² of retail GFA.
- Over 1 hectare of public open space, comprising:
 - A village square with an area of approximately 1,250m², flanked by active retail and community uses.
 - A community gathering space with an area of approximately 3,250m².
 - An environmental space around the pond and Blue Gum High Forest with an area of approximately 8,450m².
- Green corridors and pedestrian through site links, providing opportunities for potential future precinct-wide integration and linkages to the north.



Plate 1 Reference scheme for Cherrybrook Station Government Land State Significant Precinct

For the purposes of this assessment, it has been assumed that any future development within the subject land will fall within the reference scheme footprint provided.

1.2 Study Requirements for Cherrybrook Station Government Land State Significant Precinct

This assessment has also been prepared to address the requirements of the Study Requirements for Cherrybrook Station Government Land State Significant Precinct issued by DPIE (DPIE 2020c). The study requirements relevant to biodiversity matters (as per Section 8 of the document) are outlined in Table 1 below, along with the relevant section where each item is addressed in this BDAR.

Table 1 Study Requirements for Cherrybrook Station Government Land State Significant Precinct

Study requirements (DPIE 2020c)	
<p>(8.1, 8.2) Identify and assess the key biodiversity attributes of the site and surrounds and document how these have been appropriately considered in the planning, rezoning and future development proposed for the site. Include the identification and potential impacts on the common vegetation species and particularly of the threatened species, ecological communities and/or their habitat listed under the NSW BC Act and/or the EPBC Act.</p>	<p>Section 3 of this report identifies the key vegetation attributes of the subject land, and Section 4 identifies the potential for presence of threatened biota or their habitat listed under the BC Act and/or EPBC Act. Section 7 of the report addresses the potential impacts of the proposed rezoning and future development on these features. Appendix 2 also provides a comprehensive assessment of the potential for presence of threatened biota listed under the BC Act and/or EPBC Act within the subject land.</p>

Study requirements (DPIE 2020c)	
(8.3) The proposal should retain Blue Gum and Cumberland Plain species, with local offsets prioritised within the site to maintain on site biodiversity values and preservation.	Section 7 of this report provides a summary of all impacts of the proposed rezoning and future development, including the preservation of all Blue Gum High Forest species. No Cumberland Plain Woodland was recorded within the study area.
(8.4) Consider the recommendations of the soon to be released Cumberland Plain Conservation Plan in relation to the vegetation on the government land site and the adjacent land.	The Cumberland Plain Conservation Plan has not yet been released as final, however this assessment assumes that once released, the future development of the study area will consider this plan in relation to the vegetation within the study area and adjacent land.
(8.5) Identify the requirements and approach to protecting the existing Blue Gum High Forest area adjacent to the north of the site and investigate opportunities for new pedestrian/cycle connections between the town centre and surrounding streets to the north east and north west that could potentially be provided adjacent to the outer edge of this Blue Gum High Forest.	Section 5.1.3 addresses the approach of the project to protecting the Blue Gum High Forest within the study area, and discusses opportunities for a future pedestrian/cycle pathway along the outer edge of the retained vegetation.

1.3 Purpose of this assessment

The purpose of this study is to address the relevant study requirements for the State Significant Precinct, as issued by DPIE. It is part of a larger, overall State Significant Precinct Study. This State Significant Precinct Study undertakes planning investigations for the precinct in order to achieve a number of objectives that are summarised as follows (refer to the State Significant Precinct Study Planning Report for a full list of the study requirements):

- facilitate a mixed-use local centre at Cherrybrook Station that supports the function of the station and the needs of the local community.
- deliver public benefit through a mixed use local centre.
- deliver transport and movement initiatives and benefits.
- demonstrate the suitability of the site for the proposed land uses.
- prepare a new planning framework for the site to achieve the above objectives.

This BDAR will:

- Address the BAM (DPIE 2020) 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 and reviewed by Accredited Assessor Callan Wharfe (BAAS18138). This BDAR describes the outcome of the development assessment case (00016723) conducted consistent with the BAM.

1.4 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 broader area in which the development site is located, including all direct and indirect impacts. For this project the subject land encompasses the Cherrybrook State Significant Precinct (the development site) and a patch of native vegetation immediately to the north totalling 8.6 hectares (Figure 1).
- The development site is defined as the Cherrybrook Station State Significant Precinct (Figure 1). Cherrybrook State Significant Precinct comprises the Cherrybrook Station, commuter carpark and station access road (Bradfield Parade) and vacant land to the east of the station. It is bound by Castle Hill Road (south), Franklin Road (south east) and Robert Road (north west).
- The development footprint comprises the total area of proposed disturbance, encompassing any proposed development footprint and all areas that could be disturbed during construction (e.g. plant laydown, Asset Protection Zone [APZ] management, and access tracks) within the DGL.
- The assessment area includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land.

The subject land, development site and development footprint are show on Figure 1.

1.5 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 subject land, records of flora and fauna from within ten kilometres (the locality) were collated from the following databases and were reviewed:

- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool for matters protected by the EPBC Act.
- EES BioNet Atlas of NSW Wildlife, for species, populations and ecological communities listed under the BC Act.
- PlantNET (The Royal Botanic Gardens and Domain Trust).
- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (DPIE 2021a).
- Relevant vegetation mapping
 - The *Native Vegetation of the Sydney Metropolitan Area* version 3.1 (OEH 2016a).
 - The *Native Vegetation of the Cumberland Plain* (NPWS 2013).
 - *Native Vegetation Communities of Hornsby Shire* (Smith & Smith 2008).

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

- *Cherrybrook Precinct Developable Government Land Planning Proposal: Flora and fauna assessment*. Report for UrbanGrowth NSW (Biosis 2017).
- *Cherrybrook Gateway Rezoning: Flora and Fauna Assessment*. Report for UrbanGrowth NSW (Biosis 2016).
- Final determination for *Blue Gum High Forest in the Sydney Basin Bioregion* – critically endangered ecological community (CEEC) listing (NSW Threatened Species Scientific Committee 2011).
- Commonwealth Listing Advice on *Blue Gum High forest of the Sydney Basin Bioregion* (Threatened Species Scientific Committee 2005).

Mapping was conducted using hand-held (uncorrected) GPS units (GDA94), mobile tablet computers running Collector for ArcGIS and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 5 metres) and dependent on the limitations of aerial photo rectification and registration.

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 (now Land Registry Services).

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 (Department of the Environment 2012)
- Directory of Important Wetlands (DoIW)
- NSW Soil and Land Information System
- Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:
 - 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.

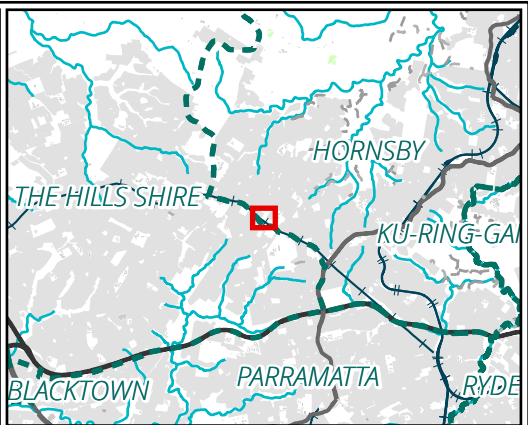
1.6 Legislative requirements

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*.
- *Fisheries Management Act 1994*.
- *Biosecurity Act 2015*.
- State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021 (SEPP Biodiversity and Conservation SEPP 2021)*.
- Hornsby Development Control Plan (DCP) 2013.

- Hornsby Local Environmental Plan (LEP) 2013.

* The SEPP Biodiversity and Conservation 2021 commenced on 1 March 2022. The SEPP Biodiversity and Conservation 2021 consolidates, transfers and repeals provisions of 11 SEPPs with the aim of reducing the complexity of the NSW planning system. Of the 11 SEPPs, the SEPP (Koala Habitat Protection) 2021 (Koala SEPP 2021) is relevant to this study. The intent and provisions of the Koala SEPP 2021 are included in Chapter 4 of the SEPP Biodiversity and Conservation 2021 and remain unchanged. These largely administrative changes to the NSW planning system are reflected in this BDAR.



Legend

- Subject land
- Development site - Developable Government Land (DGL)
- Development footprint - Developable Government Land (DGL)

Figure 1 Subject land

0 10 20 30 40 50
Metres

Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 56

biosis

Matter: 36800, Date: 29 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F1_SubjectLand
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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 2020a). Figure 3 shows the location of the subject land and landscape features within the 1500 metre buffer.

2.1.1 Native vegetation cover

Native vegetation cover within the 1500 metre buffer was assessed using GIS based on the most suitable vegetation mapping, in this case *The Native Vegetation of the Sydney Metropolitan Area* (OEH 2016a), ground-truthed vegetation mapping undertaken by Biosis (2016) and additional aerial imagery interpretation.

The total area of the native vegetation cover equates to 19.4 % (>10-30% class as defined in Section 3.2.3 of the BAM). This value was rounded to 19% and entered into the BAM calculator.

2.1.2 Bioregions

The subject land 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 4.53 per cent of NSW and is one of two bioregions contained wholly within the state. The region covers the area from Nelson Bay to just north of Batemans Bay and 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 (OEH 2016b).

The Cumberland IBRA subregion is characterised by low rolling hills and wide valleys in a rain shadow area below the Blue Mountains (OEH 2019). Geology consists of Triassic Wianamatta group shales and sandstones. Vegetation is typically comprised of eucalypt woodland with swamp oak occurring on river flats, Tall Spike Rush and Juncus with Parramatta Red Gum in lagoons and swamps.

2.1.3 Rivers and streams

The subject land is located within the Greater Sydney LLS Region and the Sydney Metropolitan catchment management authority. The closest river-mouth is the Parramatta River located approximately 21 kilometres to the south-east of the subject land. The closest major waterbody is Prospect Reservoir, located approximately 15 kilometres to the south-west of the site. To the south-west of the subject land the nearest waterway is Excelsior Creek, a third order stream with multiple second and first order tributaries creating a riparian corridor through the wider locality. Two second order streams, Bellbird Creek and Darling Mills Creek, are present to the south of the subject land.

There are no Key Fish Habitat as mapped by the NSW Department of Primary Industries (DPI) within the subject land (DPI 2019).

2.1.4 Wetlands

The subject land does not occur within any nationally or internationally listed wetlands. Parramatta estuary is listed under the *Coastal Management Act 2016* and is located approximately 9 kilometres to the south-east along the lower reaches of the Parramatta River.

2.1.5 Connectivity

Native vegetation occurs within the subject land along the northern boundary. This vegetation is part of a patch extending to the north of the subject land and is connected through private properties along Kayla Way

to the south-east of the subject land through remnant canopy. Remnant vegetation along Castle Hill Road to the south east connects the subject land to riparian vegetation within gullies containing first and second order streams (Figure 3). Native vegetation in the north of the subject land is also partially connected to these areas through narrow roadside strips of vegetation to the west of the subject land (Figure 3).

2.1.6 Geological features

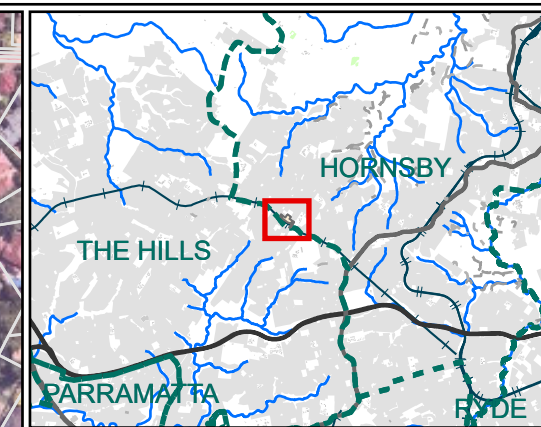
There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land or within the assessment area.

2.1.7 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity values within the subject land.

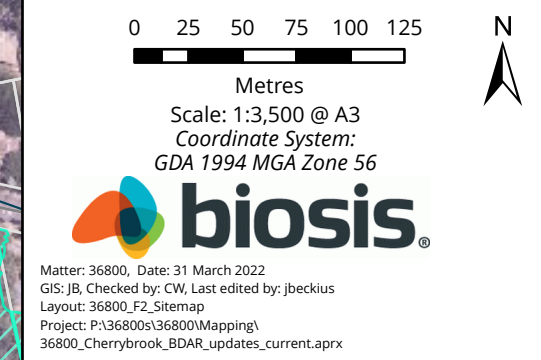
2.1.8 NSW (Mitchell) Landscape

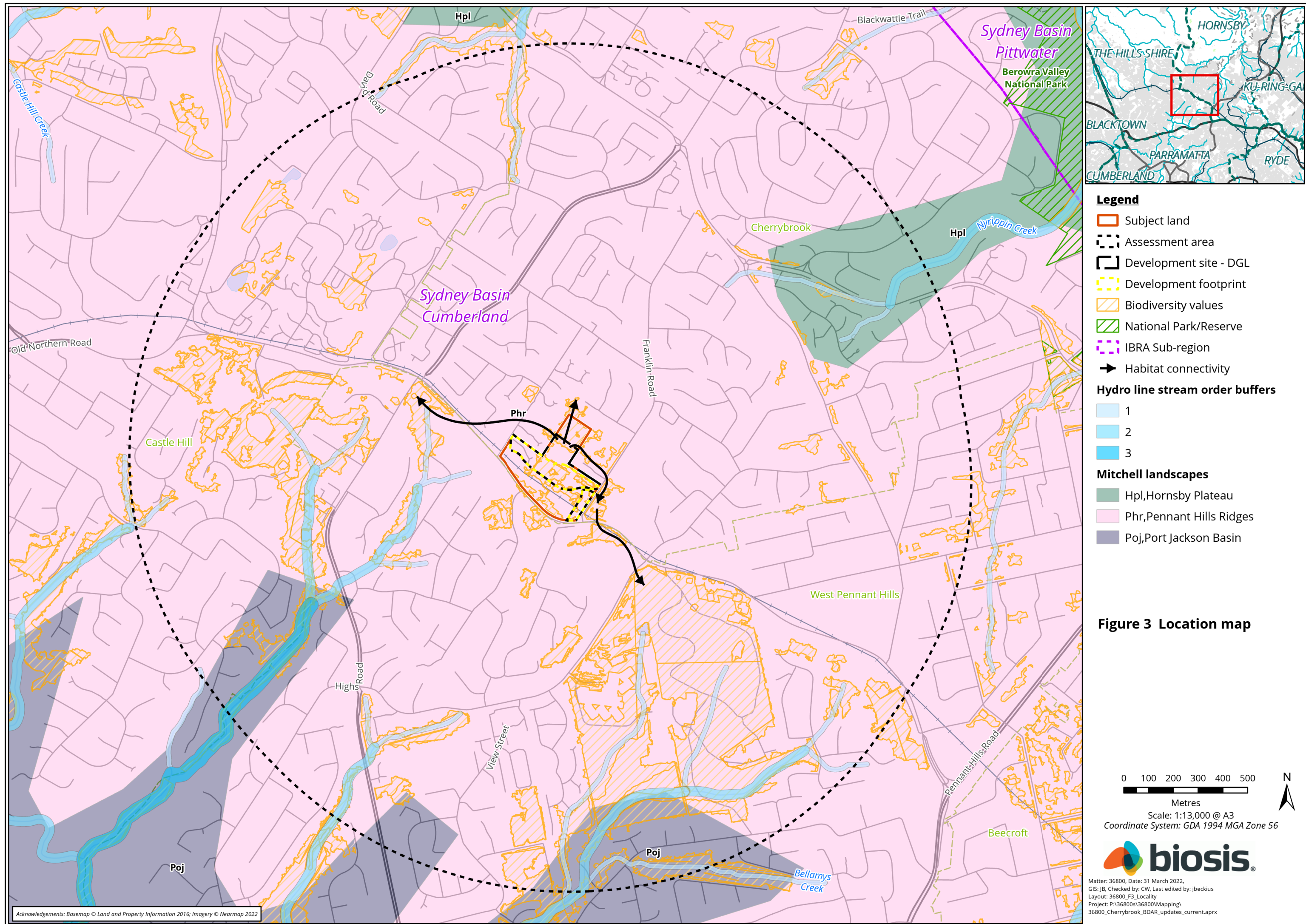
The subject land occurs within the Pennant Hills Ridges Mitchell Landscape. This landscape is characterised by rolling to moderately steep hills on horizontal Triassic shales and siltstones with a general elevation of 10 – 90 metres and a local relief of 60 metres (Mitchell 2002). On narrow hillcrests soils are deep red texture-contrast, while on slopes soils are red and brown to yellow texture contrast soils becoming slightly harsher in drainage lines.



- Legend**
- Subject land
 - Development site - DGL
 - Development footprint
 - Lot
 - IBRA Sub-region
 - Biodiversity values
 - Habitat connectivity
- Hydro line stream order buffers**
- 1
 - 2
- Mitchell landscapes**
- Phr, Pennant Hills Ridges

Figure 2 Site map





3 Native vegetation

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 and Section 4 of the BAM (DPIE 2020a).

Figure 4 provides a map of the native vegetation extent recorded within the subject land, as assessed during field investigations undertaken in June 2019. 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. Given the field investigation was undertaken within five years of the preparation of this BDAR, it is compliant with the BAM.

3.1.2 Review of existing information

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

- Regional vegetation mapping, *The Native Vegetation of the Sydney Metropolitan Area* (OEH 2016a)
- Existing site reports (Biosis 2016, Biosis 2017)

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 27 June 2019 under the terms of Biosis' Scientific Licence issued by the EES under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 May 2022). Fauna survey was conducted under approval CSB 17/892 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2022).

Assessment in accordance with the BAM was planned and managed by Callan Wharfe (BAAS18138) and Tobias Scheid (BAAS19060).

The subject land 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 and *The Native Vegetation of the Sydney Metropolitan Area* (OEH 2016a).
- Undertaking floristic plots 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.
- 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) (Appendix 4).

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 Collector/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 NSW BioNet Vegetation Classification database (DPIE 2020b). 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 Non-native vegetation

Approximately 7.4 hectares of the subject land was observed to be heavily disturbed containing exotic grasses with no native over storey or mid storey cover as a result of previous clearing. This met the definition of non-native vegetation / cleared land and were 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.

3.1.5 Plant community types

The subject land supports 1.35 hectares of native vegetation comprising one PCT with varying levels of disturbance and establishment.

The vegetation within the subject land and surrounds has been modified by past disturbances which have included clearing for housing, infrastructure, farmland/orchards and community utilities and services. Very few patches of undisturbed remnant vegetation occur within the locality, with remnant native vegetation and communities generally being considered re-growth following clearing over the past 50-150 years. As a result, fully structured forest vegetation is scarce outside protected areas, with the majority of native plant communities consisting of native canopy trees over a paucity of native shrubs and/or groundcovers.

This is the case for PCT 1237 within the subject land, where native trees such as Sydney Blue Gum *Eucalyptus saligna* and Blackbutt *Eucalyptus pilularis* occur over an understory dominated by noxious listed species including Lantana *Lantana camara*, Large-leaf Privet *Ligustrum lucidum* and Small-leaf Privet *Ligustrum sinense*. The vegetation within the subject land forms the southern extent of a larger patch of PCT 1237 in higher ecological condition.

A small row of planted native trees extends along the north eastern boundary of the subject land. This vegetation consists of planted Swamp Mahogany *Eucalyptus robusta*, Tallowwood *Eucalyptus microcorys*, Red Ironbark *Eucalyptus fibrosa* and Forest Red Gum *Eucalyptus tereticornis* with a sparse underlying exotic mid

and ground species including Small-leaf Privet, Madeira Winter Cherry *Solanum pseudocapsicum*, Fireweed *Senecio madagascariensis* and Panic Veldtgrass *Ehrharta erecta*. There was no regeneration of native canopy species or established native midstorey within this patch. This vegetation community has been assessed as PCT 1237 - Planted condition due to the presence of one Sydney Blue Gum, but is not considered to be a remnant stand of the surrounding PCT 1237 observed within the subject land and locality.

PCT 1237 within the northern boundary of the subject land has been assessed as PCT 1237 – Low and PCT 1237 – Moderate condition, and meets the threshold for listing as Blue Gum High Forest as a CEEC under both the BC Act and EPBC Act. The vegetation assessed as PCT 1237 – Planted is not considered consistent with the key diagnostics of the final determinations for Blue Gum High Forest CEEC under either the BC Act or EPBC Act.

The remainder of the subject land has been cleared and is devoid of vegetation and habitat for native fauna.

PCT 1237 is present within the subject land in two different condition states:

- PCT 1237 - low condition and moderate condition (Blue Gum High Forest CEEC) (Table 2)
- PCT 1237 - planted condition (Table 3).

Table 2 to Table 3 provide detailed descriptions of PCT 1237 recorded within the subject land. The distribution of PCT 1237 PCTs recorded within the subject land is shown on Figure 5.

Table 2 PCT 1237

PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	
Vegetation formation	Wet Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	North Coast Wet Sclerophyll Forests
Extent within subject land	1237 Low – 0.77 ha 1237 Moderate – 1.04ha
Condition	Within the subject land PCT 1237 occurs in a low to moderate condition state with native species dominating the upper stratum only, and a high cover and abundance of exotic species observed in the mid and ground strata.
Description	<p>PCT 1237 is described in <i>The Native Vegetation of the Sydney Metropolitan Area</i> (OEH 2016) as a tall wet sclerophyll forest found on fertile shale soils in the high rainfall districts of Sydney's north shore. It is dominated by Sydney Blue Gum <i>Eucalyptus saligna</i>, Blackbutt <i>Eucalyptus pilularis</i> and Turpentine <i>Syncarpia glomulifera</i> with a number of other eucalypts occurring patchily. A sparse to open cover of small trees is found at most sites and includes a variety of sclerophyllous and mesophyllous species. The ground layer is variable in both composition and cover. It may be ferny, grassy or herbaceous depending on topographic situation and disturbance history.</p> <p>PCT 1237 observed within the subject land consisted of an open and maturing canopy of Sydney Blue Gum with scattered occurrences of smaller trees including Hickory Wattle <i>Acacia implexa</i>, Black Wattle <i>Acacia decurrens</i> and Forest Oak <i>Allocasuarina torulosa</i>. The mid storey was highly disturbed and consisted primarily of exotic species including Large-leaved Privet <i>Ligustrum lucidum</i>, Small-leaved Privet <i>Ligustrum sinense</i>, <i>Senna pendula</i> var. <i>glabrata</i> and Blackberry <i>Rubus fruticosus</i>. A small number of opportunistic native vines and climbers including old man's beard <i>Clematis aristata</i>, <i>Glycine clandestine</i> and Wonga Wonga Vine <i>Pandorea pandorana</i> were present. The ground storey was again largely disturbed and dominated by exotic species, however occasional native species including Blue Flax-lily</p>

PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion


	<p><i>Dianella caerulea</i>, Forest Nightshade <i>Solanum prinophyllum</i>, Spiny-headed Mat-rush <i>Lomandra longifolia</i>, Weeping Grass <i>Microlaena stipoides</i> and Brown's Lovegrass <i>Eragrostis brownii</i> were recorded. Common annual and perennial introduced species were also recorded and juvenile exotic midstorey species were present.</p>
Survey effort	One BAM plot/transect
Justification of PCT	<p>The vegetation occurs as an open forest within the Sydney Basin IBRA and Cumberland IBRA Subregion. The area was mapped within the Native vegetation of the Sydney metropolitan area mapping project (OEH 2016a) as Blue Gum High Forest.</p> <p>Floristic data collected in the field was used in the BioNet PCT identification tool which identified PCT 1237 as a match based on species recorded within the subject land.</p>
TEC Status	<p>PCT 1237 within the subject land meets the threshold for listing as <i>Blue Gum High Forest in the Sydney Basin Bioregion</i> (Blue Gum High Forest), an ecological community which is listed as Critically Endangered under both the BC Act and EPBC Act.</p> <p>NSW BC Act: Blue Gum High Forest as listed in the BC Act is characterised by the species assemblage listed in the NSW Scientific Committee's final determination for the community as critically endangered (NSW Threatened Species Scientific Committee 2011), and the vegetation occurs in the Sydney Basin bioregion.</p> <p>Commonwealth EPBC Act: Occurrences of the Blue Gum High Forest are considered to be part of the nationally listed ecological community if they are greater than one hectare in size and:</p> <ul style="list-style-type: none"> • Have a canopy cover greater than 10%; or • Have a canopy cover less than 10% and occur in areas of native vegetation in excess of five hectares (Threatened Species Scientific Committee 2005) <p>Blue Gum High Forest within the subject land is considered to be listed also under the EPBC Act based on the canopy cover of greater than 10%.</p>
Estimate of percent cleared value of PCT	90% (BioNet 2020) (EES 2020)

PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion

**PCT 1237 – low condition
within the subject land**



Table 3 PCT 1237 - planted

PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (Blue Gum High Forest)	
Vegetation formation	Wet Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	North Coast Wet Sclerophyll Forests
Extent within subject land	0.03 ha
Condition	PCT 1237 mapped within the north east of the subject site was recorded in a planted condition state. The native species exist as a planted row of trees only. There was no native regeneration observed nor were there established natives in the mid or ground strata.
Description	PCT 1237 - planted consisted of a planted row of native canopy trees including Swamp Mahogany, Tallowwood, Red Ironbark and Forest Red Gum. There was no regeneration of native species observed in the mid of ground stratum and the patch was in a highly disturbed state with a high cover of exotic species observed.
Survey effort	One BAM plot/transect
Justification of PCT	PCT 1237 – planted was assigned only due to the presence of planted Forest Red Gum (known to occur in the local variant of Blue Gum High Forest) and the location of the vegetation adjacent to remnant PCT 1237 vegetation.
TEC Status	PCT 1237 – planted within the subject land does not meet the thresholds for listing under the BC Act or EPBC Act.
Estimate of percent cleared value of PCT	90% (BioNet 2020)
PCT 1237 – planted within the subject land	

3.1.6 Threatened ecological communities

Vegetation within the northern boundary of the subject land was found to represent a TEC listed under both the NSW BC Act and the Commonwealth EPBC Act. The TECs recorded within the subject land as detailed in Table 2 above, are provided in Figure 8.

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. This resulted in two vegetation zones identified within the development footprint. Table 4 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 relatively large patch of connecting vegetation with an area of over 600 hectares. Much of this area comprises Cumberland State Forest to the south-east of the subject land.

Patch size classes for each vegetation zone are also outlined in Table 4 below.

Table 4 Vegetation zones within the subject land

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Impact assessment area	Max. patch size development footprint
1237_TEC_Low	PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Low	1	0.27 ha	>100 ha
1237_TEC_Moderate*	PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Moderate	0*	1.04	>100 ha
1237_Planted	PCT 1237 – Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the	Planted	1	0.03 ha	>100 ha

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Impact assessment area	Max. patch size development footprint
	Hornsby Plateau, Sydney Basin Bioregion				

*Note, no plot was able to be undertaken in 1237 moderate, and therefore benchmark values have been utilised.

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 metre x 50 metre quadrat and 50 metre transect for assessment of site attributes and function.
- A 20 metre x 20 metre 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 5 and Figure 6.

Table 5 BAM plots completed within the subject land

BAM plot reference	Vegetation zone
CB_01	1237_TEC_Low
CB_02	1237_Planted

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 was 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 6.

Table 6 Vegetation zone integrity scores

Vegetation zone	Composition score	Structure score	Function score	Vegetation integrity score*	IBRA subregion
1237_TEC_Low	25.0	44.6	64.3	41.5	Cumberland
1237_TEC_Moderate	100	100	100	100	Cumberland
1237_Planted	8.4	7.6	18.0	10.5	Cumberland

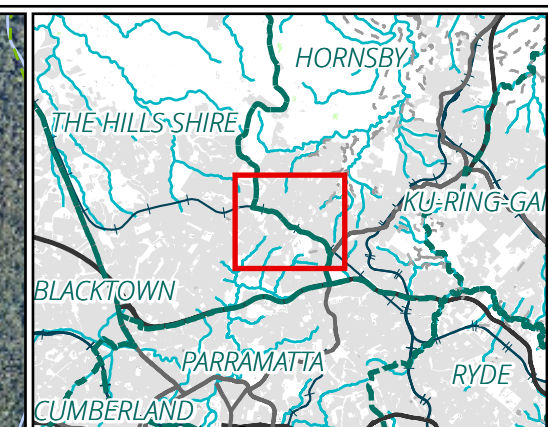
*Benchmark (pristine) condition vegetation would receive a VI score of 100.

As outlined in Section 9.2.1 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 would not be required for vegetation zone 1237_Planted due to its VI score of 10.5.



Legend

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

Figure 4 Native vegetation extent

0 100 200 300 400 500
Metres

Scale: 1:13,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56



Matter: 36800, Date: 31 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F4_NativeVeg
Project: P:\36800s\36800\Mapping\
36800_Cherrybrook_BDAR_updates_current.aprx



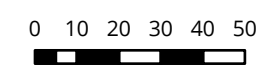
Legend

- Subject land
- Development site - DGL
- Development footprint

Plant Community Type

1237 - Sydney Blue Gum -
Blackbutt - Smooth-barked
Apple moist shrubby open
forest on shale ridges of the
Hornsby Plateau, Sydney Basin
Bioregion

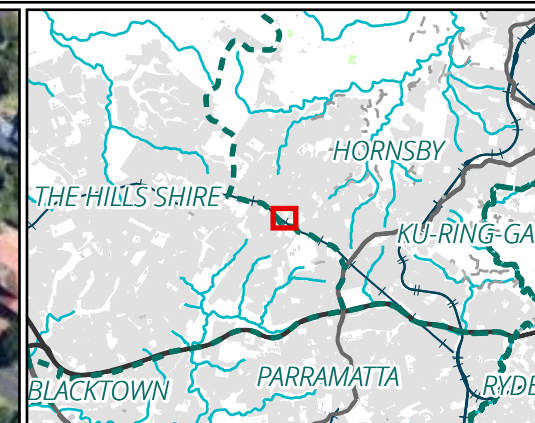
**Figure 5 Vegetation within
the subject land**



Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 56



Matter: 36800, Date: 31 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F5_BiosisVeg
Project: P:\36800s\36800\mapping\
36800_Cherrybrook_BDAR_updates_current.aprx



Legend

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

Vegetation zones

- VZ1 - PCT 1237 Low
- VZ2 - PCT 1237 Moderate
- VZ3 - PCT 1237 Planted

Figure 6 Vegetation zones and plot locations

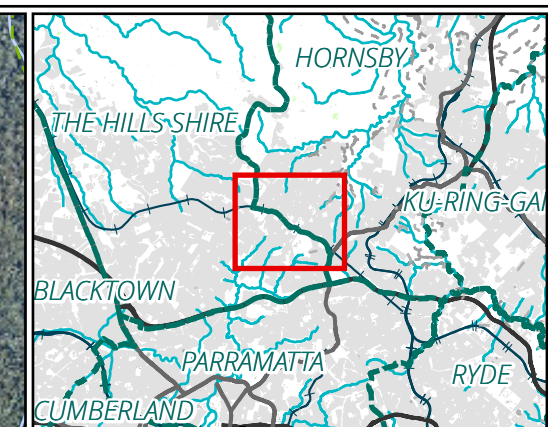


Scale: 1:1,800 @ A3

Coordinate System: GDA 1994 MGA Zone 56



Matter: 36800, Date: 31 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F6_VZ
Project: P:\36800s\36800\Mapping\
36800_Cherrybrook_BDAR_updates_current.aprx



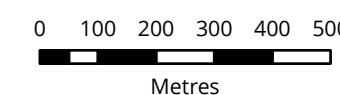
Legend

- Subject land
- Assessment area
- Development site - DGL
- Development footprint

Patch size

- ≥100ha (1237 Low, 1237 Moderate, 1237 Planted)

Figure 7 Patch size locations



Scale: 1:13,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56



Matter: 36800, Date: 31 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F7_PatchSize
Project: P:\36800s\36800\Mapping\
36800_Cherrybrook_BDAR_updates_current.aprx



- Legend**
- Subject land
 - Development site - DGL
 - Development footprint
- Threatened ecological community**
- Blue Gum High Forest in the Sydney Basin Bioregion (Critically Endangered Ecological Community)

Figure 8 Threatened ecological communities within the subject land

0 10 20 30 40 50
Metres
Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 56

biosis

Matter: 36800, Date: 31 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F8_TECs
Project: P:\36800s\36800\Mapping\
36800_Cherrybrook_BDAR_updates_current.aprx

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 7 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 7 Ecosystem credit species (predicted species) with potential to occur

Common name	Species name
Barking Owl	<i>Ninox connivens</i>
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>
Eastern Coastal Freetail-bat	<i>Micronomus norfolkensis</i>
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>
Glossy Black-cockatoo	<i>Calyptorhynchus lathami</i>
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>
Koala	<i>Phascolarctos cinereus</i>
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>
Little Bent-winged Bat	<i>Miniopterus australis</i>
Little Eagle	<i>Hieraaetus morphnoides</i>
Little Lorikeet	<i>Glossopsitta pusilla</i>
Masked Owl	<i>Tyto novaehollandiae</i>
Powerful Owl	<i>Ninox strenua</i>
Regent Honeyeater	<i>Anthochaera phrygia</i>
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>
Superb Fruit-Dove	<i>Ptilinopus superbus</i>
Swift Parrot	<i>Lathamus discolor</i>
Varied Sittella	<i>Daphoenositta chrysoptera</i>
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>

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 candidate 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 assessment area, the PCTs present within subject land, and patch sizes listed in Table 4.

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. Twenty-three 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 or lack of required microhabitat features.

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.

All candidate species credit species considered as part of this assessment are listed in Table 8.

Threatened flora

Habitats for threatened flora species within the subject land are considered highly degraded due to significant infestations of ecosystem transforming weed species such as Lantana, Blackberry and Wandering Jew *Tradescantia fluminensis* in the 'PCT 1237', or subject to historical disturbance in the 'PCT 1237 – planted' vegetation. Targeted habitat assessments and targeted meander surveys were undertaken during the field investigation and any threatened flora species that may have been present would have been detected.

Due to the highly degraded and disturbed nature of the flora habitats within the subject land, no flora species credit species were considered candidates for the BAM assessment. As such, no targeted surveys were undertaken for threatened flora in accordance with the *Surveying threatened plants and their habitats* (DPIE 2016). A description of habitat requirements for each predicted species and justification of exclusion from the candidate species list is provided in Appendix 2 BAM Candidate species assessment.

Threatened fauna

No targeted surveys were undertaken for threatened fauna, as the habitat present within the subject land was considered unsuitable for all but two candidate fauna species, discussed below.

One hollow-bearing tree containing two small hollows was recorded along the north-eastern boundary (Figure 5). This tree provides limited habitat for threatened microbat species given the surrounding disturbances relating to the construction of Cherrybrook Station and the exposed aspect. However, given the proximity of the tree to a water detention basin which can provide potential foraging habitat, the hollow-bearing tree provides suitable habitat for one microbat species, Southern Myotis. Southern Myotis has been assumed present within the subject land. The hollow-bearing tree will not be impacted by the proposed rezoning of the subject land, and is not predicted to be impacted by future development within the subject land (Plate 1).

Areas within the subject land mapped as PCT 1237 contain six Koala feed tree species as listed for the Central Coast Koala Management Area in Schedule 3 of the SEPP Biodiversity and Conservation 2021. These species are Sydney Blue Gum, Blackbutt, Swamp Mahogany, Tallowwood, Red Ironbark and Forest Red Gum. Additionally, the closest Koala record to the subject land occurs approximately 1 kilometre away, and was recorded in 2015 (EES 2020). Koala has been assumed to be present within the subject land. Koala feed trees will not be impacted by the proposed rezoning of the subject land, and are not predicted to be impacted by future development within the subject land.

Blue Gum High Forest within the subject land provides potential roosting habitat for common small bird species, and may provide marginal roosting for threatened owl species such as Powerful Owl. Roosting habitat within this patch of vegetation is considered to be marginal given the understory is predominantly weed species, the area is subject to edge effects and there is an absence of suitable hollows for breeding.

The subject land is considered unlikely to provide habitat for further threatened species, although mobile species may occur on occasion during dispersal or for foraging on eucalypt species during times of peak flowering.

An assessment of the habitats present within the subject land, and the potential for occurrence and impact for all species credit species is provided in Appendix 2 BAM Candidate species assessment. No vegetation, and thus no threatened species habitat, will be impacted by the proposed rezoning of the subject land. Additionally, no vegetation is to be removed by future development of the subject land.

Table 8 Candidate fauna species credit species

Species name	Common name	Survey period	Method of assessment	Biodiversity Risk Weighting
<i>Myotis macropus</i>	Southern Myotis	October-March	Assumed present	2
<i>Phascolarctos cinereus</i>	Koala	All year	Assumed present	2

Stage 2 – Impact assessment (biodiversity values)

5 Avoid and minimise impacts

This section identifies the potential impacts of the proposal on the biodiversity values of the subject land, and includes measures undertaken to date, and additional recommendations to assist the final design of the development, to further avoid and minimise impacts on biodiversity within and surrounding the development site.

5.1 Actions to avoid/minimise project impacts

The principal means to reduce impacts on biodiversity values within the subject land is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered.

Steps undertaken to avoid and minimise impacts to biodiversity are broken down into site selection and planning, construction and operation.

5.1.1 Site selection and planning

The proposed development site has not yet been selected within the subject land, as rezoning of the land must first be approved. However, this report assumes that the future development footprint will avoid all native vegetation within the subject land, to minimise impacts to native vegetation and flora and fauna habitats present within the subject land.

One hollow-bearing tree providing low-quality habitat for threatened species occurs within the subject land and this report also assumes that this tree will not be removed as part of the future proposed development

5.1.2 Construction

Mitigation measures recommended to avoid and minimise indirect impacts to vegetation and habitats during the construction phase of any proposed development include:

- Installation of appropriate exclusion fencing around trees and vegetation to be retained in the subject land and to prevent encroachment on adjacent properties.
- The radius of the tree protection zone (TPZ) is calculated for each tree by multiplying its diameter at breast height (DBH) by 12. ($TPZ = DBH \times 12$) in accordance with the Standards Australia Committee (2009).
- A TPZ should not be less than 2 metres nor greater than 15 metres, except where crown protection is required (Standards Australia 2009).
- This would include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'.
- Identify the location of any 'No Go Zones' in site inductions and a Construction Environmental Management Plan (CEMP).
- All material stockpiles, vehicle parking and machinery storage will be located within cleared areas proposed for clearing, and not in areas of native vegetation that are to be retained.
- Where appropriate, any native vegetation cleared from the subject land should be mulched for re-use on the site, to stabilise bare ground.
- Wet down areas to reduce dust generation during construction.

- Implementation of temporary stormwater controls during construction and to ensure that discharges to the drainage channels are consistent with existing conditions.
- Sediment and erosion control measures should be implemented prior to construction works commencing (e.g. silt fences, sediment traps), to protect the drainage channels to the west and to the south. These should conform to relevant guidelines, should be maintained throughout the construction period and should be carefully removed following the completion of works.

Prescriptions for mitigation of potential impacts of construction activities on retained native vegetation and habitat should be addressed in a site-specific CEMP. The CEMP should include all measures outlined above.

5.1.3 Operation

The following recommendations are made to avoid impacts resulting from 'operation' of the proposed development:

- Any lighting required around the facility should point towards the development and not into surrounding vegetated areas.
- Adequate stormwater control measures to direct water flowing from the future development into existing stormwater systems and away from retained native vegetation.
- On-going treatment of exotic or priority weed species from within retained vegetation should be undertaken to assist resilience and vegetation quality.

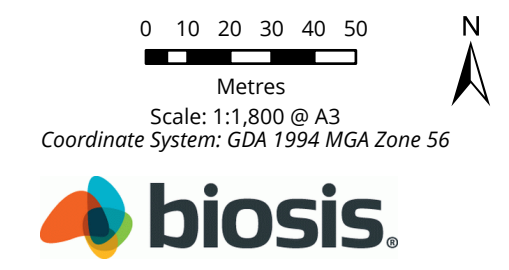
Opportunities to protect the retained patch of Blue Gum High Forest CEEC vegetation within the subject land, and the continuation of that patch to the north, may include items such as:

- The transfer of ownership of the Blue Gum High Forest to Council, to manage as an asset for Natural Resources. This would be subject to funding, and would require further discussions with Council, Landcom and/or a future developer.
- Alternately, establishment of a private land conservation agreement with the Biodiversity Conservation Trust under Part 5 of the BC Act to ensure in-perpetuity conservation of the TEC. Such agreements include Biodiversity Stewardship Agreements, Conservation Agreements, and Wildlife Refuge Agreements.
- Incorporate the retained vegetation into the future green-space plan and provide pedestrian access and cycleway around the retained vegetation. Ensure educational signage (or similar) should be provided that informs future residents of the highly threatened nature of the vegetation and the habitat that it provides for threatened species likely to occur in the area.
- Whilst it may result in some level of impact to the vegetation remnant, investigate opportunities to provide low-impact pedestrian access through the vegetation, such as on raised boardwalks located in low impact areas. This will allow future residents some low-impact access into the vegetation, rather than excluding the local community, which is more likely to encourage unauthorised access.
- Consider exclusion fencing to prevent access to the retained vegetation, however it is expected that exclusion fencing is likely to result in unauthorised access and potential vandalism.



- Legend**
- Subject land
 - Development site - DGL
 - Development footprint
 - Hollow-bearing tree
- Vegetation zones**
- VZ1 - PCT 1237 Low
 - VZ2 - PCT 1237 Moderate
 - VZ3 - PCT 1237 Planted
- Threatened ecological community**
- Blue Gum High Forest in the Sydney Basin Bioregion
 - Critically Endangered Ecological Community

Figure 9 Final development footprint



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

There will be no direct impacts on biodiversity arising from the rezoning of the subject land. If future development is to be proposed within the subject land after rezoning has occurred, it has been assumed that the development footprint will not remove any native vegetation, and thus will also have no direct impacts on biodiversity values.

6.2 Indirect impacts

Potential indirect impacts arising from the project are outlined and addressed in Table 9 and shown in Figure 10.

Table 9 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 and implementation of a CEMP detailing best practice environmental protection measures.
Reduced viability of adjacent habitat due to edge effects.	Adjacent habitats are currently subject to a high degree of edge effects due to surrounding existing residential development. As no native vegetation is to be removed from the subject land, no increased edge effects will occur to the remnant vegetation in the north of the subject land.
Reduced viability of adjacent habitat due to noise, dust or light spill.	As both the patches of native vegetation are to be retained, it is not predicted that the adjacent habitat to the north of the development site will be impacted substantially by noise, dust or light spill, during construction or operation of the future development of the subject land. The subject land also already occurs next to existing residential areas, and a construction site and metro station, and light and noise pollution is most likely moderate to high. This will likely not increase due to the proposed rezoning or future development.
Transport of weeds and pathogens from the site to adjacent vegetation.	Weeds occurring within the subject site are common with those occurring within adjacent vegetation to be retained. Vegetation retained is in similar condition and increased transport of pathogens and weeds is unlikely to occur, and 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.	No hollow-bearing trees will be removed from the subject land and the habitat present is considered marginal for most fauna species given the disturbed condition. The proposed rezoning and future development will not increase risk of starvation, exposure and loss of shade or shelter to native species.
Loss of breeding habitats.	No specialist breeding habitat will be impacted by the proposed rezoning or future development. Retained vegetation in adjacent lots provides similar 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 restricted to areas having undergone significant previous disturbance and would not result in the removal of any areas of deep rooted vegetation. 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.	No fertiliser is proposed to be used.
Rubbish dumping.	If future development is proposed within the subject land, standard environmental controls would ensure potential impacts are minimised. Works would follow an approved Waste Management Plan.
Wood collection.	Future development proposed within the subject land has the potential to increase access to the retained vegetation to the north, however this vegetation currently occurs on private land. Opportunities to incorporate this vegetation into future green space are being explored, however access opportunities will be limited and the retained vegetation will be protected. Based on the expected future built form of the development site being high density residential, future residents are not expected to be likely to undertake wood collection within the retained vegetation to a level that it will have a detrimental effect. The community will be educated regarding the high conservation significance of the vegetation and as such unauthorised access and collection of wood is expected to be minimal.
Bush rock removal and disturbance.	The subject land does not support bush rock.
Increase in predatory species populations.	No vegetation is to be removed from the subject land, and the subject land already occurs within an urbanized setting with pets such as domestic cats common, and thus the project is unlikely to increase predatory species populations.

Indirect impact	Assessment / likelihood of occurrence
Increase in pest animal populations.	<p>The proposal occurs in a highly urbanized area with impacts including introduced domestic pets 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 Greater Sydney 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.</p> <p>Suitable waste disposal implemented during and post construction will further reduce the resources available for pest species.</p>
Increased risk of fire.	<p>The proposal occurs in a highly urbanized area and will not result in removal of native 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.</p>
Fragmentation of movement corridors.	<p>Movement corridors are currently restricted in width and availability through the locality. The project will not remove native vegetation, and thus will not further fragment movement corridors.</p>

6.3 Prescribed impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 10 below and shown in Figure 11

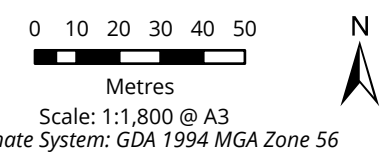
Table 10 Assessment of prescribed impacts

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. No threatened species or communities associated with rocks, outcropping or bushrock will be impacted by the rezoning or future development.
Occurrences of human-made structures and non-native vegetation	No human-made structures will be impacted by the rezoning or future development. Any non-native vegetation that may be removed by the proposed works is considered to provide limited habitat for threatened species.
Corridors or other areas of connectivity linking habitat for threatened entities	As no vegetation is likely to be removed by the rezoning or future development of the subject land, no impacts on the connectivity of threatened species habitat are predicted. As no vegetation is likely to be removed by the rezoning or future development of the subject land, no impacts on the movement of threatened species are predicted.
Water bodies or any hydrological processes that sustain threatened entities	A water detention basin occurs within the subject land, which may provide foraging habitat for Southern Myotis. The basin appears to be of low foraging quality, and several creek lines occur within the locality, providing alternate foraging habitat for Southern Myotis (Figure 2). If the detention basin is removed as part of any future development of the subject land (e.g. undergrounded), it is not considered likely to have a significant or substantial impact on Southern Myotis.
Protected animals that may use the proposed wind farm development site as a flyway or migration route	This prescribed impact is not applicable.
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Previous and ongoing works within the development site means that vehicles in the area are common and would not be increased by the rezoning or future development of the subject land. However due to the potential presence of Koala within the subject land, mitigation measures to reduce the likelihood of vehicle strikes should be implemented if development is to occur.

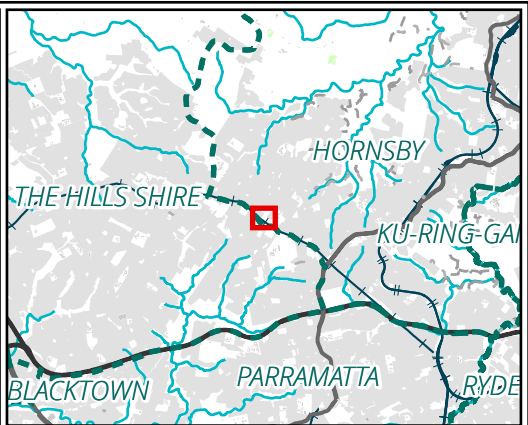


- Legend**
- Subject land
 - Development site - DGL
 - Development footprint
- Prescribed impacts**
- Southern Myotis *Myotis macropus* potential foraging habitat

Figure 10 Prescribed impacts

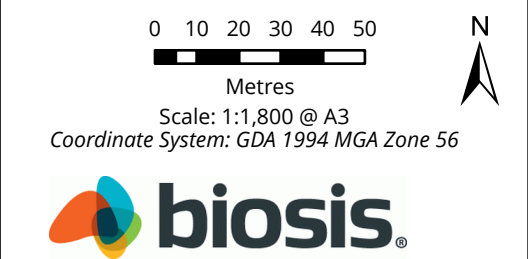


Matter: 36800, Date: 29 March 2022,
GIS: JB, Checked by: CW, Last edited by: jbeckius
Layout: 36800_F10_Impacts
Project: P:\36800s\36800\mapping\36800_Cherrybrook_BDAR_updates_current.aprx



- Legend**
- Subject land
 - Development site - DGL
 - Development footprint
 - Estimated zone of indirect impact

Figure 11 Estimated zones of indirect impact for the proposal



6.4 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. The subject land is not mapped as supporting GDEs.

6.5 Adaptive management strategy

Following rezoning, any future development will have construction and operational management plans detailing required mitigation measures and all containing 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.

7 Impact summary

7.1 TECs and threatened species

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

- Addressing all criteria for each TEC listed as at risk of an SAI present on the subject land.
- Addressing all criteria for each threatened species at risk of an SAI present on the subject land.
- Documenting all sources of data, information, references used or consulted.
- Identification of impacts requiring offset.
- Identification of impacts not requiring offset.
- Identification of areas not requiring offset.

Figure 12 shows the location of impacts requiring offset, impacts not requiring offset and areas not requiring assessment.

7.2 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:

- 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.*
- 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.*
- 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.*
- 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.*

No native vegetation or habitat is to be removed as part of the rezoning or future development of the subject land. One TEC (Blue Gum High Forest in the Sydney Basin Bioregion) and two threatened fauna species (Southern Myotis and Koala) listed under the BC Act have been recorded or assumed present within the subject land. However, no areas of the threatened ecological community and no areas of native vegetation associated with threatened fauna will be removed as part of any future proposed development. One sediment basin within the subject land, and will not be impacted, provided potential foraging habitat for Southern Myotis, however, this habitat is considered to be of low quality and alternate habitat occurs within the locality. Should the basin be removed as part of any future development, it is unlikely to have a significant impact on Southern Myotis, however further assessment may be required.

As such, no potential serious and irreversible impacts on biodiversity values have been recorded or assessed as likely to occur as part of the current assessment.

7.3 Identification of impacts requiring offset

7.3.1 Impacts to native vegetation and predicted threatened species (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.

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 .

All direct impacts to PCTs and the threatened species habitat they support will be avoided by future development within the subject land.

As no native vegetation would be directly or indirectly impacted by rezoning or by future development, no offsetting of ecosystem credits is required.

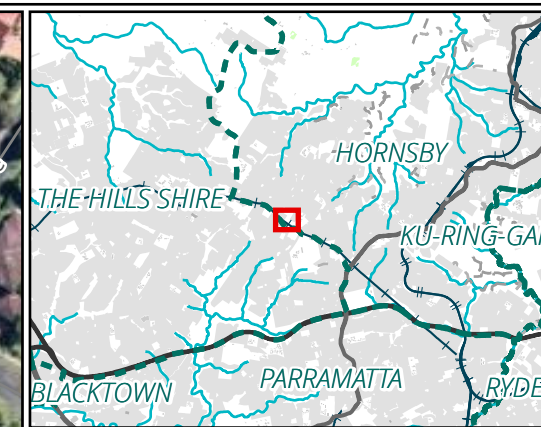
7.3.2 Impacts to threatened species and their habitat

Vegetation associated with two threatened fauna species, Southern Myotis and Koala, was recorded within the subject land. However, this habitat will not be impacted by the rezoning or the future development of the subject land. Thus, in accordance with Section 10 of the BAM, no offsets are required for impact to species credit species

7.4 Identification of impacts not requiring offset

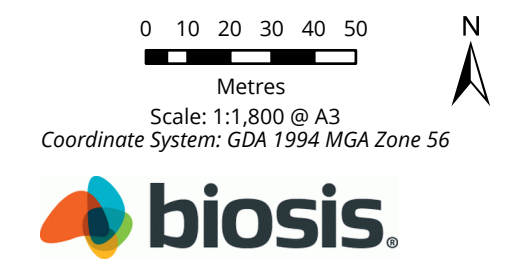
Following the assessment, and the absence of direct impacts, areas that do not require offsetting in accordance with BAM:

- The proposed development footprint would not directly impact any native vegetation, therefore, it is not required to be assessed other than for threatened species habitat and prescribed impacts in accordance with Chapters 5 and 6 of the BAM
- PCT1237_Planted, as the site value score is <15.



- Legend**
- Subject land
 - Development site - DGL
 - Development footprint
- Plant Community Type**
- 1237 - Sydney Blue Gum - Blackbutt - Smooth-barked
 - Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion
- Impacts not requiring offset**
- Development footprint
 - Southern Myotis *Myotis macropus* potential foraging habitat

Figure 12 Impacts not requiring offset



8 Biodiversity credit report

Offsetting through the transfer and retirement of biodiversity credits is not required for the proposed rezoning or future development of the subject land because:

- Proposed works will avoid impacts to native vegetation.
- Proposed works will avoid impacts to threatened species and their habitats.
- Proposed works would not result in prescribed impacts substantive enough to warrant retirement of credits.

The credit requirement for the current assessment is zero due to the avoidance of impact to all native vegetation. However, it is a limitation of the BAM-C that a *BAM Credit Summary Report* reflecting a zero credit obligation could not be exported and included here.

9 Assessment against biodiversity legislation

9.1 Environment Protection and Biodiversity Conservation Act 1999

An assessment of the impacts of the proposed development on Matters of National Environmental Significance (MNES), against heads of consideration outlined in the MNES Significant Impact Guidelines (CoA 2013) was undertaken to determine whether referral of the proposed development to the Commonwealth Minister for the Environment is required. Matters of NES relevant to the proposed development are summarised in Table 11.

Table 11 Assessment of the proposed development against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	EPBC listed threatened species previously recorded within the locality include 17 flora species and 10 fauna species. Of these, one species, Koala, is predicted to occur within the subject land. As there will be no native vegetation removed impacts to Koala are considered negligible. The subject land is unlikely to support any other EPBC Act listed threatened species.	Significant impact unlikely to occur as a result of the proposed rezoning or development.
Threatened ecological communities	One EPBC listed TEC, Blue Gum High Forest in the Sydney Basin Bioregion, occurs within the subject land, in low condition. However, none of this TEC will be removed as part of the proposed rezoning or future development within the subject land. Thus, no further assessment has been undertaken.	Significant impact unlikely to occur as a result of the proposed rezoning or future development.
Migratory species	Migratory species have the potential to occur within the subject land on a transient basis. However, vegetation outside the subject land provides higher quality foraging and breeding habitat for these species.	Significant impact unlikely to occur as a result of the proposed rezoning or future development
National Heritage Place	The subject land is not located within a National Heritage Place.	No potential for impact as a result of the proposed rezoning or future development.
Wetlands of international importance (Ramsar sites)	No wetlands of international importance occur within or nearby to the subject land.	No potential for impact as a result of the proposed rezoning or future development.

On this basis, the EPBC Act is unlikely to be triggered and referral of the proposed rezoning or future development to the Commonwealth Minister for the Environment will not be required.

9.2 Environmental Planning and Assessment Act 1979

9.2.1 SEPP Biodiversity and Conservation 2021

Chapter 4: Koala Habitat Protection 2021

Chapter 4 of the SEPP Biodiversity and Conservation must be considered within any development application for land that:

- Is within an LGA listed on Schedule 2 of the SEPP Biodiversity and Conservation 2021
- Is 1 hectare or more.
- Does not have an approved Koala Plan of Management applying to it.

As the proposed rezoning of the subject land does not require a development application, the SEPP does not need to be addressed in this case. However, the SEPP does make recommendations for the zoning of land that falls within the above category.

The subject land to be rezoned is 8.75 hectares and does not have an approved Koala Plan of Management. In this case, the SEPP recommends that Council, where practical, rezone such an area of land to environmental zone (E Zone), in order to protect existing Koala habitat. However, the department recognises that this isn't always practical, and that the continuation of the existing land use should be considered (DPIE 2021). As the use of land surrounding the Cherrybrook Metro Station for housing and commercial purposes is essential in encouraging public transport usage, and will provide public benefit, it is not recommended that the subject land be rezoned as E Zone.

Additionally, if future development of the subject land is subject to an SSDA, of which Council is not an approval body, future development will not need to consider Chapter 4: Koala Habitat Protection 2021.

9.2.2 Biosecurity Act 2015

The Biosecurity Act provides for the identification, classification and control of Priority Weeds with the purpose of determining if a biosecurity risk is likely to occur. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within the State or any part of the State. A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

One Priority Weed for the Greater Sydney Local Land Services Region (*Lantana camara*) was recorded in the subject land. If future development is proposed within the subject land, a biosecurity management plan should be prepared as part of the project's CEMP.

9.3 Water Management Act 2000

Works are not proposed within 40 metres of the top of the bank along any watercourse. Thus, a controlled activity permit under the WM Act is not required.

9.4 Hornsby Local Environmental Plan 2013 and Hornsby Development Control Plan 2013

Landcom proposes a site specific amendment to the Hornsby Local Environmental Plan 2013 (Hornsby LEP) for changes to zoning of the subject land, as well as maximum building height and floor space ratio controls,

to support the transport oriented development surrounding the Cherrybrook Metro Station. The key outcome of the land rezoning and future development will be:

- To facilitate a mixed use local centre at Cherrybrook Station.
- To deliver public benefit through the mixed use local centre, including through community facilities, affordable housing and quality open spaces.
- To deliver transport and movement initiatives and benefits, including reducing public transport usage and reducing car dependency.

It is assumed that future development of the subject land will be undertaken in accordance with the amended Hornsby Local Environmental Plan 2013 and relevant sections of the Hornsby Development Control Plan 2013.

10 Conclusion

The proposed rezoning of the subject land will not result in direct or indirect impacts on native vegetation, TECs, threatened species or their habitats. All future proposed development within the subject land will also avoid impacts to these biodiversity values.

This includes the avoidance of one TEC, Blue Gum High Forest listed as Critically Endangered under the BC Act and EPBC Act, and habitat for 18 fauna species predicted to occur by the BAM calculator due to the presence of PCT 1237. As no native vegetation is being removed from the subject land, no ecosystem credits are required to offset impacts to vegetation zones identified within the subject land.

This assessment assumes the presence of two threatened fauna species credit species, Southern Myotis and Koala, within the subject land. However, as no native vegetation will be removed from the subject land, no species credits are required to offset impacts to these species. A water detention basin occurs within the subject land which may provide sub optimal foraging habitat for Southern Myotis. It is currently unclear as to whether this basin will be retained as part of any future development of the subject land. However, the basin appears to be of low foraging quality, and alternate foraging habitat occurs within the locality. The removal of the detention basin is not considered likely to have a significant or substantial impact on Southern Myotis. No threatened flora species were considered to be candidate species, and thus will not be impacted by the proposed project.

Matters of NES are not likely to be significantly impacted by the proposed development and as such, a referral of the project to the Commonwealth is not required.

The project should proceed as planned, however if any future development within the subject land involves the removal of native vegetation, this assessment will need to be revised and the impacts to biodiversity values reassessed.

Furthermore the data collected and relied upon for this assessment is only considered current for a period of five years. As such, if a development proposal is not lodged before the end of June 2024, field data will need to be recaptured and the assessment updated.

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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 2000, 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 maintained by the DAWE (DSEWPaC 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 May 2022). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Callan Wharfe (BAAS 18138).

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 July during dry, cool weather. No targeted searches for threatened flora or fauna were conducted as part of the assessment, and so this was an appropriate time for the field survey.

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 subject land, 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	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
<i>Galium austral</i> Tangled Bedstraw	-	E1	Yes	Low	No	Nil	No	No Turpentine forest or Acacia scrubland occur within the subject land. More suitable habitat is located within the nearby Berowra Valley Regional Park. Furthermore potential habitat for threatened flora within the subject land was substantially degraded and infested by exotic species in the understorey.	In NSW most species have been found within Turpentine forest and coastal Acacia scrubland.
<i>Grammatis stenophylla</i> Narrow-leaf Finger Fern	-	E1	Yes	Low	No	Nil	No	The vegetation within the subject land is highly disturbed and is dominated by noxious species. There is much more suitable habitat within the Berowra Valley Regional Park, where the only nearby sighting was recorded. Furthermore potential habitat for threatened flora within the subject land was substantially degraded and infested by exotic species in the understorey.	Occurs in moist locations usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
<i>Hibbertia spanantha</i> Julian's Hibbertia	CE	E4A	Yes	Low	No	Nil	No	The species is restricted to four known locations. Suitable habitat canopy species are not present within the subject land. The understorey within the subject land is dominated by noxious species such as Lantana, making it unsuitable as habitat for this species. Furthermore potential habitat for threatened flora within the subject land was substantially degraded and infested by exotic species in the understorey.	Grows in forest with canopy species including <i>Eucalyptus pilularis</i> , <i>E. resinifera</i> , <i>Corymbia gummifera</i> and <i>Angophora costata</i> . Prefers an open understorey.
<i>Rhodania rubescens</i> Scrub Turpentine	-	CE	Yes	Low	No	Nil	No	The vegetation within the subject land is highly disturbed and is dominated by noxious species. There is much more suitable habitat within the locality, and most records sightings have been recorded along local creeklines. Furthermore potential habitat for threatened flora within the subject land was substantially degraded and infested by exotic species in the understorey.	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest, usually on volcanic and sedimentary soils.
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	V	E1	Yes	Low	No	Nil	No	The vegetation within the subject land is highly disturbed and is dominated by noxious species.	Occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
								No appropriate rainforest habitat was recorded within the subject land. Furthermore potential habitat for threatened flora within the subject land was substantially degraded and infested by exotic species in the understorey.	(coastal) rainforest.
<i>Tetratheca glandulosa</i>	-	V	Yes	Low	No	Nil	No	No suitable habitat for this species occurs within the subject land. Nearby suitable habitat is located within the Berowra Valley Regional Park, where all nearby sighting have been recorded. Furthermore potential habitat for threatened flora within the subject land was substantially degraded and infested by exotic species in the understorey.	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone. The plant occurs on ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches.

Table A. 2 Threatened fauna species assessment

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
<i>Anthochaeras phrygia</i> Regent Honeyeater	CE	E4A	Yes	Low	No	Nil	No	Records within the locality are greater than 20 years old. This species breeds in a small number of known locations. The subject land provides suitable foraging habitat only. The subject land is outside of mapped 'Important areas' for this species	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	-	V, E2	Yes	Low	No	Nil	No	No suitable breeding habitat (hollows > 9cm) was present within the subject land.	Found in tall mountain forests and woodlands in summer and spring, and moves into drier more open eucalypt forest in autumn and winter. Favours old growth forest and woodland for nesting and roosting, using hollows 10cm or larger in diameter and at least 9m off the ground.
<i>Calyptorhynchus lathamii</i> Glossy Black-cockatoo	-	V	Yes	Low	No	Nil	No	Potential foraging habitat exists within the subject land, however is of low quality. Breeding habitat (hollows > 15cm) does not exist within the subject land.	Found in open forests and woodlands where stands of She-oak occur.
<i>Cercartetus nanus</i> Eastern Pgymy-	-	V	Yes	Low	No	Nil	No	The vegetation within the subject land is highly disturbed, and is	Prefers woodlands and heath, but can inhabit a broad range of

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
possum								lacking native mid-storey. No banksias or bottlebrushes are present. The habitat is not considered suitable for Eastern Pygmy-possum.	habitats including rainforest and sclerophyll forest. Feeds largely on nectar collected from banksias, eucalypts and bottlebrushes. Shelters in tree hollows, stumps, bird nests and thickets.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	Yes	Low	No	Nil	No	The subject land occurs within 2 kilometres of sandstone geologies that may support breeding habitat for the species, however as no native vegetation is being removed by the rezoning or future development impact to forage habitat associated with vegetated areas will not occur.	Found in well-timbered areas containing gullies. Roosts in caves, crevices and cliffs.
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	E1	V	No	Low	No	Nil	No	The vegetation of the subject land is highly disturbed, and does not contain appropriate den sites such as caves or large hollows. The lack of medium and large hollows means that there is unlikely to be an abundance of prey for the species such as possums or gliders.	Found in a range of habitats including rainforest, open forest, woodland, coastal heath and inland riparian forest. Den sites include hollow-bearing trees, fallen logs, caves, rock outcrops and rocky cliff faces.
<i>Hieraaetus morphnoides</i> Little Eagle	-	V	Yes	Low	No	Nil	No	No suitable breeding habitat within subject land.	Found in eucalypt forest, woodland or open woodland. Nests in tall living trees within a

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
									remnant patch.
<i>Lathamus discolor</i> Swift Parrot	CE	E1	Yes	Low	No	Nil	No	No breeding habitat exists within the mainland of Australia. The subject land is outside of mapped 'Important areas' for this species.	Found where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.
<i>Litoria aurea</i> Green and Golden Bell Frog	V	E1	Yes	Low	No	Nil	No	No suitable habitat exists within the subject land for this species although suitable habitat may exist within the wider locality. While there is a detention basin within the subject land, it does not contain any vegetation and is partially shaded, deeming it unsuitable as breeding habitat for the species.	Inhabits mostly unshaded marshes, dams and stream-sides, particularly those containing bullrushes or spikerushes.
<i>Miniopterus australis</i> Little Bent-winged Bat	-	V	Yes	Low	No	Nil	No	No suitable breeding habitat occurs within the subject land. The species breeds in large groups and the small tree hollows present within the subject land could not support this.	Inhabits eucalypt forest, rainforest, vine thicket, sclerophyll forests, melaleuca swamps, dense coastal forests and banksia scrub. Found in well-timbered areas. Roosts in caves, tunnels, tree hollows, culverts and bridges. Large maternity colonies form in spring, and only five nursery sites/ maternity colonies are known in Australia.
<i>Miniopterus orianae oceanensis</i>	-	V	Yes	Low	No	Nil	No	No suitable breeding habitat (caves, tunnels or accessible	Primarily roosts within caves and man-made structures such as

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/ undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
Large Bent-winged Bat								buildings) occurs within the subject land.	tunnels, mines and buildings. Forms discrete populations centred on a maternity roost that is used annually. Hunts in forested areas.
<i>Myotis macropus</i> Southern Myotis	-	V	Yes	Moderate	No (assumed present)	Nil	Yes	Two small hollows are present within the subject land, potentially providing roosting habitat for Southern Myotis. A large detention basin is also present, providing potential foraging habitat.	Roosts close to hollow-bearing trees, caves, mineshafts, buildings or bridges. Forages over streams and pools.
<i>Ninox connivens</i> Barking Owl	-	V	Yes	Low	No	Nil	No	No suitable breeding habitat (hollows > 20cm) within subject land.	Found in woodland and open forest including remnants and farmland. Roosts in tree canopies with dense foliage. Breeds in hollows of large, old trees.
<i>Ninox strenua</i> Powerful Owl	-	V	Yes	Low	No	Nil	No	No suitable breeding habitat (hollows > 20cm) within subject land.	Found in a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It roosts by day in dense vegetation. It nests in large tree hollows at least 0.5m deep in trees at least 150 years old.
<i>Phascolarctos cinereus</i> Koala	V	V	Yes	Moderate	No (assumed present)	Nil	Yes	Six Koala feed tree species (Sydney Blue Gum, Blackbutt, Swamp Mahogany, Tallowwood, Red Ironbark and Forest Red Gum)	Found in eucalypt woodlands and forests containing specific feed tree species as listed in the Koala Habitat Protection SEPP 2019.

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
								listed in the Koala Habitat Protection SEPP 2019 for the Central Coast Koala Management Area are present within the subject land. The closest Koala record to the subject land occurs approximately one kilometre away, and was recorded in 2015.	
<i>Pommerhelix duralensis</i> Dural Woodland Snail	E	E1	Yes	Low	No	Nil	No	Species habitat requirements are not met by the subject land. Dense weedy understory has prevented suitable habitat from accumulating. The subject land does not contain suitable soils and lacks in rocky substrate features.	Found in communities in the interface region between shale-derived and sandstone-derived soils. Shelters under rocks and curled-up bark.
<i>Pseudophryne australis</i> Red-crowned Toadlet	-	V	Yes	Low	No	Nil	No	No suitable habitat (wet drainage lines below sandstone ridges) occurs within the subject land.	Found in open forests mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Breeding occurs in dense vegetation and debris beside ephemeral creeks and gutters.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	Yes	Low	No	Nil	No	This species has high site fidelity of maternity camps. There are no known camps within the subject land and no roosting Grey-headed	Occurs in rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and

Species	Conservation status		BAM Predicted SCS	Potential occurrence in subject land	Survey required/undertaken	Potential for impact	BAM Candidate species	Candidate species rationale	Habitat description
	EPBC	BC							
								Flying-fox were detected during the habitat assessment. Species may forage on the eucalypt blossom within the site as part of a larger home range, however no trees are being removed.	cultivated fruit crops. Roosting camps are found within 20km of a regular food source and are commonly in gullies, close to water, in vegetation with a dense canopy.
<i>Tyto novaehollandiae</i> Masked Owl	-	V	Yes	Low	No	Nil	No	No suitable breeding habitat (hollows > 20cm) within subject land.	Found in dry eucalypt forests and woodlands up to 1100 m. Hunts along edges of forests and roadsides. Breeds in large hollows within moist eucalypt forested gullies.

Appendix 3 BAM Plot data

Appendix 3.1 BAM plot field data

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

Plot number	Scientific Name	Growth form	% Cover	Abundance
Native species				
CB_01	<i>Acacia decurrens</i>	Tree (TG)	1	20
CB_01	<i>Acacia implexa</i>	Shrub (SG)	10	10
CB_01	<i>Adiantum aethiopicum</i>	Fern (EG)	0.2	50
CB_01	<i>Allocasuarina torulosa</i>	Tree (TG)	0.2	20
CB_01	<i>Bursaria spinosa</i>	Shrub (SG)	0.2	1
CB_01	<i>Clematis aristata</i>	Other (OG)	1	3
CB_01	<i>Commersonia fraseri</i>	Shrub (SG)	0.1	1
CB_01	<i>Dianella caerulea</i>	Forb (FG)	0.2	10
CB_01	<i>Entolasia marginata</i>	Grass & grasslike (GG)	0.1	1
CB_01	<i>Eragrostis brownii</i>	Grass & grasslike (GG)	0.2	5
CB_01	<i>Eucalyptus saligna</i>	Tree (TG)	50	5
CB_01	<i>Glycine clandestina</i>	Other (OG)	0.1	2
CB_01	<i>Lomandra longifolia</i>	Grass & grasslike (GG)	2	30
CB_01	<i>Microlaena stipoides</i>	Grass & grasslike (GG)	50	500
CB_01	<i>Oplismenus aemulus</i>	Grass & grasslike (GG)	0.2	20
CB_01	<i>Pandorea pandorana</i>	Other (OG)	0.1	1
CB_01	<i>Pittosporum undulatum</i>	Shrub (SG)	0.1	1
CB_01	<i>Solanum prinophyllum</i>	Forb (FG)	0.1	3
CB_02	<i>Eucalyptus fibrosa</i>	Tree (TG)	4	1
CB_02	<i>Eucalyptus microcorys</i>	Tree (TG)	3	1
CB_02	<i>Eucalyptus robusta</i>	Tree (TG)	3	1
CB_02	<i>Eucalyptus tereticornis</i>	Tree (TG)	10	1
CB_02	<i>Oplismenus aemulus</i>	Grass & grasslike (GG)	0.2	30
Exotic species				
CB_01	<i>Ageratina adenophora</i>	-	0.2	20
CB_01	<i>Asparagus aethiopicus</i>	-	0.1	2
CB_01	<i>Asparagus asparagoides</i>	-	0.1	1
CB_01	<i>Bidens pilosa</i>	-	20	30
CB_01	<i>Ehrharta erecta</i>	-	0.1	10
CB_01	<i>Lantana camara</i>	-	3	5
CB_01	<i>Ligustrum lucidum</i>	-	0.1	10
CB_01	<i>Ligustrum sinense</i>	-	20	20
CB_01	<i>Lonicera japonica</i>	-	2	500
CB_01	<i>Ranunculus repens</i>	-	20	1000

Plot number	Scientific Name	Growth form	% Cover	Abundance
CB_01	<i>Rubus fruticosus</i>	-	50	30
CB_01	<i>Senna pendula</i> var. <i>glabrata</i>	-	20	10
CB_01	<i>Stellaria media</i>	-	0.1	2
CB_01	<i>Tradescantia albiflora</i>	-	50	500
CB_02	<i>Bidens pilosa</i>	-	0.2	50
CB_02	<i>Cenchrus clandestinus</i>	-	0.4	1000
CB_02	<i>Conyza bonariensis</i>	-	0.1	3
CB_02	<i>Ehrharta erecta</i>	-	10	30
CB_02	<i>Euphorbia terracina</i>	-	0.1	1
CB_02	<i>Ligustrum sinense</i>	-	0.1	1
CB_02	<i>Plantago lanceolata</i>	-	0.1	2
CB_02	<i>Rumex crispus</i>	-	0.1	1
CB_02	<i>Senecio madagascariensis</i>	-	0.1	5
CB_02	<i>Sida rhombifolia</i>	-	0.1	2
CB_02	<i>Solanum pseudocapsicum</i>	-	0.1	6
CB_02	<i>Stellaria media</i>	-	5	100
CB_02	<i>Verbena bonariensis</i>	-	0.1	1

Table A. 4 BAM plot attribute summary

Plot	PCT	Area	PatchSize	Cond.	Zone	Easting	Northing	Bearing	compTree	compShrub	compGrass
CB_01	1237	0.27	101	TEC_Low	56	317771.1	6265468	210	3	4	5
CB_02	1237	0.03	101	Weedy	56	317892.1	6265345	315	4	0	1
Plot	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees
CB_01	2	1	3	51.2	10.4	52.5	0.3	0.2	1.2	0	0
CB_02	0	0	0	20	0	0.2	0	0	0	0	0
Plot	funLitterCover	funLenFallenLogs	funTreeStem5to10	funTreeStem10to20	funTreeStem20to30	funTreeStem30to50	funTreeStem50to80	funTreeRegen	funHTE		
CB_01	53	22	1	1	1	1	0	1	115.6		
CB_02	19	0	0	1	1	1	1	0	10.7		