

BANKSTOWN NORTH PUBLIC SCHOOL

SSD-10290 Proposed School Re-development
Biodiversity Development Assessment Report

Prepared for:
JDH Architects
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DARLINGHURST NSW 2010

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with JDH Architects (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
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EXECUTIVE SUMMARY

SLR Consulting has been engaged to prepare a Biodiversity Development Assessment Report in accordance with the NSW Biodiversity Assessment Method for the proposed re-development of Bankstown North Public School in Bankstown, NSW. This project is deemed to be state significant development and therefore the project will be determined under Section 4.12(8) of the NSW Environmental Planning and Assessment Act 1979 and Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

One native plant community PCT 849 - Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion has been recorded and approximately 0.59 hectares mapped across the site. The vegetation around the site peripheries is in 'moderate to good' condition and constitutes Cumberland Plain Woodland in the Sydney Basin Bioregion, which is listed as a 'critically endangered ecological community' under the NSW Biodiversity Conservation Act 2016. The vegetation in the centre of the site is in 'low' condition and does not constitute the 'critically endangered ecological community'.

None of the PCT 849 vegetation on the site qualifies as the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, a 'critically endangered ecological community', as listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, as it does not meet the condition thresholds listed within the conservation advice.

The development footprint will impact one vegetation zone 'PCT 849_Moderate-good', which has been sampled using a single BAM plot. The BAM plot was collected by an accredited assessor, returning a vegetation integrity score of 38.9. The areas of 'PCT 849_Low' are proposed to be removed via a separate application and have not been sampled using a BAM Plot. The remaining parts of the site comprise developed land and exotic vegetation.

The assessment reveals that the proposed development will require the removal of 0.03 ha of PCT 849, which also constitutes Cumberland Plain Woodland 'critically endangered ecological community' as listed under the BC Act. This impact has been assessed in accordance with the BAM, resulting in an offset requirement of one ecosystem credit for PCT 849 or PCT 850. The proponent has chosen to retire biodiversity credits under the credit trading system as an alternative to making a payment into the Biodiversity Conservation Fund.

The Cumberland Plain Woodland 'critically endangered ecological community' is a potential Serious and Irreversible Impact entity. However, the assessment has determined that the proposal will involve the clearing of a very small percentage of Cumberland Plain Woodland across the sub-region. The small amount of vegetation to be cleared also expresses a low vegetation integrity and therefore clearing 0.03 ha of degraded Cumberland Plain Woodland to facilitate the proposal is unlikely to constitute a serious and irreversible impact. No threatened species or their habitats have been recorded within the Project Site and therefore no species credits are required.

The proposal has avoided development within 95 % of the Cumberland Plain Woodland (albeit degraded) within the site. Mitigation measures have been presented to reduce the potential for indirect impacts on biodiversity values adjacent or downstream of the Project Site.

The proposed development is not likely to have a significant impact on any Matters of National Environmental Significance listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

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ABBREVIATIONS

Abbreviation	Description
AOBV	Area of Outstanding Biodiversity Value
asl	Above sea level
BAM	Biodiversity Assessment Method
BCF	Biodiversity Conservation Fund
BC Act	Biodiversity Conservation Act 2016 (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BNPS	Bankstown North Public School
BOS	Biodiversity Offsets Scheme
BV Map	Biodiversity Values Map (NSW)
CEEC	Critically Endangered Ecological Community
CPW	Cumberland Plain Woodland
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DIPE	Department of Planning, Industry and Environment (NSW)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2000 (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
GIS	Geographical Information System
ha	Hectares
IBRA	Interim Biogeographical Regionalisation for Australia
km	Kilometres
LGA	Local Government Area
LLS Act	Local Land Services Act 2013 (NSW)
m	Metre
Microbat(s)	Microchiropteran Bats
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage (NSW)
PCT(s)	Plant Community Type
SAII	Serious and Irreversible Impact
SEARs	State Environmental Assessment Requirements
SLR	SLR Consulting Australia Pty Ltd

Abbreviation	Description
TEC(s)	Threatened ecological communities
VI	Vegetation Integrity

1 INTRODUCTION

This section introduces the proposal and provides the context of the BDAR. The proposal, landscape context, key features of the Project Site and report objectives are detailed below.

1.1 Background

The New South Wales (NSW) Environmental Planning and Assessment Act 1979 (EP&A Act) forms the legal and policy platform for proposal assessment and approval in NSW and aims to 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and Schedule 2 of the NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation).

The NSW Biodiversity Conservation Act 2016 (BC Act), the NSW Biodiversity Conservation Regulation 2017 (BC Regulation) and amendments to the NSW Local Land Services Act 2013 (LLS Act) commenced on 25 August 2017. In accordance with the BC Act, the Biodiversity Assessment Method (BAM) and entry into the Biodiversity Offsets Scheme (BOS) is applicable to certain development activities based on specific criteria. In this regard, preparation of a Biodiversity Development Assessment Report (BDAR) is required for a development application that meets any of the following criteria:

- Part 4 development activities deemed to be 'State Significant' under the EP&A Act.
- Development activities that have the potential to impact an Area of Outstanding Biodiversity Value (AOBV) as listed under Part 3 of the BC Act.
- Local developments that have the potential to cause a significant impact on a threatened species, population or ecological community, listed under Schedules 1 and 2 of the BC Act, as determined by application of a five-part-test of significance in accordance with Section 7.3 of the BC Act.
- Development activities that have the potential to impact areas mapped as having 'high biodiversity value' as indicated by the NSW Biodiversity Values Map (BV Map).
- Development activities that involve clearing of native vegetation that exceeds the Biodiversity Offset Scheme thresholds (BOS thresholds) as determined by the BC Regulation.

This project is deemed to be state significant development and therefore the project will be determined under Section 4.12(8) of the EP&A Act and Schedule 2 EP&A Regulation. Project State Environmental Assessment Requirements (SEARs) have been issued, which request the preparation of a BDAR to be submitted along with the Project Application. The Project Site and locality do not contain any AOBV, and there are no areas of 'high biodiversity value' within the site, as indicated by the BV Map (viewed 09 March 2020).

SLR Consulting Australia Pty Ltd (SLR) has been engaged to prepare a BDAR in accordance with the BAM for the proposed re-development of Bankstown North Public School in Bankstown, NSW. Due to limited biodiversity values of the site a BDAR waiver request was submitted to the Department of Planning, Industry and Environment (DPIE); however, the request was rejected by DPIE and a BDAR is required.

1.2 The Project Site

The 'Project Site' is Bankstown North Public School (BNPS), located at 322 Hume Highway, Bankstown, NSW (Figure 1). The site is located within Canterbury-Bankstown Local Government Area (LGA), 20 kilometres (km) west-southwest from the Sydney Central Business District. The site is approximately 2.8 hectares (ha) in area and is bordered by the Hume Highway to the south, Stacey Street to the north, Beresford Avenue to the east, and mixed residential and commercial properties along the site's western boundary.

The site is positioned within a highly urbanised landscape, generally surrounded by light industrial and residential land uses. Two areas containing open space (inclusive of grass and trees) include the Bankstown Reservoir and the Apex Reserve situated to the east and southeast of the site. The BNPS and the Bankstown Reservoir are positioned at the intersection of the Hume Highway and Stacey Street (also known as Metro 6) which are major six and four-lane roads presenting a 20 to 30 metre (m) ecological barrier to the site.

The BNPS was established at its current location in 1924 (BNPS 2013), inclusive of the two-storey building along the Hume Highway. Historic aerial imagery (DFSI 2020) shows that there was limited vegetation on the site in 1943, suggesting that most of the vegetation on the site was removed by this date. The site currently comprises existing school buildings, sealed driveways, carparking and sporting courts, grassed areas and some lightly vegetated areas in the site's north and along the site's boundaries, as depicted in Figure 2. The site is predominately cleared of native vegetation and there are no watercourses or other special features representing items of biodiversity value present within the site.

1.3 The Project

The proposal is for the redevelopment of BNPS which will increase student capacity to 644 students and will involve the construction of:

- 24 new permanent teaching spaces;
- new staff, administration and core facilities to core 35 guidelines;
- new library and special programs;
- new student amenities pro rata for 644 students;
- new kiss & drop area;
- new games court and assembly area;
- new landscape;
- substation upgrade; and
- removal of demountable buildings and existing sport court.

The layout of the proposed development is presented in Figure 3. Separate applications are being submitted under different planning approvals pathways for early works involving:

- Demolition of the following features across the site: Building Blocks B, C, D and K; one demountable building; a Covered Outdoor Learning Area (COLA); a sports court; and areas of concrete.
- Construction of a new carpark and installation of a demountable library in the northeast of the site, as well as installation of new demountable buildings within the oval in the south of the site.
- Removal of 21-25 trees from the central parts of the site.

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Source: Nearmap (January 2020)

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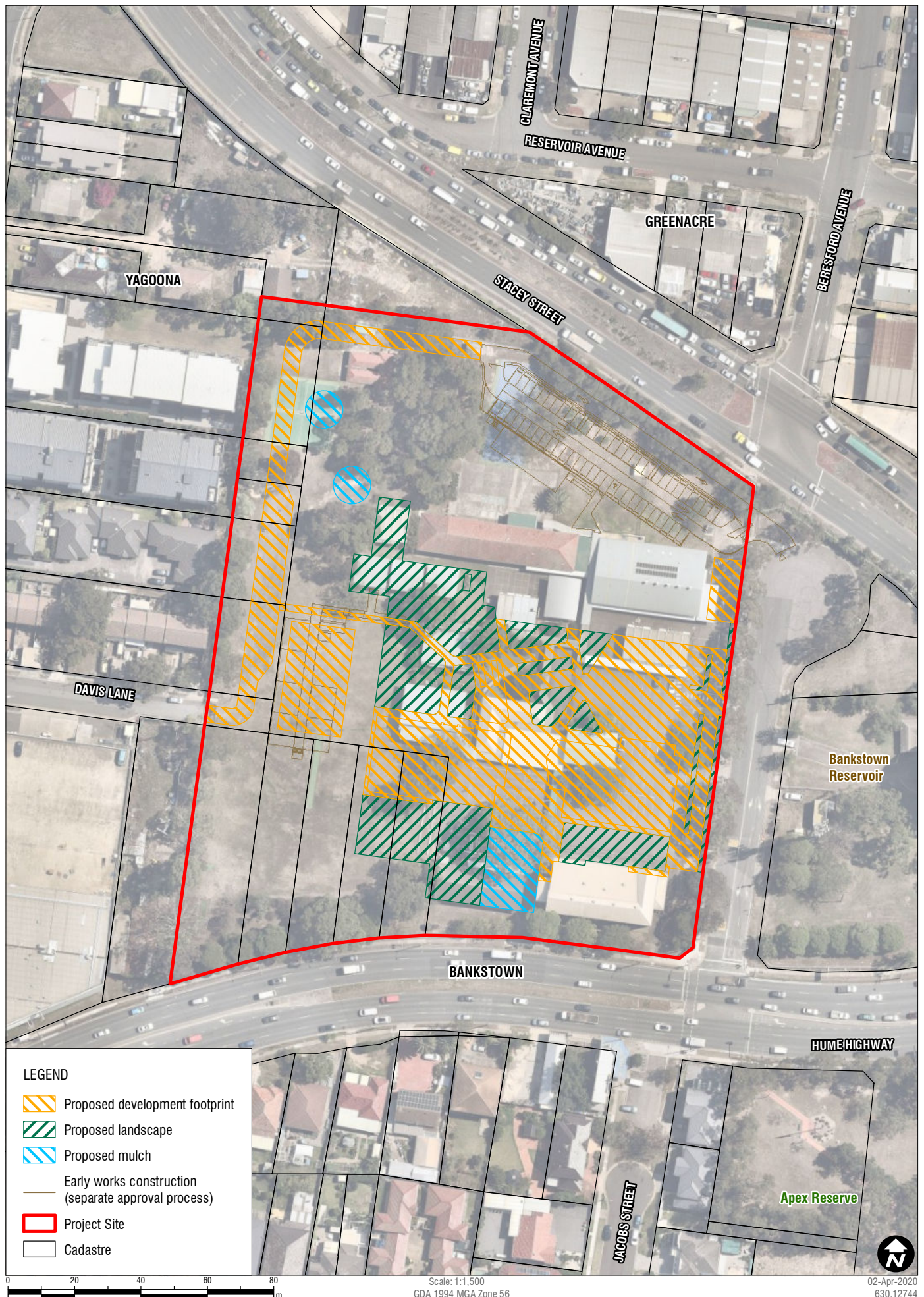
Source: Nearmap (January 2020)

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Aerial Image of the Project Site

FIGURE 2

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Source: Nearmap (January 2020)

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1.4 Report Objectives

This BDAR has been prepared in accordance the BAM (OEI 2017a) and aims to:

- Describe the biodiversity values, as defined under the BC Act, of the Project Site.
- Assess potential impacts of the proposal on biodiversity values, including prescribed impacts and Serious and Irreversible Impact (SII) entities, in terms of biodiversity credits (i.e. ecosystem credits and species credits) as per the BAM Ancillary Rules (OEI 2017b).
- Recommend mitigation and environmental management measures to avoid and/or minimise adverse impacts on biodiversity values.
- Determine whether a biodiversity offset is required, as per the requirements of the BAM.

1.5 Project SEARs

This BDAR address the SEARs issued for the Environmental Impact Statement (EIS) that relate to biodiversity. The biodiversity SEARs and section of the report which addresses each requirement is included in Table 1.

Table 1 Addressing the Project SEARs for Biodiversity

SEARs Requirement	Section
Biodiversity impacts related to the proposed development (SSD 10290) are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.	Whole Report
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 4.1 to 4.4
The BDAR must include details of the measures proposed to address the offset obligation as follows:	
• the total number and classes of biodiversity credits required to be retired for the development/project	Section 4.8.4
• the number and classes of like-for-like biodiversity credits proposed to be retired	Section 4.8.4
• the number and classes of biodiversity credits proposed to be retired in accordance with the variation rules	NA
• any proposal to fund a biodiversity conservation action	NA
• any proposal to make a payment to the Biodiversity Conservation Fund.	NA
If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	NA
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.	Section 2.1
Where a Biodiversity Assessment Report is not required, engage a suitably qualified person to assess and document the flora and fauna impacts related to the proposal. Note: Notwithstanding these requirements, the Biodiversity Conservation Act 2016 requires that State Significant Development Applications be accompanied by a Biodiversity Development Assessment Report unless otherwise specified under the Act.	NA

2 METHODS

This chapter describes the methods undertaken to identify biodiversity values within the Project Site in accordance with Stage 1 of the BAM.

2.1 Staff Qualifications

The roles and qualifications of all staff responsible for preparation of this BDAR are listed in Table 2.

Table 2 Staff Roles and Qualifications

Staff Name & Title	Qualifications and Training	Role
Jeremy Pepper Principal Ecologist	Bachelor of Science (Hons Class 1) University of NSW 1996 Cert II Bushland Regeneration, TAFE NSW Cert III Horticulture (Arboriculture), TAFE NSW BAM accredited assessor (#BAAS17104)	Report technical review
Fiona Iolini Associate Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2007 Certificate of Native Plant Identification, Sydney University 2008 Eucalypt and Grass Identification Workshop (Van Klapthake) 2013 Cert III Conservation and Land Management, TAFE NSW 2015 BAM accredited assessor (#BAAS19042)	Project management, field assessment, BAM calculations, report preparation
David Martin Project Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2014 Master of Science, The University of Melbourne 2018	Report preparation
Emily Mitchell CAD/GIS Technician	Bachelor of Development Studies, University of Newcastle 2008 Cert IV Spatial Information Services, TAFE NSW 2011 Master of Information Technology, University of Newcastle 2019	GIS data management and figure preparation

2.2 Information Sources

Existing information on the flora and fauna of the Project Site and the locality, including relevant threatened biota was obtained from the following resources:

- The NSW BioNet (DPIE 2020a) and Protected Matters Search Tool (DAWE 2020a) for previous records of threatened species, populations and ecological communities within a 10 km radius centred on the centre of the site.
- The NSW BioNet 'Threatened Biodiversity Data Collection' (DPIE 2020a), Threatened Species Profiles (DPIE 2020b), Final Determinations (TSC 2020) and Species Profile and Threats Database (DAWE 2020b) for information on threatened species, populations and ecological communities.
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2016a) and BioNet Vegetation Classification (DPIE 2020c) for information on the Plant Community Type (PCT).

2.3 Likelihood of Occurrence

Following collation of database records and species and community profiles, a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the Project Site. The likelihood of threatened species occurring in the Project Site was assessed based on presence of records from the locality, species distribution and habitat preferences, and the quality of potential habitat present, as defined in Table 3.

Table 3 Likelihood of Occurrence for Threatened Species

Likelihood	Criteria
Present	The species was observed in the Project Site during the current survey.
High	It is highly likely that a species inhabits the site and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the site. Also includes species known or likely to visit the site during regular seasonal movements or migration.
Moderate	Potential habitat is present in the site. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the site opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the site or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the Project Site and the species has not been recorded recently in the locality (10km). It may be an occasional visitor, but similar habitat to that present on the site is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the site or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent.

2.4 Field Assessment

2.4.1 Overview

A field assessment was undertaken by SLR Associate Ecologist Fiona Iolini on 18th March 2019, followed by a supplementary field assessment by Fiona on the 19th February 2020. The weather was mostly fine and sunny during the surveys, with a light shower during the March 2019 survey. A large amount of rain preceded the February 2020 survey meaning conditions were suitable for detecting plant cover and the Cumberland Plain Land Snail (i.e. non-drought conditions) (see Table 4).

Table 4 Weather during the Field Assessments

Date	Min temp (°C)	Max temp (°C)	Rain (mm)	Rain in 2-week lead-up (mm)
18.03.2019	17.6	22.4	37.8	51.2
March means	16.3	26.4	100.5	NA
19.02.2020	18.6	28.6	13	334.2
February means	18.2	27.9	107.5	NA

*Recorded at BOM Bankstown airport AWS Weather Station number: 066137 (BOM 2020).

Methods utilised during the field surveys included collection of BAM plot data, vegetation surveys and habitat assessment as described in the following sections. The assessment was undertaken in accordance with the BAM (OEH 2017a) and with reference to the NSW Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004), NSW Guide to Surveying Threatened Plants (OEH 2016b) and 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH 2018b).

2.4.2 Vegetation Assessment

The site was inspected for areas of native vegetation and intact soils. Areas of native vegetation within the site were assessed in accordance with the definition in Section 1.6 of the BC Act, which relevantly defines native vegetation as any tree, understorey plant, groundcover or wetland plant that is native to NSW (including saplings and presumably planted vegetation). Plants native to NSW are considered those that were present prior to European Settlement. Boundaries of vegetation types and communities were assessed using tree survey data (CMS Surveyors 2018) and aerial imagery (Nearmap 2020) supplemented by field survey notes on plans which were later mapped using Geographical Information System (GIS) software.

Vegetation data collected via BAM plots (OEH 2017a) and random meanders was compared with PCT descriptions provided in the BioNet Vegetation Classification (DPIE 2020c), particularly against the PCTs mapped within and around the site by Regional Mapping (OEH 2016a). Where vegetation was highly degraded, 'best fit' PCTs were established based on the species composition in each patch and the most likely original PCT prior to site disturbance. Vegetation types within the site were also assessed against identification criteria for State and Commonwealth listed Threatened Ecological Communities (TECs) (TSC 2020, DAWE 2020b). The vegetation condition of each PCT was defined as 'moderate to good' or 'low' based on the definitions presented in Table 5.

Table 5 Vegetation Condition Definitions

Vegetation Condition	Definition [#]
Moderate - Good	Vegetation retaining the species complement and structural characteristics of the pre-European equivalent. Vegetation retaining a native canopy and has a native understorey of greater than 50% cover. This condition class can include derived native grasslands and can have minor weed incursions with some patches being subject to grazing.
Low	Vegetation within which the understorey is generally dominated by exotic species being greater than 50% exotic cover, with canopy absent or canopy foliage cover below benchmark. The shrub layer is generally absent and weed invasion is generally significant.

[#] Note: vegetation condition classes are not defined in the BAM

Following delineation of vegetation zones within the Project Site, a plot-based floristic vegetation survey was conducted by the author (Accredited Assessor F Iolini). One 20 metre (m) by 50 m (1000 m²) plot/transect ('BAM plot') was sampled containing a nested 20 m by 20 m (400 m²) floristic plot. The BAM plot was positioned randomly to sample an area that was most representative of the floristic characteristics of the vegetation zone. The number of BAM plots sampled in each vegetation zone was based on the requirements of the BAM (OEH 2017a), which are presented in Table 6.

Table 6 BAM Plots Required and Completed per Vegetation Zone

Zone	Vegetation Zone	Zone Area (ha)	BAM Category (ha) [#]	Plots Required	Plots Completed
1	PCT 849_Moderate-good	0.59	<2	1	1

[#] Based on Table 4 in the BAM (OEH 2017a)

Vegetation Integrity (VI) was determined using data collected from the BAM plot by examining the vegetation composition, structure and function attributes as follows:

- The assessment of vegetation composition was based on the number of native plant species (richness) observed within the 400 m² plot.
- The assessment of vegetation structure was based on the percentage of foliage cover for each plant growth form group within the 400 m² plot.
- The assessment of high threat exotic vegetation cover was based on the percentage of foliage cover for high threat exotic species within the 400 m² plot.
- The assessment of vegetation function was based on an assessment of the following attributes within the 1000 m² plot: number of large trees, tree regeneration, tree stem size class, total length of fallen logs, litter cover (i.e. assessed using five 1 m² quadrats along the 50 m transect) and hollow bearing trees.

For a more detailed description of how the VI score was calculated, refer to the BAM (OEH 2017a). Plant identification and nomenclature within this assessment is based on species descriptions presented within PlantNET (RBGDT 2020).

2.4.3 Threatened Flora Surveys

Threatened flora surveys were conducted in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016b) involving searches for any species identified during the desktop review and BAM assessment. Two surveys were conducted; one on the 18th March 2019 and on the 19th February 2020. The surveys consisted of a random meander followed by parallel field traverses (i.e. 10m apart) in suitable habitats. This method is consistent with the survey effort required to adequately detect threatened herb, shrubs and trees in woodland habitat.

2.4.4 Fauna Surveys and Habitat Assessment

Opportunistic and incidental observations of fauna species were recorded during the field surveys. These included opportunistic observation of fauna activity such as scats, tracks, burrows or other traces. Given the limited native vegetation and habitat clearing involved, no intensive fauna survey methods (such as trapping or call playback) were used to target threatened fauna species. A likelihood of occurrence assessment for threatened fauna species is presented in Appendix A.

The locations of any important habitat features, such as microbat roosting habitat, hollow-bearing trees and nests/burrows were captured with a handheld Global Positioning System unit and photographed where appropriate. Searches for potential habitat of threatened fauna species included but were not limited to koala feed trees, foraging trees for threatened arboreal fauna, hollow-bearing trees and terrestrial refugia such as woody debris and logs.

Specific fauna survey techniques used at the BNPS included:

- All trees within and around the development footprint were inspected for hollows and evidence of fauna use. Large trees were inspected from all angles to determine whether there were any hollows or nests, as well as thoroughly inspected at the trunk and base to search for evidence of scratches and scats.

- Targeted searches for threatened microchiropteran bats ('microbats') involving daytime roost searches with reference to the OEH (2018b) guidelines. A diurnal inspection of external crevices of buildings was undertaken using a 1000 lumen headtorch at ground level to search for bats or evidence of microbat roosting (urine stains, droppings, remains).
- Areas of potential habitat for the Cumberland Plain Land Snail were thoroughly searched including searches under leaf litter accumulations at the base of trees and beneath any refuse such as timber or rubbish. Recent surveys were undertaken when the ground was moistened after a two-week period of good rainfall leading up to the survey, improving conditions for detecting the snail.
- The ground beneath trees of genera *Allocasuarina* and *Casuarina* was thoroughly searched for chewed cones, which typically indicate browsing by Cockatoo species (Glossy Black Cockatoo).

2.4.5 Ecosystem Credit Species and Candidate Threatened Species

A discussion of 'ecosystem credit species' and 'candidate threatened species' (i.e. species credit species) as returned by the BAM (OEH 2017a) is presented in Section 3.7. The section outlines the recommended survey period for detecting any relevant species, states whether any of these species were detected during the field survey and determines whether the proposal is likely to impact any of these species (i.e. based on habitat suitability). Although surveys are unlikely to have coincided with the detectability of all species, the BAM states:

"that a candidate species credit species will be considered unlikely to occur on the Project Site if after carrying out a field assessment of the habitat constraints or microhabitats on the subject land, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land".

It has been determined that targeted surveys during the correct survey conditions for the listed candidate threatened species are not required due to a lack of habitat present within the Project Site or due to a lack of foreseeable impacts due to avoidance and mitigation measures as detailed in Section 4.

2.4.6 Survey Limitations and Assumptions

The Project Site occurs within a modified urban environment that is largely cleared of native vegetation and fauna habitats. Ecological features are generally restricted to small patches of modified or degraded native vegetation.

Given the minor scale of direct impacts associated with the proposed development (i.e. minimal vegetation removal), the current ecological survey was designed to provide an overall assessment of the ecological values within the Project Site. Given the duration and timing of the field surveys, it is likely that some of the species that may occur within the Project Site (i.e. permanently, seasonally or transiently) were not detected.

It was beyond the scope of the survey to carry out fauna surveys, such as fauna trapping, however, a detailed habitat assessment was conducted to inform the 'likelihood of occurrence' of threatened species known or predicted to occur within the locality.

Site conditions (including the presence of threatened species of flora and fauna) may change after the date of this report. SLR does not accept responsibility arising from, or in connection with, any change to the site conditions. SLR is also not responsible for updating this report if the site conditions change.

2.4.7 Licenses and Permits

The SLR ecology team operates under a Scientific Licence (licence number SL100176, issued under the BC Act), which authorises field staff to trap, capture, harm, hold and release plants and animals protected under the BC Act and National Parks and Wildlife Act 1974, as well as Animal Research Authority (issued by the Secretary of the NSW Animal Care and Ethics Committee of DPIE), which allows trapping of animals in NSW for the purposes of 'animal research'.

2.5 Biodiversity Credit Calculations

Biodiversity credits required to offset impacts of the proposal were calculated using the BAM Calculator¹ in accordance with the BOS. These calculations were performed by SLR Associate Ecologist Fiona Iolini (BAM Accredited Assessor - BAAS19042) in April 2020. For a more detailed description of how biodiversity credits are calculated, refer to the BAM (OEH 2017a).

¹ App last updated: 19/11/2019 (Version: 1.2.7.2) BAM data last updated *: 26/11/2019 (Version: 22).

3 STAGE 1 – BIODIVERSITY ASSESSMENT

This chapter describes the biodiversity values of the site and landscape context, in accordance with Stage 1 of the BAM.

3.1 Landscape Features

3.1.1 Overview

The following landscape features are to be described in the BDAR and shown on the Site Map and the Location Map²:

- The Interim Biogeographical Regionalisation for Australia (IBRA) bioregions and IBRA subregions.
- Rivers, streams and estuaries (classified according to stream order and including riparian buffers).
- Important and local wetlands on, adjacent and downstream of the site.
- Habitat connectivity identifying the area/s of connectivity joining different areas of habitat that intersect with the subject land and the areas of habitat that are connected.
- Karst, caves, crevices, cliffs and areas of geological significance.
- Any AOBV that have been identified under the BC Act.
- Additional features required to be assessed by the SEARs for a major project.

Landscape features, as applicable to the Project Site, are summarised in Table 7 and shown in the Site Map (Figure 4) and the Location Map (Figure 5). Further details regarding landscape features are provided in the following sub-sections.

Table 7 Landscape Features and Information

Landscape Feature	Name and Comment	BDAR Section
IBRA Region	Sydney Basin	3.1.1
IBRA Sub Region	Cumberland	3.1.1
BioNet NSW (Mitchell) Landscape	Ashfield Plains	3.1.1
Native vegetation extent	Small area present on site	3.1.2
Cleared areas	Present on site	3.2
Rivers, streams and estuaries	Cooks River 900m to north	3.1.4
Important and local wetlands	None	3.1.4
Habitat connectivity	Negligible or zero	3.1.3
Karst, caves, crevices, cliffs and areas of geological significance	None	3.1.5
AOBV	None	3.1.5
Additional features in SEARs	None	3.1.5

² Refer Chapter 4 of the BAM (Section 4.2.1.3)

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Source: Nearmap (January 2020)

Sheet Size : A4



3.1.2 Native Vegetation Extent

Vegetation clearing has occurred historically within the Project Site and across much of the surrounding locality (see Figure 5). Most of the surrounding land is now occupied by residential, commercial and light industrial development, as well as infrastructure and rail. Native vegetation in the locality consists mainly of scattered trees along road and property boundaries, with some small patches of vegetation within parks, corridors and around the Potts Hill Reservoir to the northwest of the site.

According to historic aerial imagery (DFSI 2020) the site was cleared in 1943 and areas of native vegetation now within the site are likely to have been planted or regrown. Areas of native vegetation within the Project Site currently consist of small patches and scattered individuals of native trees, shrubs or grasses, mostly around the site boundaries. Field survey results indicate that 0.7 ha of native vegetation is present within the site, which represents 25 % of the total 2.8 ha site area.

The extent of mapped native vegetation (OEH 2016a) within the 1,500 m buffer (a total area of 810 ha) is 9.86 ha. Accordingly, the native vegetation cover in the landscape context is 1.2 %. This percent cover value has been entered into the BAM Calculator and corresponds to the cover class of 0-10 % cover. The extent of native vegetation cover in the landscape buffer is shown in the Location Map (Figure 5) and a breakdown of the native plant communities mapped within the landscape buffer is listed below in Table 8.

Table 8 Native Plant Communities within the Landscape Buffer

Vegetation Type	PCT	Area (ha)
Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion	724	0.58
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	725	3.57
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	849	2.67
Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	1281	3.04
Total		9.86

Source: OEH (2016a)

3.1.3 Connectivity Features

The land surrounding the Project Site is highly urbanised, consisting of predominantly residential, commercial and light industrial land uses, as well as major urban infrastructure, including main roads (Hume Highway and Stacey Street), rail and water (i.e. the reservoir) (see Figure 1). Small areas of vegetation exist throughout the landscape, primarily along property boundaries and roads, and around small urban parks. These areas are not well connected through the landscape and are likely a mix of planted natives/non-natives and remnants of the natural vegetation that once occurred in the area.

Within the Project Site native vegetation includes small patches in the north western corner and narrow bands around the perimeter. The vegetation within the Project Site is not recognised as a 'Regional Corridor' (OEH 2015) and is unlikely to constitute part of a larger corridor connecting local vegetation patches owing to the site's highly urbanised surrounds acting as significant barriers to fauna movement.

3.1.4 Rivers, Streams and Wetlands

The site slopes gently to the north from 67 m above sea level (asl) at the southern boundary to 61 m asl at the northern boundary (Figure 4) and there are no mapped waterways or wetlands within the Project Site. The site is within the Cooks River catchment (DPIE 2010a) and the nearest waterway is Cooks River, which is approximately 900 m to the north of the Project Site, as well as a smaller tributary to Cooks River that is approximately 600 m to the east. The nearest wetland is artificial and is the Potts Hill Reservoir (DPIE 2010b) 900 m to the northwest. There are no important wetlands (i.e. as listed under the Directory of Important Wetlands or Coastal Management State Environmental Planning Policy) within the landscape buffer of the site.

Impacts on waterways, wetlands and their catchments as a result of the proposed development are likely to be negligible, mainly due to the small amount of vegetation clearing proposed and the disturbed nature of the area to be developed within the site.

3.1.5 Other Notable Landscape Features

The Project Site contains no other notable landscape features relevant to this assessment, including:

- Wetlands (including important wetlands) – there are no wetlands within the site.
- Areas of geological significance (karsts, caves, crevices or cliffs).
- Soil hazard features (e.g. dryland salinity, acidification, compaction or contamination).
- An AOBV as listed under the BC Act.
- Additional features identified in the SEARs (not applicable).

3.2 Floristic Data

3.2.1 Native Plant Species

A total of 71 native plant species were recorded during the field assessment. A complete list of all plant species observed on the site is presented in Appendix B. Native plant species recorded on site comprise the following plant groups: five forbs, 12 grass or grass-like species (including tussocks, sedges and rushes), three vine (other), 17 shrubs and 34 trees.

For Vegetation Zone 1 (PCT 849_Moderate-good) the following plant types were recorded within the plot and entered in the BAM Calculator: ten native tree, five shrub, five grass or grass-like species, zero forbs, zero ferns and zero other species.

All BAM Plot data is presented in Appendix C.

3.2.2 Weeds and High Threat Exotics

Of the 34 exotic plant species identified during the assessment, 11 are identified as High Threat Exotics (HTEs) according to the DPIE High Threat Weeds List (DPIE 2020d). These comprise: *Araujia sericifera*, *Schefflera actinophylla*, *Bidens pilosa*, *Cinnamomum camphora*, *Corymbia torelliana*, *Ochna serrulata*, *Briza subaristata*, *Cenchrus clandestinus*, *Ehrharta erecta*, *Eragrostis curvula* and *Paspalum dilatatum*.

For Vegetation Zone 1 (PCT 849_Moderate-good), the total cover of HTEs recorded and entered in the BAM Calculator is 21.4 % (Appendix C).

3.3 Plant Community Types

3.3.1 Regional Vegetation Mapping

According to available regional scale vegetation mapping data (OEH 2016a), the site is not mapped as containing native vegetation (see Figure 6). The nearest areas of native vegetation include small isolated patches of native woodland and forest scattered throughout the locality. The following PCTs are mapped as occurring in the surrounding locality:

- PCT 724 - Broad-leaved Ironbark – Grey Box – *Melaleuca decora* grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion.
- PCT 725 - Broad-leaved Ironbark – *Melaleuca decora* shrubby open forest on clay soils of the Cumberland Plain, Sydney basin Bioregion.
- PCT 849 - Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.
- PCT 1281 - Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion.

3.3.2 Site Vegetation Mapping

Field surveys conducted by SLR in accordance with the BAM have revealed that there are small patches of native vegetation present in the northwest corner of the Project Site, as well as narrow bands along the site boundaries. These areas comprise a total area of 0.59 ha of Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849) that is in moderate to good condition. This PCT is associated with Cumberland Plain Woodland in the Sydney Basin Bioregion, which is a Critically Endangered Ecological Community (CEEC) listed under the BC Act. Small patches of native vegetation within the central developed portion of the site are lacking a native middle and ground layer and are considered to represent a 'best-fit' version of PCT 849 in low condition but do not qualify as the Cumberland Plain Woodland CEEC.

The profile of PCT 849 from the BioNet Vegetation Classification is provided in Appendix D. Summaries of the characteristics of this vegetation zone (based on data collected from the Project Site according to the BAM, as well as the BioNet profile data) are presented in Table 9. A revised vegetation map showing the extent of native vegetation (i.e. PCT 849) within the Project Site is presented in Figure 7.

Table 9 PCT 849 Description

Vegetation Community	Floristic Structure and Composition
Vegetation Formation	KF_CH3 Grassy Woodlands.
Vegetation Class	Coastal Valley Grassy Woodland.
PCT Common Name	Cumberland Shale Plains Woodland.
PCT Scientific Name	PCT 849 – Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.
PCT Scientific Description	<i>Eucalyptus moluccana</i> , <i>Eucalyptus tereticornis</i> / <i>Bursaria spinosa</i> subsp. <i>spinosa</i> / <i>Dichondra repens</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Aristida vagans</i> , <i>Microlaena stipoides</i> var. <i>stipoides</i> .
Conservation Status	Associated with Cumberland Plain Woodland in the Sydney Basin Bioregion, a CEEC listed under the BC Act and EPBC Act.

Vegetation Community	Floristic Structure and Composition
Cleared Status	93%
Typical Vegetation Structure	Open grassy woodland dominated by a canopy of <i>Eucalyptus moluccana</i> , <i>E. tereticornis</i> and Ironbarks (<i>E. crebra</i> / <i>E. fibrosa</i>) and some localised patches of <i>Corymbia maculata</i> . Shrub layer is sparse to moderate cover including <i>Bursaria spinosa</i> subsp. <i>spinosa</i> and a high cover of grasses and forbs.
Floristic Composition	PCT 849 within the Project Site is dominated by <i>Eucalyptus moluccana</i> , with some <i>E. tereticornis</i> and <i>Corymbia maculata</i> , as well as several other planted native species. The mid-canopy comprises a mix of mostly planted shrubs including: <i>Acacia parramattensis</i> , <i>Acacia falcata</i> , <i>Allocasuarina littoralis</i> , <i>Daviesia ulicifolia</i> , <i>Melaleuca</i> spp., <i>Callistemon</i> spp. and <i>Ozothamnus diosmifolius</i> . The groundcover is dominated by native and exotic grasses and herbs, including the following native species: <i>Glycine clandestina</i> , <i>Hardenbergia violacea</i> , <i>Kennedia rubicunda</i> , <i>Microlaena stipoides</i> , <i>Bothriochloa macra</i> , <i>Aristida vagans</i> , <i>Paspalidium distans</i> , <i>Rytidosperma monticola</i> , <i>Rytidosperma racemosum</i> , <i>Sporobolus creber</i> , <i>Themeda triandra</i> , <i>Carex inversa</i> , <i>Cyperus gracilis</i> , <i>Lomandra longifolia</i> , <i>Einadia hastata</i> and <i>Einadia nutans</i> subsp. <i>linifolia</i> .
Soil Type and Geology	The Project Site is within Blacktown soil landscape (OEH 2019) on Wianamatta Group shales. Soil at the BAM plot appeared to be brown clay loam, whilst it is likely that soils are more disturbed around the buildings in the site's centre.
Disturbance	The locality has been extensively cleared and includes a mix of residential, infrastructure, commercial and industrial development. The Project Site was cleared in 1943 and has been developed and maintained as a school.
BAM Plot Sampled	P01 (see Photo 1 and Photo 2)



Photo 1 Vegetation Zone 1 PCT 849, facing South at start of Transect



Photo 2 Vegetation Zone 1 PCT849, facing North at end of Transect

3.3.3 Plant Community Type Justifications

A comparison of the site data to BioNet Vegetation Classification (DPIE 2020c) has determined that the vegetation within the Project Site is commensurate with PCT 849 (see Figure 7). The diversity and percentage coverage of native species was relatively low for this patch, especially for mid-storey species, as evidenced by the data collected from the BAM plot compared with benchmark values for PCT 849. This is likely to be due to the disturbance caused by historical land uses, including site clearing and maintenance of school grounds. Justification for the identification of PCT 849 includes the following:

- The site is within the Sydney Basin Bioregion and the Cumberland subregion and vegetation includes species that are native to NSW.
- The vegetation is commensurate with a Coastal Valley Grassy Woodlands vegetation class, as indicated by the open canopy forest/woodland structure (some of which is in a regrowth form) and a ground cover comprising mainly grass (and other non-grass) species.
- Whilst the vegetation is not mapped as PCT 849, the patch lies within approximately one km of a small area of vegetation mapped as PCT 849 to the northwest (Figure 6).
- The canopy of the community is dominated by two key indicator species, being *E. moluccana* and *E. tereticornis*.
- The community is characterised by native groundcover indicator species such as *Dichondra repens*, *Microlaena stipoides*, *Aristida vagans*, *Paspalidium distans* and *Themeda triandra*.

H:\Projects-SLR\630-Sydney Metro Vegetation Mapping\06 SLR Data\07 CADGIS\ArcGIS\SLR63012744_BDAR_RegionalVeg_01.mxd





3.3.4 Biodiversity Risk Weighting

The BAM uses a biodiversity risk weighting to evaluate the ecological risks of threatened entities from the BOS. The biodiversity risk weighting includes two components:

- 'Sensitivity to loss' – this considers the increased threat posed to an entity from offsetting the loss of habitat or population.
- 'Sensitivity to potential gain' – this considers the ability of a species to respond to improvements in habitat condition at an offset site.

PCT 849 is commensurate with a CEEC listed under the BC Act. In accordance with the BAM, this community therefore has a 'very high sensitivity to loss' and a 'high sensitivity to potential gain'. The risk weighting for PCT 849 in the BAM Calculator is 2.50.

3.4 Vegetation Integrity Assessment

3.4.1 Vegetation Zones

The native plant community (PCT 849) recorded on the Project Site was incorporated into two vegetation zones based on broad 'low' and 'moderate to good' condition states, in accordance with Section 5.3.1 of the BAM. There is no clearing of 'PCT 849_Low' as part of this application, therefore, there is no need to assess the VI of this zone. The approximate area (ha) of 'PCT 849_Moderate-good' and the number of BAM plots required to sample the vegetation in accordance with Section 5 of the BAM is presented in Table 10 and Figure 8.

Table 10 BAM Plots Completed per Vegetation Zone

Zone	Veg Zone	PCT Name	Area (ha)	Required	Completed
1	PCT 849_Moderate-good	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.59	1	1

3.4.2 Patch Size

Patch size area was calculated for Vegetation Zone 1 and assigned to a class, being; <5 ha, 5–24 ha, 25–100 ha or ≥ 100 ha (as per Section 5.3.2 of the BAM). Patch size for Vegetation Zone 1 has been calculated (using GIS) as 1.66 ha (see Figure 8), which falls within the < 5 ha patch size class (see Table 11).

Table 11 Vegetation Patch Size

Zone	Veg Zone	Patch No.	Area (ha)	Patch Size Class (ha)
1	PCT 849_Moderate-good	Patch 1	1.66 ha	<5 ha

3.4.3 Vegetation Integrity

The VI score for 'PCT 849_Moderate-good', as returned by the BAM Calculator, is presented in Table 12.

Table 12 Vegetation Integrity Calculations

Zone	Vegetation Zone	Area (ha)	Composition	Structure	Function	VI
1	PCT 849_Moderate-good	0.03	35.1	36.5	45.8	38.9

3.5 Threatened Ecological Communities

Thirty-two TECs occur within a 10 km radius of the Project Site (Appendix A). One of these TECs was identified within the Project Site: Cumberland Plain Woodland in the Sydney Basin Bioregion, which is listed as critically endangered under Schedule 2 of the BC Act. The 0.59 ha patches of PCT 849 in moderate to good condition within the site are commensurate with this TEC. The following sources were consulted to inform this decision:

- The BioNet Vegetation Classification profile, which lists PCT 849 as wholly a subset of Cumberland Plain Woodland (CPW) CEEC (see Appendix D).
- The Final Determination for the listing of CPW as a CEEC (TSC 2020).
- The Cumberland Plain Woodland in the Sydney Basin Bioregion – profile (DPIE 2020b).

The main indicators suggesting that the vegetation on the site is commensurate with the definition of Cumberland Plain Woodland in the Sydney Basin Bioregion are:

- The location of the site within the Sydney Basin IBRA region and Cumberland IBRA subregion.
- The site is located within undulating terrain associated with clay loam soils derived from Wianamatta Group geology.
- The site consists of an open woodland structure dominated by *Eucalyptus moluccana* and *E. tereticornis*, with a sparse shrub layer and a ground layer characteristic of CPW CEEC.
- The site contains the following 20 species that are listed as characteristic within the Final Determination for CPW CEEC (TSC 2020): *Eucalyptus crebra*, *E. moluccana*, *E. tereticornis*, *Acacia implexa*, *Daviesia ulicifolia*, *Einadia hastata*, *E. nutans*, *Indigofera australis*, *Aristida vagans*, *Austrodanthonia racemosa* var. *racemosa* (syn. *Rytidosperma racemosum* var. *racemosum*), *Bothriochloa macra*, *Carex inversa*, *Cyperus gracilis*, *Dichondra repens*, *Glycine clandestina*, *Hardenbergia violacea*, *Microlaena stipoides* var. *stipoides*, *Paspalidium distans*, *Sporobolus creber* and *Themeda triandra*.

Although the vegetation lacks the diverse floristic characteristics of better-quality sites, the Final Determination for CPW (TSC 2020) states:

“The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including grazing, land clearing and fire) history. The number and relative abundance of species will change with time since fire and may also change in response to changes in fire frequency or grazing regime. At any one time, above-ground individuals of some species may be absent, but the species may be represented below-ground in soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers”.

Based on the vegetation condition definitions presented above, the CPW vegetation around the peripheries of the Project Site is moderate to good condition. Further information pertaining to the classification of the community and its conservation status is presented in Table 13. The extent of TEC within the Project Site is presented in Figure 9.

Table 13 PCT 849 Structural Information and Conservation Status

Formation	Class	PCT	Cleared	BC Act TEC
Grassy Woodland	Coastal Valley Grassy Woodland	PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	93 %	CPW CEEC



**Threatened Ecological Communities
within the Project Site**

FIGURE 9

3.6 Fauna Species and Habitat

A total of 10 fauna species was identified during the assessment, of which all species were birds, including eight native and two exotic species. The bird species recorded are common and widespread species that are often recorded in urban areas of the Western Sydney region.

No reptiles or mammals were recorded during the diurnal survey; however, common urban species such as Dark-flecked Sun-skink, Blue Tongue Lizard, Brushtail Possum and Ringtail Possum are also likely to occur in the locality and could inhabit or utilise the site. A complete list of fauna species identified during the assessment is presented in Appendix E.

As part of the field survey, the site was assessed for the presence of habitat features important for occupancy of native fauna species, including the following:

- Aquatic habitat (watercourses and dams), which is required for both aquatic and amphibious species.
- Hollow-bearing trees, which are important for nesting birds and arboreal mammals.
- High native flora diversity, which is important for insects, foraging birds and mammals.
- Complex vegetation structure, which generally encourages occupancy of a diversity of fauna groups.
- Soft substrates, which are important for burrowing species such as reptiles and terrestrial mammals.
- Ground habitat features such as dense leaf litter, habitat logs or exfoliating rock. These features are generally important for terrestrial fauna diversity.

None of these habitat features was present on the site, probably as a result of historic and recent use of the land. Fauna species with the greatest potential to utilise the site are likely to be highly mobile species, namely bat and bird species, which may temporarily perch or forage above or within the tree canopy of these vegetated areas and throughout the surrounding cleared parts of the site.

Locally occurring bird species, such as those recorded in the locality and on the site during field assessment (Appendix E), might forage on blossom, nectar and/or fruits produced by the trees on site. As a result of the small size and isolation of the Grey Box - Forest Red Gum grassy woodland patch, and its landscape context within a predominantly cleared and highly urbanised landscape, the site is likely to constitute only a minor foraging resource for locally occurring species.

Microbat species are highly mobile and thus could potentially use the site as foraging habitat. However, no suitable microbat roosting or breeding habitat was recorded on site during inspections of bark fissures and cavities within permanent and demountable buildings and structures (see Photo 3).

An area of woodland within the northwest corner of the Project Site was found to contain leaf litter, logs and other garden refuse which was considered to provide potential habitat for the Cumberland Plain Land Snail. However, searches for the species (see Photo 4) did not detect any individuals and the habitat is considered poor quality due to its small size, limited connectivity and site disturbance.



Photo 3 Searches of Potential Microbat Roosts around Demountable Buildings



Photo 4 Searches for Cumberland Plain Land Snails within Leaf litter

3.7 Threatened Species (BC Act)

This section describes the threatened species predicted to occur within the Project Site, based on the field survey results, the outputs of desktop assessment and the outputs of the BAM Credit Calculator, in accordance with Section 6 of the BAM. The following sections describe 'ecosystem credit species' and 'species credit species' separately, in accordance with Section 6 of the BAM.

3.7.1 Desktop Results (BioNet)

A search of the BioNet Atlas (dated 4th March 2020) returned a total of 26,570 records of 111 species, comprising 43 threatened plant species, 60 threatened fauna species and eight threatened populations within a 10 km radius of the centre of the Project Site (see Appendix A). Maps showing the locations of previous records of threatened species of flora and fauna within a 5 km radius around the Project Site are provided in Figure 10 and Figure 11. Based on the habitats recorded at the site, most species and populations were assessed as having 'none' or 'low' likelihood of occurrence on the site. A detailed assessment of the likelihood of occurrence of all threatened species and endangered populations previously recorded in the locality and predicted to occur in the BAM Calculator is provided in Appendix A.

3.7.2 Threatened Species Survey Results

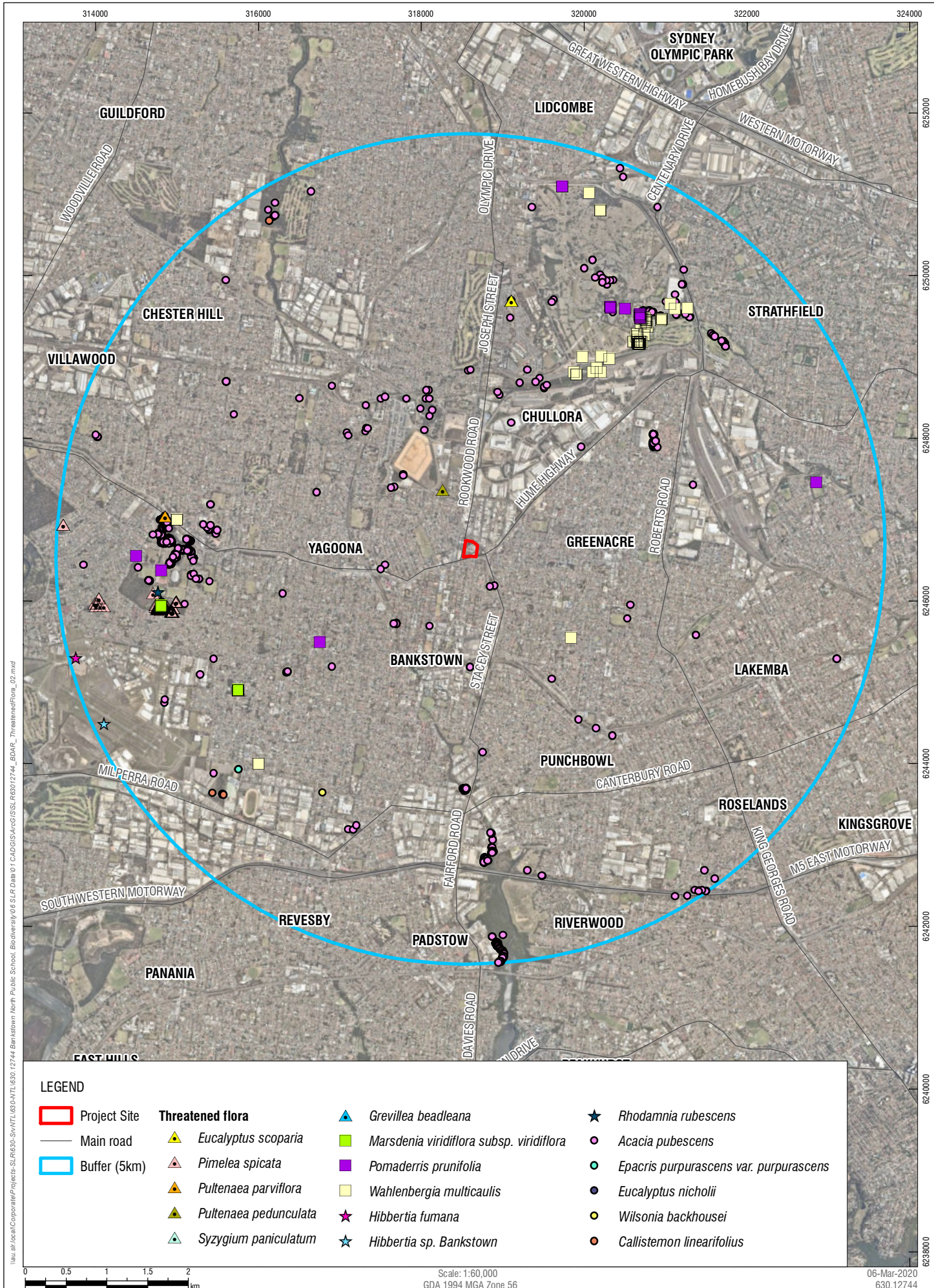
One threatened species was recorded within the Project Site during the current survey, a single specimen of the commonly planted street tree species Wallangarra White Gum *Eucalyptus scoparia* (see Figure 9). No other threatened species were recorded within the Project Site during the recent surveys. Review of habitat descriptions of the predicted species provided in the NSW BioNet 'Threatened Species Data Collection' (DPIE 2020a) reveal that the habitats present on the site are degraded to the extent that the site is unlikely to provide suitable habitat for any threatened plant species.

In relation to threatened fauna species, individuals of mobile species, notably microbats and some forest and woodland bird species, could occur on the site on a transient or seasonal basis, but only temporarily as part of their foraging, migration or dispersal activities. The site does not contain sufficiently large, good condition or intact habitats to support viable local populations of any threatened species considering the small size of the patches of native vegetation, the highly modified nature of the habitats and the surrounding land use.

3.7.3 Ecosystem Credit Species

According to the BAM Calculator, incorporating the considerations under Section 6.2 of the BAM, a total of 17 threatened species are predicted to occur within patches of PCT 849 on the site. Predicted species include: Brown Treecreeper, Diamond Firetail, Dusky Woodswallow, Eastern Coastal Free-tailed Bat, Flame Robin, Grey-headed Flying-fox, Hooded Robin, Koala, Large Bent-winged Bat, Little Bent-winged Bat, Little Lorikeet, Regent Honeyeater, Scarlet Robin, Speckled Warbler, Spotted-tailed Quoll, Swift Parrot and White-bellied Sea-eagle. Most of these species have a 'low' likelihood of occurring within the site, except for the Grey-headed Flying-fox which has a 'moderate' likelihood of occurring due to the many records of the species nearby and its high mobility.

No ecosystem credit species were excluded from the BAM Credit Calculator to determine the offset obligation for the removal of PCT 849 from the site. The Predicted Threatened Species Report from the BAM Credit Calculator is provided in Appendix F.



Source: Nearmap (January 2020)

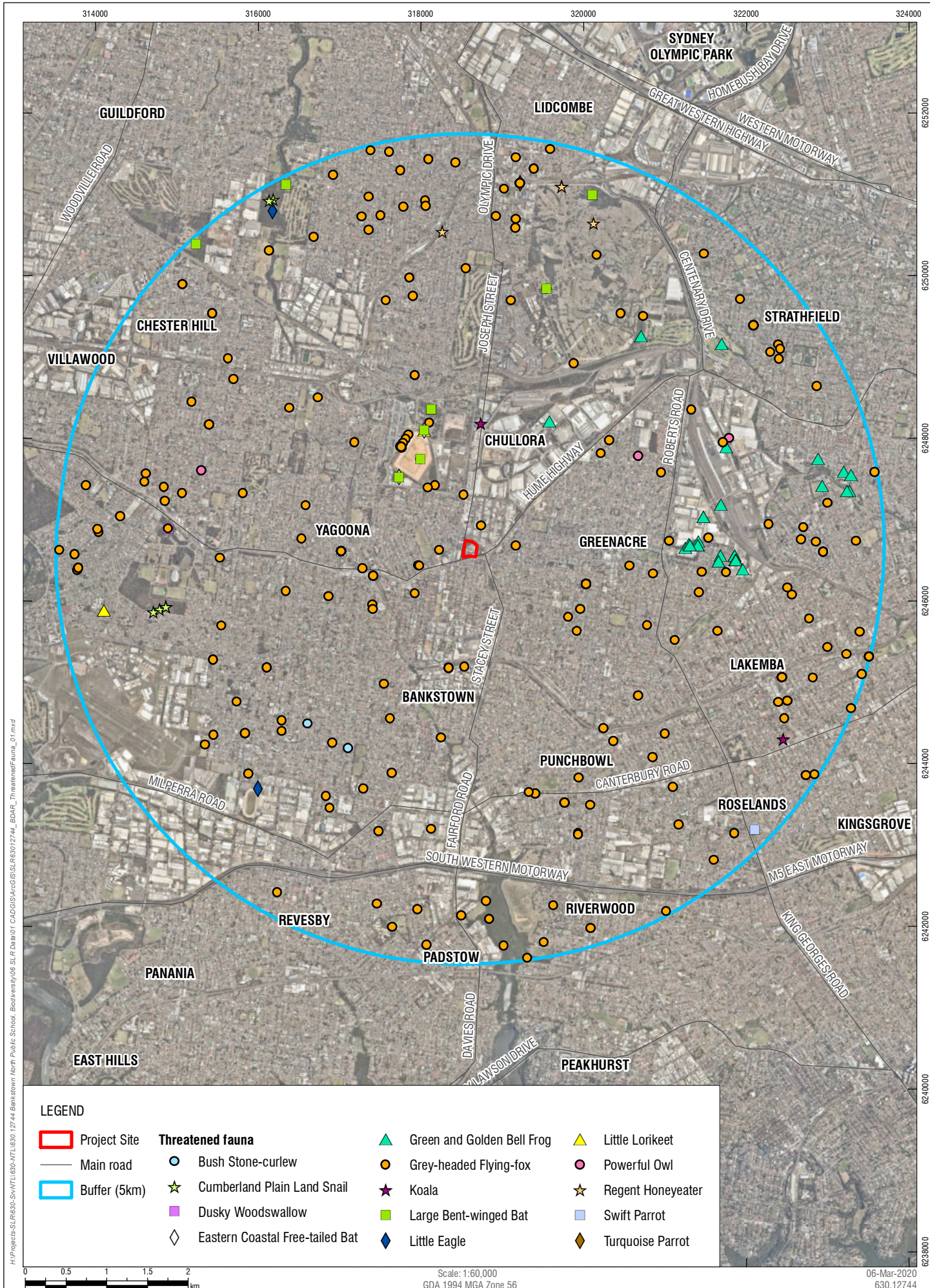
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Threatened Species Records - Flora (BioNet)

FIGURE 10



Source: Nearmap (January 2020)

Sheet Size : A4

3.7.4 Candidate Species Credit Species

A total of 27 candidate threatened species (i.e. species that generate species credits) are determined to be relevant to the Project Site according to the BAM Credit Calculator (see BAM Candidate Species Report in Appendix F).

Targeted surveys are required for candidate species with suitable habitat within the Project Site. The likelihood of assessment determined that the candidate threatened species do not have potentially suitable habitat within the Project Site (see Appendix A) and therefore do not require targeted survey. Further consideration of candidate species with a 'low' likelihood of occurrence is detailed in Appendix A and summarised in Table 14.

Based on the findings of the field surveys, it was determined that none of the candidate species of flora occur within the Project Site and that habitat is too degraded to be suitable for these species. Additionally, the site does not contain suitable breeding habitat for any candidate species of fauna and therefore species that generate species credits for breeding habitat are not relevant to the site and not assessed further.

All candidate species of fauna with 'low' or 'moderate' likelihood of occurring within the project site due to potential foraging have been captured within the ecosystem credit offsetting for the project.

Table 14 Candidate Threatened Species to Further Consider

Species Name	Survey Requirements	Habitat Suitability
Acacia pubescens Downy Wattle	Any time of year.	Broadly suitable habitat (CPW) exists but is degraded. Two targeted surveys (Mar 2019, Feb 2020) but not recorded on Project Site.
Caladenia tessellata Thick-lipped Spider-orchid	Coastal populations best surveyed in September.	Broadly suitable habitat exists (grassy dry sclerophyll woodland on clay loam) but is degraded and species has not been recorded within 5 km of site. Habitat not suitable. No targeted survey required.
Marsdenia viridiflora subsp. viridiflora (population)	November to February.	Broadly suitable habitat exists (open shale woodland) but is degraded. Not recorded on Project Site. One targeted survey (Feb 2020) but not recorded on Project Site.
Pimelea spicata Spiked Rice-flower	Three monthly surveys year-round, with rain.	Broadly suitable habitat exists (CPW on clay soil) but is degraded. Not recorded on Project Site. Two targeted surveys (Mar 2019, Feb 2020) but not recorded on Project Site.
Pultenaea pedunculata Matted Bush-pea	September to November.	Broadly suitable habitat exists but is degraded and no Laterite/ironstone noted in soil. Habitat not suitable. No targeted survey required.
Thesium austral Austral Toadflax	Survey November to February when in flower/fruit.	Broadly suitable habitat exists (grassy woodland) but is degraded. Species not recorded within 10km of site. One targeted survey (Feb 2020) but not recorded on Project Site.
Anthochaera phrygia Regent Honeyeater	None as no 'important habitat' mapped on site.	A possible occasional visitor to the site, but the Project Site does not fall within the mapped breeding habit.
Haliaeetus leucogaster White-bellied Sea-eagle	Survey potential nest for breeding July to December.	A possible occasional visitor to the site which is within one kilometre of Cooks Creek, but there are no living or dead mature trees within suitable vegetation for breeding and no large nests within the Project Site.

Species Name	Survey Requirements	Habitat Suitability
Lathamus discolour Swift Parrot	None as no 'important habitat' mapped on site.	A possible occasional visitor to the site during winter, but the Project Site does not fall within the mapped breeding habit.
Miniopterus australis Little Bent-winged Bat	December to February, survey caves for breeding.	A possible occasional visitor to the site, but no known or suspected maternity caves. Targeted survey (Feb 2020) of buildings but not recorded on Project Site.
Miniopterus orianae oceanensis Large Bent-winged Bat	December to February, survey caves for breeding.	A possible occasional visitor to the site, but no known or suspected maternity caves. Targeted survey (Feb 2020) of buildings but not recorded on Project Site.
Pteropus poliocephalus Grey-headed Flying-fox	October to December, survey camps for breeding.	Likely to seasonally use foraging resources within the site opportunistically, however no breeding camp or suitable habitat for a breeding camp.
Meridolum corneovirens Cumberland Plain Land Snail	Shells found year-round. Survey for live snail's early morning or evening during or after rain.	Suitable habitat exists (CPW with leaf litter), but isolated and degraded. No records from targeted surveys conducted on Project Site.

3.8 Threatened Populations (BC Act)

Eight populations listed as endangered under the BC Act are known to occur within a 10 km radius of the Project Site, these include the following:

- *Acacia prominens* population in the Hurstville and Kogarah LGAs.
- *Allocasuarina diminuta* subsp. *mimica* population in the Sutherland Shire and Liverpool City LGAs.
- *Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs.
- *Pomaderris prunifolia* in the Parramatta, Auburn, Strathfield and Bankstown LGAs.
- *Prostanthera saxicola* population in Sutherland and Liverpool LGAs.
- *Wahlenbergia multicaulis* in the Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs.
- Long-nosed Bandicoot population in inner western Sydney.
- White-fronted Chat population in the Sydney Metropolitan Catchment Management Area.

Most of these populations are either: associated with highly specific habitat requirements that do not exist on the Project Site (e.g. *Wahlenbergia multicaulis* association with Cooks River Castlereagh Ironbark Forest on Villawood Soils) or are known only from highly restricted populations a considerable distance from the site (e.g. Long-nosed Bandicoot population is >9 km from the Project Site). No threatened populations were recorded on site during the current or previous surveys.

A description of threatened populations and their habitats as well as an assessment of their likelihood of occurrence on the Project Site is included in Appendix A.

3.9 Prescribed Biodiversity Values

With reference to Section 6.7 of the BAM, the Project Site does not contain any of the 'prescribed biodiversity values' identified in that section, as follows:

- Karst, caves, crevices and cliffs.
- Occurrences of rock.
- Human made structures (deemed to be habitat for a threatened species or ecological community).
- Watercourses or hydrological processes that interact with rivers and streams.
- The proposed development is not for a wind farm.

Further discussion of potential impacts on prescribed biodiversity values is provided in Section 4.4.

3.10 EPBC Act Protected Matters

A search of the Protected Matters Search Tool (dated 05 March 2020) reveals that 152 Matters of National Environmental Significance (MNES) listed under the EPBC Act are predicted to occur within the locality of the site (see Appendix G). Relevant MNES which are predicted to occur in the locality comprise threatened species, migratory species, listed ecological communities and Wetlands of International Importance. A brief discussion of the above four matters is provided below.

No other MNES exist or are predicted to occur in the locality, including World Heritage Properties, National Heritage Places, or Commonwealth Marine Areas. The Great Barrier Reef Marine Park, nuclear actions (including uranium mining) and water resources, in relation to coal seam gas development and large coal mining developments, are not relevant to the project.

3.10.1 Listed Threatened Species

A total of 82 threatened species listed under the EPBC Act are predicted to occur in the locality of the site. No EPBC Act listed species were recorded on the site during the surveys conducted on the 18th March 2019 or the 19th February 2020.

Due to the lack of suitable habitats or resources, the small size and condition of available habitats, no EPBC Act listed threatened species are likely to occur on the Project Site. The exception is the highly mobile threatened species including the Grey-headed Flying-fox, which could occur on the site on a transient or seasonal basis, but only temporarily as part of their foraging, migration or dispersal activities.

Moreover, the Project Site would not constitute 'important habitat' or 'habitat critical to the survival of a species or ecological community', as defined in the EPBC Act Significant Impact Guidelines 1.1 (DEWHA 2013) for any EPBC Act listed species. This is mainly due to a lack of mature native vegetation and habitat features (such as aquatic habitat, hollows, complex vegetation structure, soft burrowing substrate and ground habitat features).

3.10.2 Listed Migratory Species

A total of 59 migratory species (and/or their habitats) listed under the EPBC Act are predicted to occur within the locality of the site. The migratory species predicted to occur comprise, marine species, terrestrial species and wetland species, as follows:

- Migratory Marine Birds - 19 species. Species such as the Fork-tailed Swift, is a seasonal migrant, is always on the wing and could occur in flight above the site. Other listed migratory marine birds are unlikely to occur in the vicinity of the Project Site due to the absence of necessary marine or coastal habitat on site.
- Migratory Marine Species – eight species. This includes species such as the Leatherback Turtle and Loggerhead Turtle, none of which are relevant to the site as there is no marine habitat within the site boundaries or in the immediate vicinity of the site.
- Migratory Terrestrial Species – seven species. Species such as the Satin Flycatcher and Rufous Fantail are nomadic throughout their ranges and utilise eucalypt dominated forest and woodland (and other) habitats during their dispersal and foraging movements. It is theoretically possible, therefore, that individuals of one or more of these species could occur on the site, but only on a transient or temporary basis. The site would not represent important habitat for any such species, given their large ranges and the relatively small and marginal patch of potential habitat on the site.
- Migratory Wetland Species – 25 species of wetland birds, none of which are relevant to the site as there is no wetland habitat within the site boundaries.

In accordance with the above points, the site of the proposed BNPS development is not considered to represent 'important habitat' for any listed migratory species and would represent only marginal resting or foraging habitat for a narrow selection of terrestrial migratory species.

3.10.3 Threatened Ecological Communities

A total of 10 TECs listed under the EPBC Act are predicted to occur in the locality. Of these, one is of relevance to the Project Site: The Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC.

None of the patches of PCT 849 on the site qualifies as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, which is listed as a TEC under the EPBC Act. Core thresholds required to meet the definition of this community under the EPBC Act (DAWE 2020b) include:

- Minimum patch size is ≥ 0.5 ha; and
- ≥ 50 % of the perennial understorey vegetation cover is made up of native species.

The patch size of the vegetation within and around the site is 2 ha, however, the perennial understorey vegetation cover within the site is not made up of ≥ 50 % native species. This is supported by the BAM plot data which shows that exotic *Ehrharta erecta* and other weeds make up approximately 20% of the perennial understorey vegetation cover, as opposed to natives which make up 5%. Accordingly, the Project Site does contain an EPBC Act listed threatened community.

4 STAGE 2 – IMPACT ASSESSMENT

This chapter details the potential impacts of the proposed development on biodiversity values, in accordance with Stage 2 of the BAM.

4.1 Avoidance of Impacts on Biodiversity Values

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the project to date, in accordance with Section 8 of the BAM. The proposed development has undergone several reiterations to avoid impacts to native vegetation as much as possible.

In relation to the recommendations for avoiding and minimising impacts on native vegetation and habitat during project planning, as per Section 8.1 of the BAM:

- The location of the project - The proposal is a modification to an existing and operating school and represents an activity that is appropriate for the location.
- Designing the project - The proposed buildings and associated infrastructure have been designed to avoid impacts to native vegetation at the site; however, a small amount of clearing is required for access.

Based on the above considerations, removal of the small amount of native vegetation at the site boundaries is considered negligible. In relation to the recommendations for avoiding and minimising prescribed biodiversity impacts during project planning (as per Section 8.2 of the BAM); there are no prescribed biodiversity values on the Project Site and hence no impacts on prescribed biodiversity values.

4.2 Direct Impacts

4.2.1 Impacts on Native Vegetation

The proposed development will involve the removal of 0.03 ha of PCT 849 (see Figure 12) which constitutes CPW CEEC under the BC Act. Specifically, this will involve the removal of a select number of planted native trees and areas of native grasses from across the site, including:

- A patch of young planted native trees (*Eucalyptus moluccana*, *E. punctata*, *E. sideroxylon*) with a groundcover containing native species (*Aristida vagans*, *Paspalidium distans*, *Rytidosperma* sp., *Glycine clandestina* and *Carex inversa*) in the northwest corner of the site (see Photo 5).
- A single Mugga Ironbark *E. sideroxylon*, within mixed native/exotic lawn at the sporting ground in the northwest of the site (see Photo 6).
- A single Grey Gum *E. punctata* at the edge of the patch of native vegetation along the northern boundary (Photo 7).
- Areas of mixed native groundcover (including *Microlaena stipoides*, *Dichondra repens* and *Cyperus gracilis*) at the memorial garden along the eastern boundary of the site (see Photo 8).

A summary of the impacts of vegetation removal within each vegetation zone is presented in Table 15. The impacts on native vegetation summarised in terms of VI loss are provided in the BAM Credit Summary Report in Appendix F and summarised in Table 16.

H:\Projects\SLR\630-SW\WTL\630-N\TL\630-12744-Bankstown North Public School, Biodiversity\06 SLR Data\07 CAD\GIS\ArcGIS\SLR630 12744_BDAR_Impacts_04.mxd



Impacts on Native Vegetation Zones

FIGURE 12



Photo 5 Patch of Native Vegetation to be removed for Access in Northwest of Site



Photo 6 Mugga Ironbark to be Removed for Access in Northwest of Site



Photo 7 Disturbance to Patch Edge along Northern Boundary of Site



Photo 8 Native Vegetation Removal at Memorial Garden along Eastern Boundary

Table 15 Vegetation Impact Summary

Zone	Vegetation Zone	BC Act TEC	Area removed (ha)	Area retained (ha)
1	PCT 849_Moderate-good	CPW CEEC	0.03	0.56

Table 16 Vegetation Integrity Calculations

Zone	Vegetation Zone	Area (ha)	VI Loss	Sensitivity to gain	Risk Weighting	SAII [#]
1	PCT 849_Moderate-good	0.03	38.9	High	2.5	Yes
#	Potential Serious and irreversible impact entity					

4.2.2 Impacts on Fauna Habitat

Impacts on fauna habitat within the Project Site will be in general limited in extent and involve loss of a small portion (0.03 ha) of the modified woodland habitat that is within the site, as well as potential artificial habitat for microbats in buildings that will be removed. Impacts on fauna habitat will comprise:

- removal of a select number of planted native trees from across the site, none of which provide any special habitat features such as hollows or loose bark;
- removal or disturbance to a small amount of ground cover layer, including areas with native grasses and leaf litter; and
- removal of several buildings (mostly temporary demountable buildings) and outdoor awnings which provide marginal potential intermittent habitat for roosting bats and are not likely to be used for breeding purposes.

The loss of a small number of mature native trees, including myrtaceous species, will result in the loss of perching and resting sites, as well as foraging resources (such as blossom and nectar in flowering trees) for locally occurring forest bird species and microbats.

The open disturbed parts of the site could represent foraging and hunting space for local raptors, such as the Nankeen Kestrel and Australian Hobby, which might prey on small rodents (e.g. Black Rat or house mouse), insects and small birds on the site. However, the site would represent only a small fraction of the foraging territory available to local species and its removal would have no measurable impact on their foraging behaviour or life cycles.

No hollow-bearing trees, nests, burrows, water resources or other important habitat features for native fauna will be removed. Hence removal of the native vegetation from the site will not impose adverse effects on hollow dependent native arboreal fauna, particularly birds and microbats. None of the habitat features within the Project Site are likely to be important to the long-term survival of fauna species within the locality. The removal of marginal foraging habitat is therefore considered to be negligible.

4.2.3 Impacts on Threatened Species Habitat

Impacts on threatened species habitat are limited to the removal of potential foraging habitat (in the form of modified PCT 849 vegetation) for species of birds and mammals that are highly mobile and are typically able to forage within urban remnants.

There is no breeding habitat for any threatened species of fauna or potential habitat for ground-dwelling fauna (such as the Cumberland Plain Land Snail) with the Project Site. Additionally, the site is not considered to represent potential habitat for threatened species of flora. The two specimens of Wallangarra White Gum *Eucalyptus scoparia* are most likely of planted origin but in any case, are not proposed to be removed under this application.

All species with potential to forage over the site, at least on occasion, have been captured within the ecosystem credit calculation for the project.

4.2.4 Impacts on Threatened Ecological Communities

Construction of the proposed development will require the removal of approximately 0.03 ha of CPW CEEC. This impact has been addressed in the BAM Calculator as part of the removal of the Grey Box - Forest Red Gum grassy woodland vegetation in Zone 1 (PCT 849_Moderate-good).

4.3 Indirect Impacts

Potential indirect impacts to native vegetation and habitat may occur during the construction and operational phase of the project. These impacts may include the following:

- Increased traffic and visitation within the Project Site may facilitate the spread of weeds that could further degrade offsite native vegetation.
- Pollution such as chemical spills from construction machinery may have adverse effects on native vegetation, fauna and downstream waterways.
- Ground disturbance by machinery during the construction phase may create dust and facilitate the movement of water-borne sediment. Sedimentation could adversely affect the downstream vegetation and habitats.
- Increased noise by vehicles, machinery and increased human visitation may disrupt the natural behaviour of fauna species (if and where present) during the construction phase.
- Light spill from artificial lighting during the construction phase or operational phase may adversely affect the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and foraging microbats.

4.4 Prescribed Biodiversity Impacts

Prescribed biodiversity values are identified in Section 3.9 of this BDAR. In relation to potential impacts on habitat of threatened species or ecological communities associated with prescribed biodiversity values, as defined under clause 6.1 of the BC Regulation:

- The site does not contain the following fauna habitat features:
 - karst, caves, crevices, cliffs and other geological features of significance; or
 - "rocks" per se, being natural rock formations and rock outcrops.
- Human-made structures, although present these features are not likely to be of any importance to the survival of any threatened biota in the locality.
- Non-native vegetation is present on the site; however, the planted trees and groundcovers recorded on the site are not likely to be of any importance to the survival of any threatened biota in the locality.

- The patches of native vegetation on the site and adjoining parks are isolated in the landscape, and are not contiguous with any other larger intact areas of vegetation and hence are not relevant to the connectivity of habitat for threatened species that could facilitate the “movement of those species across their range”.
- The development site is not relevant to the movement of threatened species through the landscape such that it would make any meaningful contribution to the maintenance of their lifecycles.
- The site contains no watercourses and therefore is of no relevance to “water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities”.
- The proposed development does not involve wind turbines (and hence potential strikes on protected animals).
- No threatened ground-dwelling fauna exist on the site; hence, the risk of vehicle strikes on threatened species of animals or on animals that are part of a TEC is negligible.

4.5 Serious and Irreversible Impacts

Biota or entities identified as being vulnerable to ‘serious and irreversible impacts’ (SAIL) are also known as ‘SAIL entities’. These entities are identified based on principles set out in clause 6.7 of the BC Regulation and according to the Guidance to assist a decision-maker to determine a serious and irreversible impact (OEH 2017c). The CPW CEEC is the only SAIL entity that was recorded on the site. No other SAIL entities were recorded on the Project Site or are considered likely to depend on the habitat within the site for their survival. An assessment of the criteria set out in Appendix 4 of the Guidance to assist a decision-maker to determine a Serious and Irreversible Impact (OEH 2017c) and Section 10.2 of the BAM (OEH 2017a) for CPW is addressed in Table 17.

In summary the assessment determines that the proposed development is unlikely to constitute a serious and irreversible impact on CPW, as defined by the BC Regulation, based on the following:

- Direct impacts to the majority of the CPW CEEC across the site have been avoided and 95% (0.56 ha) of the community found on site will be retained following the proposed development.
- The proposal will involve the clearing of a very small percentage of the SAIL entity across the Cumberland sub-region.
- Indirect impacts on the areas of the CPW CEEC to be retained within the site will be reduced via mitigation measures, including landscaping (including additional tree planting), erosion/sediment control, pollution control, weed management and vegetation protection.

Table 17 Additional Information for SAIL to Cumberland Plain Woodland CEEC

No	Serious and Irreversible Impacts Assessment	Additional Information
a	The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAIL.	The proposed development has been designed to avoid impacts to 95 % of the CPW CEEC on the site. The design avoids impacting the larger patch in the northwest corner, with impacts restricted to the north edge including an area that is already concreted. Measures to avoid indirect impacts on vegetation include site landscaping, erosion/sediment control, pollution control, weed management and vegetation protection as recommended in Section 4.7.

No	Serious and Irreversible Impacts Assessment	Additional Information
b	The area (ha) and condition of the threatened ecological community (TEC) to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone.	The proposed development will impact 0.03 ha of CPW CEEC in moderate to good condition, with a further 0.56 ha potentially impacted by indirect impacts across the remainder of the site.
c	A description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guideline for determining an SAIL	The Threatened Biodiversity Data Collection was inspected on 11 March 2020 and at that time there was no threshold identified for this SAIL.
d	The extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint	There is approximately 3.92 ha of moderate condition CPW mapped within 1000 ha of the site and approximately 76 ha of moderate condition CPW within 10,000 ha of the site.
e	An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration	The current area of CPW within Cumberland IBRA subregion is 22,160 ha (OEH 2013). After removal of 0.03 ha of vegetation as part of this proposal, the area of CPW will be approximately 22,160 ha.
f	An estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and the IBRA subregion	Around 1,292 ha of CPW lies within reserve system within Cumberland IBRA subregion.
g (i)	The development, clearing or biodiversity certification proposal's impact on abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns	The proposed development is not expected to have a substantial impact on abiotic factors critical to the long-term survival of CPW, such as water runoff, pollution or soil composition.
g (ii)	The development, clearing or biodiversity certification proposal's impact on characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants	The proposed development is not expected to have a substantial impact on characteristic and functionally important species. The proposal will remove 0.03 ha of CPW, but retain 0.56 ha, which will continue to be managed as native vegetation areas within school grounds.
g (iii)	The development, clearing or biodiversity certification proposal's impact on the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC	The proposal is not expected to impact on the quality and integrity of the CPW CEEC on the site to any extent further than would already be occurring, as use of the site for the school's purposes. Current practises are likely to involve weed removal, planting, mowing and general use of the site and areas of CPW CEEC by children for educational and recreational purposes.
h	Direct or indirect fragmentation and isolation of an important area of the potential TEC.	The proposal will not result in direct or indirect fragmentation and isolation of an important area of the CPW CEEC.

No	Serious and Irreversible Impacts Assessment	Additional Information
i	The measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.	The removal of 0.03 ha of CPW CEEC will be offset in accordance with the BAM. The remainder of the CPW CEEC on the site will be retained and it is recommended that these areas are managed as native vegetation, as well as for recreational and educational purposes by the school.

4.6 Impacts on EPBC Act Protected Matters

No MNES listed under the EPBC Act are likely to occur or are of relevance to the site. Consequently, the proposed development is not likely to have a 'significant impact' on any MNES listed under the EPBC Act. Referral of the proposed development to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for consideration pursuant to the EPBC Act is therefore not warranted.

4.7 Mitigation and Management of Impacts on Biodiversity Values

This chapter recommends a selection of measures that are designed to reduce the risk or severity of potential indirect impacts on biodiversity values, in accordance with Section 9.3 of the BAM.

4.7.1 Construction Impacts

Mitigation and management measures to minimise construction impacts are identified in Table 18.

Table 18 Mitigation and Management Measures during Construction

Measure	Description
Landscape Planting	The proposal incorporates tree planting around the periphery of the site and buildings. It is recommended that any landscaping adjoining areas of PCT 849 (at site peripheries and in the northwest corner) incorporates planting of locally indigenous species, such as species that are characteristic of PCT 849 included in the BioNet Vegetation Classification Profile at Appendix D.
Erosion Control	Mitigation measures to reduce soil erosion and pollutant run-off during construction would be included in a standard erosion and sedimentation control plan, which would include the following: <ul style="list-style-type: none"> • Installation of erosion and sediment control measures prior to any works. • Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality. • Management of excavated materials to prevent sediment transfer. • Stockpiling of materials in flat cleared areas, away from site boundaries, remaining vegetation and adjacent to native vegetation, but instead use areas that are already cleared/ disturbed. • Undertake maintenance of silt fences and other mitigation measures to isolate runoff.
Dust Control	Specific measures to minimise the generation of dust and associated impacts on adjacent natural environments should include: <ul style="list-style-type: none"> • Setting maximum speed limits for all traffic within the Project Site to limit dust generation. • Use of a water tanker (or similar) to spray unpaved access tracks during the construction phase where required. • Application of dust suppressants or covers on soil stockpiles.

Measure	Description
Chemical Spills	Specific measures to minimise the potential for chemical spills and associated impacts on adjacent natural environments should include the following: <ul style="list-style-type: none"> All chemicals must be kept in clearly marked bunded areas. Regularly inspect vehicles and mechanical plant for leakage of fuel or oil.
Weed Management	High Threat Exotic species were identified within the Project Site (see Section 3.2.2). Measures to prevent the spread of weeds should include the following weed hygiene procedures: <ul style="list-style-type: none"> All vehicles, equipment, footwear and clothing should be clean and free of weed propagules prior to entering the Project Site. Any weeds that are removed during the construction phase should be disposed of appropriately.
Vegetation Clearing	The following recommendations are to be implemented during vegetation clearing: <ul style="list-style-type: none"> Areas of vegetation outside the development footprint are to be clearly demarcated with high visibility tape to prevent accidental clearing during the construction phase. Vegetation should be cleared in a way that will allow fauna species living in the clearing site (if any) enough time to move out of the area without additional human intervention. No clearing should occur during the early evening or at night, when nocturnal fauna species are most likely to be active. The direction of clearing should also ensure that fauna species are directed away from threats such as roads, developed areas or disturbed areas.
Fauna Impacts	The following recommendations apply to the management of fauna species during construction: <ul style="list-style-type: none"> Should any injured fauna species be found during the construction period, construction must stop immediately so that the injured animal can be taken to a vet or wildlife carer. All handling of fauna species should be conducted by a qualified ecologist or wildlife carer. During vegetation clearing and removal of buildings and structures, animals that are injured or displaced are to be captured and relocated (by a qualified ecologist or wildlife carer) to nearby bushland (subject to landowner approval), or trees containing wildlife shall be sectioned and dismantled before relocating the animals. Nocturnal fauna species, such as gliders and possums, if captured and rescued during vegetation clearing and demolition, are to be secured in suitable enclosures and kept in a quiet, dark and cool environment until they can be released into suitable habitat after dark.

4.7.2 Operational Impacts

Mitigation and management measures to minimise operational impacts are identified in Table 19.

Table 19 Mitigation and Management Measures during Operation

Measure	Description
Landscape Planting	Maintenance of landscape planting, as proposed, should be ongoing to ensure plantings maintain health and longevity.
Artificial Lighting	Artificial lighting has the potential to disrupt the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and microbats. To reduce potential impacts to individuals of any locally occurring species, artificial lighting should be reduced where possible within the Project Site. Lights should be turned off at night (where not required for security) and any essential lighting should be fitted with directional shades to avoid light spill into adjoining areas.

Measure	Description
Adaptive Management	Section 9.4 of the BAM states that adaptive management such as monitoring programs are required for projects where uncertain impacts such as impacts to karst, caves, crevices, cliffs, subsidence or wind turbine strikes may occur. No uncertain impacts have been identified for the current proposal that would require implementation of an adaptive management strategy.

4.8 Offsetting of Impacts

4.8.1 Impacts Not Requiring Further Assessment

As noted in Section 10.4.1 of the BAM, the assessor is not required to assess areas of land on the Project Site “without native vegetation” but must still assess these areas for the potential presence of threatened species. Most of the areas within the development footprint do not contain native vegetation or important habitat features for threatened species and do not require further assessment. No species credit species have been recorded within the site and predicted threatened species (i.e. ecosystem credits) have been assessed as part of the impacts on Veg Zone 1 PCT 849_Moderate-good.

4.8.2 Impacts Requiring an Offset

The BAM (OEH 2017a) establishes a framework to offset impacts on biodiversity from development through the BOS. Section 10.3.1 of the BAM sets out the thresholds for impacts on native vegetation that require offsetting based on VI scores. The VI score for Vegetation Zone 1 (PCT 849_Moderate-good), which represents a form of the CPW CEEC, is > 15 and therefore the removal of 0.03 ha of this vegetation requires an offset.

The reduction in VI score as a result of the impact of the proposed development and the corresponding thresholds for offsets are listed in Table 20.

Table 20 Vegetation Integrity Calculations

Zone	Vegetation Zone	Area (ha)	VI Loss	BAM VI Threshold [#]	Offset Required	Credits
1	PCT 849_Moderate-good	0.03	38.9	> 15 for EEC or CEEC	Yes	1

[#] See Section 10.3 of the BAM for offsetting thresholds for impacts on native vegetation and threatened species

The extent of vegetation to be removed is presented in Figure 12.

No species credit species (or their specific habitat constraints) were recorded on the Project Site as part of the current and previous investigations. Accordingly, no species polygons have been created for species credits and no species credits are generated in the BAM Calculator by the removal of vegetation and habitat associated with construction of the proposed development.

4.8.3 Impacts Not Requiring an Offset

The remaining parts of the site to be developed include previously cleared and developed areas and areas of exotic garden plants and lawn. These areas do not constitute native vegetation and do not require and offset.

4.8.4 Offset Calculations

The BAM Calculator³ was used to determine the offset obligation for the removal of 0.03 ha of moderate to good condition PCT 849 as presented in Table 21. No species credits are required to meet the project offset obligation. The proponent has selected to offset via the Credit Trading System for this project. Purchase and retirement of ecosystem credits must be conducted in accordance with the Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules (OEH 2017b), published under clause 6.5 of the BC Regulation. The biodiversity credit reports for the project, including the number and classes of like-for-like biodiversity credits to be retired is included in Appendix F.

Table 21 Ecosystem Credits for Plant Community Types

Zone	Vegetation Zone	PCT Name	VI Loss	Ecosystem Credit
1	PCT 849_Moderate-good	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	38.9	1

4.8.5 Fund Payment Calculation

Offset obligations can also be met by direct payment into the Biodiversity Conservation Fund. Calculations to determine the final credit price for this offset obligation are generally calculated after development consent at the time that the proponent is required to fulfil the offset obligation. However, for information purposes, the Biodiversity payment summary report for this BAM assessment is provided in Appendix F and summarised in Table 22.

Table 22 Offset Requirement – ecosystem Credits and Credit Pricing

PCT Name	Price Per Credit	No. Ecosystem Credits	Total Price
PCT 849 – Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	\$26,624.20	1	\$26,624.20
		GST 10 %	\$2,662.42
		Total	\$29,286.62

³ App last updated: 19/11/2019 (Version: 1.2.7.2) BAM data last updated *: 26/11/2019 (Version: 22).

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6 DEFINITIONS

The terms identified in Table 23 are defined for the purposes of the BAM.

Table 23 Terms and Definitions of the BAM

BAM Term	Definition
Accredited person	Has the same meaning as in the BC Act, referred to in the Biodiversity Assessment Method as 'assessor'.
Ancillary rules	Has the same meaning as set out in clause 6.5 of the NSW Biodiversity Conservation Regulation 2017.
Annual probability of decline in vegetation and habitat condition	An estimate of the average probability of decline of each attribute through clearing, stochastic factors or ongoing degrading actions (firewood removal, weed invasion, livestock grazing).
Areas of geological significance	Geological features such as karst, caves, crevices, cliffs.
Area of outstanding biodiversity value	These are declared by the Minister for the Environment. A public register of AOBVs will be available as more areas are declared. Currently, critical habitat for the little penguin population at Manly, for the Mitchell's rainforest snail in Stotts Island Nature Reserve (OEH 2018a).
Assessment area surrounding the subject land	The area of land in the 1500 m buffer zone around a Project Site, or land to be biodiversity certified or a biodiversity stewardship site, that is determined in accordance with Subsection 4.3.2 of the Biodiversity Assessment Method.
Assessor	The person accredited under the NSW Biodiversity Conservation Act 2016 referred to in Subsection 2.1.2 of the Biodiversity Assessment Method and who has been engaged by the proponent
Averted loss	The gain in vegetation and habitat condition that arises from managing the proposed land as an offset compared to the probable future vegetation condition if the land was to be left unmanaged (see Annual probability of decline).
Avoid	Measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the biodiversity assessment method for operational guidance.
BAM	The Biodiversity Assessment Method.
BC Act	The NSW Biodiversity Conservation Act 2016.
BC Regulation	The NSW Biodiversity Conservation Regulation 2017.
Benchmark data	For a PCT, vegetation class or vegetation formation benchmark data is contained in the BioNet Vegetation Classification. A local reference site may also be used to establish benchmark data for a PCT that may be used in a BAM assessment.
Benchmarks	The quantitative measures that represent the 'best-attainable' condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.
Biodiversity Assessment Method (BAM)	Is established under Section 6.7 of the NSW Biodiversity Conservation Act 2016 (BC Act). The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act, Local Land Services Act 2013 or the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.
Biodiversity certification	Has the same meaning as in the NSW Biodiversity Conservation Act 2016.

BAM Term	Definition
Biodiversity Certification Assessment Report (BCAR)	Has the same meaning as in the NSW Biodiversity Conservation Act 2016.
Biodiversity credit report	The report produced by the Credit Calculator that sets out, the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a Project Site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Development Assessment Report (BDAR)	Has the same meaning as in the BC Act.
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.
Biodiversity stewardship agreement	Has the same meaning as in the NSW Biodiversity Conservation Act 2016.
Biodiversity stewardship site	Has the same meaning as in the NSW Biodiversity Conservation Act 2016.
Biodiversity Stewardship Site Assessment Report (BSSAR)	The report that must be prepared in accordance with the Biodiversity Assessment Method and submitted as part of an application for a biodiversity stewardship agreement.
Biodiversity values	Has the same meaning as clause 1.5(2) of the NSW Biodiversity Conservation Act 2016.
Biodiversity values map	Is established according to clause 7.3 of the NSW Biodiversity Conservation Regulation 2017. Development within an area identified on the map requires assessment using the BAM.
BioNet Atlas	The OEH database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the TSC Act) and some fish.
Bionet Vegetation Classification	The master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm .
Broad condition state	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Certified more appropriate local data	Has the same meaning as set out in Subsection 2.2.2 of the Biodiversity Assessment Method.
Change in vegetation integrity score for a biodiversity stewardship site	The difference (gain) between the estimated vegetation integrity score without management at a biodiversity stewardship site and the predicted future vegetation integrity score with management at a biodiversity stewardship site.
Class of biodiversity credit	As defined in Section 11.3 of the Biodiversity Assessment Method.
Clearing site	The site proposed to be cleared of native vegetation where approval is sought under Part 5A of the Local Land Services Act 2013 or the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.
Clonal species	Flora species that propagate asexually at a site or have a limited degree of sexual reproduction, either within or between sites. Modes of asexual reproduction will include vegetative reproduction such as by rhizomes, root suckers or bulb replication.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

BAM Term	Definition
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 of the Biodiversity Assessment Method to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Critically endangered ecological community (CEEC)	An ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
Crown cover	The vertical projection of the periphery of tree crowns within a designated area.
Derived vegetation	PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. Over-storey of grassy woodland) or have developed new structural components where they were previously absent (e.g. Shrubby mid-storey in an open woodland system).
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. The term development footprint is also taken to include clearing footprint except where the reference is to a small area development or a major project development.
Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a Project Site and the gain in biodiversity values at a biodiversity stewardship site.
Endangered ecological community (EEC)	An ecological community specified as endangered in Schedule 2 of the BC Act, or listed under the EPBC Act.
Environment Agency Head	Has the same meaning as in the BC Act.
EP&A Act	The NSW Environmental Planning and Assessment Act 1979.
EPBC Act	The Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
Ephemeral flora species	Flora species where the abundance of the species above ground fluctuates in response to the plant life history in combination with environmental conditions and/or disturbance regimes. Fluctuations in abundance may be short-term (seasonal) or long-term (yearly to decadal). Many ephemeral species persist underground through unfavourable conditions via soil seed banks or dormant vegetative organs (bulbs, tubers, rootstocks).
Estuarine area	A semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).
Expert	A person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.
Foliage cover	The percentage of a plot area that would be covered by a vertical projection of the foliage and branches and trunk of a plant, or plants or a growth form group. Foliage cover can also be referred to as percent foliage cover.
Gain	The gain in biodiversity values at a biodiversity stewardship site, over time from undertaking management actions at a biodiversity stewardship site. Gain in biodiversity values is the basis for creating biodiversity credits at the biodiversity stewardship site.
Grassland	Native vegetation classified in the vegetation formation 'Grasslands' in Keith (2004). Grasslands are generally dominated by large perennial tussock grasses, lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.
Growth form	The form that is characteristic of a particular flora species at maturity. Growth forms are set out in Appendix 4 of the BAM.

BAM Term	Definition
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.
Habitat component	The component of habitat that is used by a threatened species for either: breeding, foraging or shelter.
Habitat surrogates	Measures of habitat that predict the occurrence of threatened species and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.
Herbfield	Native vegetation which predominantly does not contain an over-storey or mid-storey and where the ground cover is dominated by non-grass species.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and out-compete native plant species. Also referred to as high threat weeds.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
IBRA region	A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system 3, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA subregion	A subregion of a bioregion identified under the IBRA system.
Impact assessment	An assessment of the impact or likely impact of a development on biodiversity values which is prepared in accordance with the BAM.
Impacts on biodiversity values	Loss in biodiversity values from direct or indirect impacts of development in accordance with Chapters 8, 1 and 10.
Important wetland means	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) from time to time, and the actual location on the ground that corresponds to a Coastal wetland (Coastal Management SEPP).
Individual	In relation to organisms, a single, mature organism that is a threatened species, or any additional threatened species listed under Part 13 of the EPBC Act.
Intact vegetation	Vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.
Intrinsic rate of increase (ir)	An estimate of the rate of gain for an attribute at a biodiversity stewardship site from actions undertaken as part of the management plan. The intrinsic rate of increase is specified for an attribute according to the formation of the PCT being assessed (see Appendix 8 of the BAM).
Landscape attributes	In relation to a Project Site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.
Large tree benchmark	Is the largest stem size class for a PCT as determined by the benchmark for the PCT.
Life cycle	The series of stages of reproduction, growth, development, aging and death of an organism.
Life form	The form that is characteristic of a particular species at maturity. In the BAM, life form has the same meaning as growth form for flora species.
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.
Litter cover	The percentage ground cover of all plant material that has detached from a living plant, including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter).
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Loss of biodiversity	The loss of biodiversity values from a Project Site, native vegetation clearing site or land where biodiversity certification is conferred.
Major project	State Significant Development and State Significant Infrastructure.

BAM Term	Definition
Minimise	A process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.
Native ground cover	All native vegetation below 1 m in height, including all such species native to NSW (i.e. Not confined to species indigenous to the area).
Native ground cover (grasses)	Native ground cover composed specifically of native grasses.
Native ground cover (other)	Native ground cover composed specifically of non-woody native vegetation (vascular plants only) <1 m in height that is not grass (e.g. herbs, ferns).
Native ground cover (shrubs)	Native ground cover composed specifically of native woody vegetation <1 m in height.
Native mid-storey cover	All vegetation between the over-storey stratum and a height of 1 m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. Native species not local to the area can contribute to mid-storey structure).
Native over-storey cover	The tallest woody stratum present (including emergent) above 1 m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community, the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.
Native plant species richness	The number of different native vascular plant species that are characteristic of a PCT.
Native vegetation	Has the same meaning as in Section 1.6 of the BC Act. That is; the same meanings as in Part 5A of the Local Land Services Act 2013, as follows: <ul style="list-style-type: none"> (1) For the purposes of this Part, native vegetation means any of the following types of plants native to NSW (a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. (2) A plant is native to NSW if it was established in NSW before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to NSW by adopting any relevant classification in an official database of plants that is publicly accessible. (3) For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to NSW if: (a) the plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and (b) it would be native vegetation for the purposes of this Part if it were native to NSW. (4) For the purposes of this Part, native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). A declaration under section 14.7 of the BC Act that specified vegetation is or is not marine vegetation also has effect for the purposes of this Part.
Native vegetation cover	The percentages of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, taking into account vegetation condition and extent. Native over-storey vegetation is used to determine the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.
Number of trees with hollows	A count of the number of living and dead trees that are hollow bearing.
Offset rules	Are those established by the BC Regulation.

BAM Term	Definition
Onsite measures	Measures and strategies that are taken or are proposed to be taken at a Project Site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM.
Patch size	An area of intact native vegetation that: a) occurs on the Project Site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the Project Site or biodiversity stewardship site.
PCT classification system	The system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.
Percent cleared value	The percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the BioNet Vegetation Classification.
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
Plot	An area within a vegetation zone in which site attributes are assessed.
Population	A group of organisms, all of the same species, occupying a particular area.
Probability of reaching benchmark	The probability of a specific attribute or growth form group reaching benchmark conditions in the vegetation zone at the end of the management timeframe.
Project Site	An area of land that is subject to a proposed development that is under the EP&A Act. The term Project Site is also taken to include clearing site except where the reference is to a small area development or a major project development.
Proponent	A person who intends to apply for consent or approval to carry out development, clearing, biodiversity certification or for approval for infrastructure.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height < 5 cm within a vegetation zone.
Residual impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The retirement of biodiversity credits from a biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	An area of land determined according to Appendix 3 of the BAM.
Risk of extinction	The likelihood that the local population or CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on the viability of that population or CEEC or EEC.
SAIL Entity	Candidate species and communities which are sensitive to serious and irreversible impacts.
SEPP 14 Coastal wetland	A wetland to which State Environmental Planning Policy No 14 – Coastal Wetlands applies or an area that is identified as a coastal wetland within the meaning of the term coastal wetlands and littoral rainforests area for the purposes of Coastal Management Act 2016.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	A development other than a linear shaped development, or a multiple fragmentation impact development.

BAM Term	Definition
Site context	The value given to landscape attributes of a Project Site or biodiversity stewardship site after an assessment undertaken in accordance with Section 4.3.
Species credit species	Are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the threatened biodiversity data collection.
State Significant Development	Has the meaning given by Division 4.1 of Part 4 of the EP&A Act.
State Significant Infrastructure	Has the meaning given by Part 5.1 of the EP&A Act.
Stream order	Has the same meaning as in Appendix 3.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a Project Site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threat status class	The extent to which a species or ecological community is threatened with extinction, or the extent to which a PCT is estimated to have been cleared (see Percent cleared value).
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNET website at www.bionet.nsw.gov.au .
Threatened ecological community (TEC)	Means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.
Threatened species	Critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Threatened species survey	A targeted survey for threatened species undertaken in accordance with Section 6.5.
Threatened species survey guidelines	Survey methods or guidelines published by OEH from time to time at www.environment.nsw.gov.au/topics/animals-and-plants/threatenedspecies/about-threatened-species/surveys-and-assessments .
Total length of fallen logs	The total length of logs present in a vegetation zone that are at least 10cm in diameter and at least 0.5m long.
Transect	A line or narrow belt along which environmental data is collected.
Upland Swamp Policy	The document entitled Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence as in force on the day when the BAM is published until such time as the Environment Agency Head publishes any further document for the purpose of it being adopted by the BAM as the Upland Swamp Policy.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification. It is available at www.environment.nsw.gov.au/research/Visclassification.htm .
Vegetation class	A level of classification of vegetation communities defined in Keith (2004) ⁴ . There are 99 vegetation classes in NSW.
Vegetation formation	A broad level of vegetation classification as defined in Keith (2004) ⁴ . There are 16 vegetation formations and sub-formations in NSW.
Vegetation integrity	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.
Vegetation integrity score	The quantitative measure of vegetation condition calculated in accordance with Equation 15 or Equation 16.

BAM Term	Definition
Vegetation zone	A relatively homogenous area of native vegetation on a Project Site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Viability	The capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.
Vulnerable ecological community (VEC)	An ecological community specified as vulnerable in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water (see also important wetland and local wetland).
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

APPENDIX A

Threatened Species Likelihood of Occurrence

Table A1 Key to Likelihood of Occurrence Table

Symbol	Description
BC	The threatened species or endangered ecological community listing in the BC Act
V	Species listed as Vulnerable
E1	Species listed as Endangered
E4A	Species listed as Critically Endangered
E2	An Endangered Population
E	An EEC listed as Endangered
CE	An EEC listed as Critically Endangered
EPBC	The threatened species or endangered ecological community listing in the EPBC Act
V	Species listed as Vulnerable
E	Species listed as Endangered
CE	Species listed as Critically Endangered
M	Species listed as Migratory
MR	Species listed as Marine
Likelihood	Likelihood or Occurrence - the probability of a threatened species occurring on the site
Present	The species was observed in the Project Site during the current survey.
High	It is highly likely that a species inhabits the site and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the site. Also includes species known or likely to visit the site during regular seasonal movements or migration.
Moderate	Potential habitat is present in the site. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the site opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the site or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the Project Site and the species has not been recorded recently in the locality (10km). It may be an occasional visitor, but similar habitat to that present on the site is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the site or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent.
NOTES	<p>Bionet Atlas Data Disclaimer</p> <p>The table below is based on data obtained from the recently reformed Atlas of NSW Wildlife website http://www.bionet.nsw.gov.au/, and the following notes accompany this dataset. Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Å°; ^^ rounded to 0.01Å°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria: Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -33.81 West: 150.94 East: 151.14 South: -34.01] returned a total of 26,570 records of 111 species. Report generated on 4/03/2020 3:22 PM</p>

Table A2 Likelihood of Occurrence of Threatened Species of Flora

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Acacia bynoeana</i> Bynoe's Wattle	E1	V	A semi-prostrate shrub to 1 m height with shiny, stiff and narrow phyllodes and hairy branchlets. A species credit species that may be surveyed at any time of year, but probably more readily seen when producing single yellow flower heads from September to March. The species is endemic to central eastern NSW, currently known from only 30 locations, many of only 1-5 plants. Grows in heath or dry sclerophyll forest on sandy soils. Prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches.	None – No suitable habitat (sandy soils). Habitat is degraded. Not recorded on Project Site.	5	BAM Candidate Species
<i>Acacia pubescens</i> Downy Wattle	V	V	A spreading shrub to 5 m height with bipinnate leaves and conspicuously hairy branchlets. A species credit species that may be surveyed at any time of year, but probably more readily seen when producing brilliant yellow flowers in August to October. The distribution of this species is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. This species occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. The species is found in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Low – Recorded within 1km of site. Broadly suitable habitat exists but is degraded. Targeted survey but not recorded on Project Site.	4854	BAM Candidate Species
<i>Acacia terminalis</i> subsp. <i>terminalis</i> Sunshine Wattle	E1	E	An erect or spreading shrub, 1-5 metres tall, with pale yellow flowers and seed pods 3-11 cm long. A species credit species with specific survey months, being May to July when flowering. The species has a very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay. Occurs in coastal scrub and dry sclerophyll woodland on sandy soils.	None – No suitable habitat (sandy soils). Not recorded on Project Site.	7	
<i>Allocasuarina glaireicola</i>	E1	E	A smooth –barked, slender shrub to 2 m high. A species credit species that may be surveyed at any time of year. Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. The species grows in Castlereagh woodland on tertiary, alluvial gravel with yellow clayey subsoil and lateritic soil.	None – No suitable habitat (alluvial lateritic soils). Not recorded on Project Site.	1	
<i>Caesia parviflora</i> var. <i>minor</i> Small Pale Grass-lily	E1		A small herb with narrow basal leaves and multi-branched flowering stems. A species credit species with specific survey months, being October to February when flowering. This variety occurs uncommonly in Tasmania, southern Victoria and south-east South Australia with an outlying population in NSW. Found in damp places in open forest on sandstone.	None – No suitable habitat (damp open forest on sandstone). Not recorded on Project Site.	1	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Caladenia tessellata</i> Thick Lip Spider Orchid	E1	V	An orchid with a long, sparsely hairy leaf and flower with five long cream-coloured petals and sepals around a broad down-curved labellum. A species credit species with specific survey months, being September (coastal) and October (ranges). Occurs from Central Coast NSW to southern Victoria, with only old records in the Sydney area. Generally, grows in grassy dry sclerophyll woodland on clay loam or sandy soils.	Low – Broadly suitable habitat exists but is degraded and species has not been recorded within 5 km of site. Not recorded on Project Site.	2	BAM Candidate Species
<i>Callistemon linearifolius</i> Netted Bottle Brush	V		A shrub which grows to 4 m tall. Leaves are long, narrow and lance-shaped with a sharp tip, thickened margins and distinct lateral veins. A species credit species with specific survey months, being October to January when the plant produced red "bottlebrush" flowers. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recent records in the Sydney area are limited to the Hornsby Plateau near Hawkesbury River. The species grows in dry sclerophyll forest on the coast and adjacent ranges.	None – No suitable habitat. Not recorded on Project Site.	34	
<i>Cynanchum elegans</i> White-flowered Wax Plant	E	E	A climber or twiner with a highly variable form. A species credit species that may be surveyed at any time of year. The species occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA. Habitat for the species includes Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	None – No records in 10km, no suitable rocky sandstone habitat. Habitat is degraded. Not recorded on Project Site.	None	BAM Candidate Species
<i>Darwinia biflora</i>	V	V	An erect to spreading shrub to 80cm high. Flowers are green, surrounded by two red bracteoles, and are mostly in pairs. A species credit species that maybe surveyed at any time of year, several times due to sporadic flowering. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Occurs in woodland, open forest or scrub-heath, typically with <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> .	None – No suitable heath on sandstone habitat. Not recorded on Project Site.	2	
<i>Deyeuxia appressa</i>	E1	E	An erect perennial grass to 0.9 m high. Leaves are 2 - 4 mm wide, deeply grooved, with a rough lower surface and a hairy upper surface. A species credit species with specific survey month being December when flowering. The species is a highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Given that <i>D. appressa</i> hasn't been seen in over 60 years, almost nothing is known of the species' habitat and ecology.	None – No suitable habitat (sandy soils). Not recorded on Project Site.	2	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Dillwynia tenuifolia</i>	V		Low spreading pea-flower shrub to 1 m high, with small narrow bent-tipped leaves. A species credit species with specific survey months, being August to September when key flowering occurs. The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. Occurs in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.	None – Only record is >8km from site. Habitat is degraded. Not recorded on Project Site.	1	BAM Candidate Species
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V		An erect shrub to 180 cm high with small pointed heart-shaped leaves. Older stem parts have prominent short, broad leaf scars. A species credit species with specific survey months, being September to October when key flowering occurs. Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	None – No suitable habitat (degraded). Not recorded on Project Site.	30	
<i>Eucalyptus benthamii</i> Camden White Gum	V	V	A tall tree with smooth, white bark and numerous flaky ribbons this species occurs on the alluvial flats of the Nepean River and its tributaries. A species credit species that may be surveyed at any time of year. The species requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment.	None – No records in 10km, no suitable habitat (wet alluvial sand). Habitat degraded. Not recorded on Project Site.	None	BAM Candidate Species
<i>Eucalyptus camfieldii</i> Camfield's Stringybark	V	V	Small stringy-barked eucalypt to 9 m high with distinct juvenile leaves that are heart-shaped and roughly hairy. A species credit species that may be surveyed at any time of year. Identifiable throughout year by epicormic growth or juvenile foliage. Occurs from Raymond Terrace to Waterfall, with populations known from Norah Head, Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai and the Royal NP. Occurs in shallow sandy soils overlying Hawkesbury sandstone. Typically, within coastal heath on exposed sandy ridges where tall heath meets low open woodland.	None – No suitable exposed sandstone, sandy soils or heath habitat. Not recorded on Project Site.	1	
<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint	V	V	A medium-sized tree 10-20 m tall with rough, thick, grey-brown bark which extends to the larger branches. A species credit species that may be surveyed at any time of year. Sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Planted as urban street trees and windbreaks. Typically grows in grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	None - Outside of natural distribution, records are planted specimens. Not recorded on Project Site.	4	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Eucalyptus scoparia</i> Wallangarra White Gum	E1	V	A small tree to 15 m tall with smooth, powdery white to pale grey bark. Survey at any time of year. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites on the Stanthorpe Plateau including one population in Girraween National Park. Found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. At lower elevations can occur in less rocky soils in damp situations.	Present - Outside of natural distribution, records are planted specimens. Planted specimens were recorded on site.	1	
<i>Genoplesium baueri</i> Bauer's Midge Orchid	E1,P,2	E	A small orchid to 15 cm high that is fleshy and brittle and yellowish/green or reddish in colour. A species credit species with specific survey months, being February to March when species produced 1-6 small flowers, especially about 6 weeks after good rain. This species is endemic to NSW and distributed between Ulladulla and Port Stephens. There are no recent records from the Sydney area. Grows in dry sclerophyll forest and moss gardens over sandstone.	None – No suitable habitat (sandy gravelly heath/forest). Not recorded on Project Site.	4	
<i>Grevillea beadleana</i> Beadle's Grevillea	E1,3	E	A distinctive spreading shrub, up to 2.5 m tall and wide with large dissected leaves. A species credit species that may be surveyed at any time of year. Known from four separate areas, all in north-east NSW: the Torrington area west of Tenterfield, Oxley Wild Rivers National Park, Guy Fawkes River National Park and at Shannon Creek south-west of Grafton. Historical records suggest it once occurred near Walcha. Found in open eucalypt forest with a shrubby understory, usually on steep granite slopes at high altitude although the Shannon Creek population is at a lower elevation on sandstone.	None -Outside of natural distribution, records are likely planted specimens. No suitable habitat. Not recorded on Project Site.	1	
<i>Grevillea juniperina</i> subsp. <i>juniperina</i> Juniper-leaved Grevillea	V	-	Easily identified medium-sized shrub with green prickly leaves. Survey at any time of year. Endemic to Western Sydney centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. Occurs on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.	None – No records in 10km, no suitable red clay habitat or records nearby. Habitat degraded. Not recorded on Project Site.	None	BAM Candidate Species
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	V	V	A low shrub less than 1 m tall with arching branches and leaves mostly held skywards. A species credit species with specific survey months, being August to November, when producing white or pink/purple grevillea-like flowers. Has a very restricted known distribution (approximately 8 by 10 km) and is confined to the northwest of Sydney near Arcadia and the Maroota–Marramarra Creek area. Occurs in heathy woodland associations on skeletal sandy soils over massive sandstones. Suggested association with yellow clays with periodically impeded drainage.	None – No suitable forest habitat. Not recorded on Project Site.	430	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Hibbertia fumana</i>	E4A	-	A low sub-shrub with small hairy and slender leaves and single terminal yellow flowers. A species credit species with specific survey months being October to December. Only known population occurs in the Moorebank area where it occurs in open understorey areas in a long intergrade between Castlereagh Scribbly Gum Woodland and Castlereagh Ironbark Forest.	None – No suitable Castlereagh habitat. Only records >5km from site. Not recorded on Project Site.	14	
<i>Hibbertia puberula</i>	E1	-	Low shrublet with small oblong-lanceolate to linear leaves. A species credit species with specific survey months, being October to December, when producing yellow flowers in groups of 1-3. Widespread but uncommon, extending from Wollemi National Park south to Morton National Park and the south coast near Nowra. Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodlands, although heaths are also occupied and one subspecies favours upland swamp.	None – no suitable habitat (sand heath). Records >8km from site. Not recorded on Project Site.	215	
<i>Hibbertia</i> sp. Bankstown	E4A	CE	Small prostrate shrub with wiry branches, lance shaped and oblong to almost linear leaves and yellow flowers. A species credit species with specific survey months, being September to December. Verify a voucher specimen with RBG. Currently known to occur in only one population at Bankstown Airport, where it occurs in Cooks River/Castlereagh Ironbark Forest on tertiary alluvial soil along a creek.	None – no suitable alluvial habitat. Known population >4km from site. Not recorded on Project Site.	216	
<i>Hibbertia stricta</i> subsp. <i>furcatula</i>	E1	-	Small upright hairy shrub with linear alternate leaves and yellow flowers. The subspecies is identified by fine forked fascicled hairs along the centre of the upper surface of the leaves. A species credit species with specific survey months, being October to January. Known to occur in two populations, one in the southern outskirts of Sydney, and one near Nowra on the mid-South Coast of NSW. The Sydney population occurs on both sides of the Woronora River gorge, near Loftus and in Royal National Park, found within dry eucalypt forest and woodland near the interface of the Lucas Heights soil landscape and Hawkesbury sandstone.	None – Sydney population >7km from site. No suitable habitat (Lucas Height/sandstone). Not recorded on Project Site.	6	
<i>Leptospermum deanei</i>	V	V	Shrub to 5 m, with bark peeling in long strips, small leaves and white "tea-tree" flowers. A species credit species with specific survey months, being October and November. The species occurs in Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. Habitat includes Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Occurs in Riparian Scrub.	None – No suitable alluvial habitat on site. Not recorded on Project Site.	1	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Leucopogon exolasius Woronora Beard-heath	V	V	Erect shrub with hanging tubular flowers. A species credit species with specific survey months, being August to September, when peak flowering occurs. The species occurs along the upper Georges River area and in Heathcote National Park and prefers rocky hillside habitats in woodland on sandstone.	None – No suitable rocky hill habitat on site. Not recorded on Project Site.	3	
Maundia triglochinoides	V	-	A strappy leaved wetland plant with flower spike to 10cm long. A species credit species with specific survey months, being November to March, when fruiting/flowering. Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	None – Only records are from 1903 – presumed extinct in Sydney. No wetland habitat. Not recorded on Project Site.	2	
Melaleuca deanei Deane's Paperbark	V	V	A shrub to 3 m high with fibrous, flaky bark. A species credit species that may be surveyed all year round. The species occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. Habitat for the species is primarily ridgetop woodland, with only 5% of sites in heath on sandstone.	None – No suitable ridgetop woodland/heath habitat on site. Not recorded on Project Site.	13	
Persoonia bargoensis Bargo Geebung	E	V	An erect bushy shrub to 2.5 m height with small, thin leaves and yellow tubular flowers. A species credit species that may be surveyed year round, especially when flowering from December to May. The distribution is restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands. The species occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone. It favours interface soil landscapes.	None – No records in 10km, no suitable interface soil-type habitat on site. The site is outside of typical range. Habitat degraded. Not recorded on Project Site.	None	BAM Candidate Species
Persoonia hirsuta Hairy Geebung	E1	E	Spreading shrub distinguished by the hairiness of the flowers, branchlets and leaves. A species credit species that may be surveyed all year round. The distribution of the species is scattered around Sydney, east to the Blue Mountains and from Singleton in the north to Bargo in the south. The species is found in dry sclerophyll open forest on sandy soils.	None – No suitable sandy habitat on site. Not recorded on Project Site.	5	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Persoonia nutans</i> Nodding Geebung	E1	E	An erect to spreading shrub to 2.5 m high with hairy young branches, linear leaves and yellow tubular flowers. Species credit species that may be surveyed all year round, with peak flowering from November to March. Mostly occurs in Agnes Banks, Londonderry, Castlereagh, Berkshire Park and Windsor Downs area. Core distribution within the Penrith, and to a lesser extent Hawkesbury LGAs, with isolated and relatively small populations in the Liverpool, Campbelltown, Bankstown LGAs. Northern populations found within aeolian and alluvial sediments with majority of individuals within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but also shale sandstone transition communities.	None – No suitable alluvium/transition habitat on site. Nearest record >5km from site. Not recorded on Project Site.	112	
<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	V	A much-branched subshrub to 120cm high with hairy stems, and small leaves with a sparsely hairy underside. Flowers are red to yellow, hairy and occur in terminal heads of 4 - 12 flowers. A species credit species with specific survey months, being October to March, with recommendation to survey at least twice during flowering. The species is confined to the coastal area of the Sydney and Illawarra regions of NSW. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	None – No suitable sandstone ridgetop habitat on site. Habitat degraded. Not recorded on Project Site.	1	BAM Candidate Species
<i>Pimelea spicata</i> Spiked Rice-flower	E1	E	Small erect or spreading shrub with opposite elliptic leaf and white/pink tubular flowers. A species credit species that may be surveyed all year round but if habitat is suitable it is recommended to survey on 3 occasions a month apart, 4 weeks after a >30mm rainfall event. Occurs in two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). The species occurs on well-structured clay soils particularly in association with good condition Grey Box CPW vegetation types.	Low – Broadly suitable habitat exists but is degraded. Nearest record >3km from site. Not recorded on Project Site.	329	BAM Candidate Species
<i>Prostanthera marifolia</i> Seaforth Mintbush	E4A	CE	An erect, straggly, openly branched shrub up to 0.3 m high with sparsely hairy stems and leaves and purple flowers. A species credit species that may be surveyed all year round, but it is recommended to use flowering of a reference population. Check at a reference site. Only known from the northern Sydney suburb of Seaforth where it occurs in localised patches in or near the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	None – No suitable Duffys Forest habitat on site. Not recorded on Project Site.	1	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Pterostylis saxicola Sydney Plains Greenhood	E1	E	A ground orchid with reddish brown and green translucent flowers on a slender stem to 35 cm tall. A species credit species with a specific survey month, being October, when flowering occurs. The species is restricted to western Sydney between Freemans Reach in the north and Picton in the south. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Pterostylis saxicola occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	None – No suitable sandstone habitat on site. Not recorded on Project Site.	2	BAM Candidate Species
Pultenaea aristata Prickly Bush-pea	V	V	Small shrub species with unmistakable, sharp-tipped leaves. A species credit species that may be surveyed year-round. The species is restricted to the Woronora Plateau; a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. Occurs in either dry sclerophyll woodland or wet heath on sandstone. Flowering occurs in winter and spring.	None – No suitable habitat on site. Not on Woronora Plateau. Not recorded on Project Site.	1	
Pultenaea parviflora	E1	V	Small shrub with alternate leaves and yellow pea-like flower. A species credit species with specific survey months, being September to November; using flowers/fruits to locate and identify; peak flowering in September, and fruiting from October to November. Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Deans Park. Outlier populations are recorded from Kemps Creek and Wilberforce. Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterite clays.	None – No suitable ironbark/laterite habitat on site. Not recorded on Project Site.	2	
Pultenaea pedunculata Matted Bush-pea	E1	-	A shrub that forms carpets 1 m or more wide, has flat elliptical leaves and yellow pea-like flowers. A species credit species with specific survey months, being September to November when flowering. Occurs in a range of habitats. In the Cumberland Plain the species favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present.	Low – Recorded within 1km of site. Broadly suitable habitat exists but is degraded and no Laterite/ironstone noted in soil. Not recorded on Project Site.	12	BAM Candidate Species
Rhodamnia rubescens Scrub Turpentine	E4A	-	Shrub or small tree to 25 m high with reddish/brown, fissured bark. A species credit species that may be surveyed all year round. Occurs in coastal districts north from Batemans Bay in NSW to areas inland of Bundaberg in QLD. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	None – No suitable rainforest/wet sclerophyll habitat on site. Not recorded on Project Site.	6	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E1	V	A small to medium sized rainforest tree, with flaky bark, dark green leaves that are light beneath and magenta fruit. A species credit species with specific survey months, being April to June, when fruiting. Naturally occurring plants generally produce low numbers of fruit, while cultivated individuals and offspring generally produce high numbers of fruit. Samples need to be verified by RBG to detect hybridisation. The species occurs in a narrow coastal strip from Bulahdelah to Conjola State Forest. Rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests.	None – No suitable rainforest habitat on site. Common landscape plant of Sydney. Not recorded on Project Site.	17	
<i>Tetratheca glandulosa</i>	V	-	Small, spreading shrub to 50 cm height with small opposite leaves, purple/pink flowers and red-tipped hairs covering the flower stalk and sepals. A species credit species with specific survey months, being August to November, when flowering. Restricted to LGAs: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. Associated with shale-sandstone transition in Lucas Heights, Gympie, Lambert and Falconbridge soil landscapes. Typically occurs in Sydney Sandstone Ridgetop Woodland on ridgetops and upper slopes with shallow yellow, clayey/sandy loam soil often with stony lateritic fragments.	None– No suitable ridgetop habitat on site. Outside of typical range. Not recorded on Project Site.	1	
<i>Tetratheca juncea</i> Black-eyed Susan	V	V	Sprawling shrub with distinct winged stem and reduced leaves. Difficult to detect without flowers. A species credit species with specific survey months, being September to October. Most populations occur on low nutrient soils associated with the Awaba Soil Landscape. Usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest.	None – No suitable low forest habitat on site. Not recorded on Project Site.	17	
<i>Thesium australe</i> Austral Toadflax	V	V	A small, straggling herb to 40 cm tall often hidden amongst grasses. A species credit species with specific survey months, being November to February, when in flower/fruit. The species occurs in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Habitat for this species includes grassland on coastal headlands or grassland and grassy woodland away from the coast.	Low – Broadly suitable habitat exists but is degraded. Species not recorded within 10km of site. Not recorded on Project Site.	None	BAM Candidate Species
<i>Wilsonia backhousei</i> Narrow-leafed Wilsonia	V	-	A perennial, sprawling, matted shrub less than 15 cm tall with small succulent leaves and white flowers. A species credit species that may be surveyed all year-round, but is best detected when water level is low, to allow observation. Found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. Occurs on the margins of salt marshes and lakes. Flowering occurs in spring and summer.	None – No suitable salt marsh habitat on site. Not recorded on Project Site.	111	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Zannichellia palustris	E1	-	A submerged aquatic plant. Leaves 2-7 cm long by less than 1 mm wide. A species credit species with specific survey months, being October to January, when in flower. In NSW, known from the lower Hunter and in Sydney Olympic Park. Grows in fresh or slightly saline stationary or slowly flowing water. NSW populations behave as annuals, dying back completely every summer.	None – No suitable aquatic habitat on site. Not recorded on Project Site.	5	

Table A3 Likelihood of Occurrence of Threatened Species of Birds

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Anthochaera phrygia Regent Honeyeater	E4A	CE	A dual credit species, with a patch size <5 ha and <10% surrounding native vegetation requirement. It does not require survey as important habitat has been mapped. In NSW the species is confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks are seen occasionally in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests. Habitat for the species includes dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	Low – Old records 4-5km to north. Winter foraging trees at low density in urban landscape. Not recorded on Project Site.	15	BAM Candidate Species BAM Predicted Species
Artamus cyanopterus Dusky Woodswallow	V	-	An ecosystem credit species with a patch size <5 ha and <10% surrounding native vegetation requirement. It does not require survey as breeding occurs outside NSW. A woodland dependent bird with a wide distribution and occurrence in a variety of habitats. The Tasmanian breeding population migrates north during the cooler months and can be found in southeast NSW. The species is an aerial forager and prefers woodland habitats.	Low – Patches of woodland foraging habitat. Not recorded on Project Site.	43	BAM Predicted Species
Botaurus poiciloptilus Australasian Bittern	E1	E	An ecosystem credit species with a patch size <5 ha and <10% surrounding native vegetation requirement. Large, stocky bird to 75 cm in length, widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (Typha spp.) and spike rushes (Eleocharis spp.).	None – No suitable freshwater wetland habitat. Not recorded on Project Site.	9	
Burhinus grallarius Bush Stone-curlew	E1	-	A species credit species with a patch size <5 ha and 11-30% surrounding native vegetation requirement. It may be surveyed all year round. Scattered distribution across NSW. Inhabits lowland grassy woodland and open forest and, in coastal areas, Casuarina and Melaleuca woodlands, saltmarsh and mangroves. Requires a low, sparse groundcover, some fallen timber and leaf litter, and a general lack of a shrubby understory.	None – Old records <4km. Broadly suitable habitat but degraded, small and isolated. Not recorded on Project Site.	7	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Calidris ferruginea</i> Curlew Sandpiper	E1	CE	A dual credit species with patch size <5 ha and <10% surrounding native vegetation requirement. It does not require survey as important habitat areas have been mapped and breeding occurs outside of Australia. The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in NSW can be found mainly in intertidal mudflats of sheltered coasts.	None – No suitable littoral or estuarine habitats present. Not recorded on Project Site.	354	
<i>Calidris tenuirostris</i> Great Knot	V	CE	A dual credit species with <5 ha patch size and <10% surrounding native vegetation requirement. It does not require survey as important habitat areas have been mapped and breeding occurs outside of Australia. In NSW, occurs in scattered sites along the coast to Narooma – it has been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	None – No suitable coastal habitats on site. Not recorded on Project Site.	2	
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	V	-	A dual credit species with <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months for species credits, being October to January. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts	None- No suitable habitat on site. Nearest record >7km from site. Not recorded on Project Site.	3	
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo	V	-	A dual credit species with <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being April to August. Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of Sheoak (<i>Allocasuarina/Casuarina</i> spp.). Prefers woodland and open forests, rarely away from Sheoak. Roost in leafy canopy trees, preferably eucalypts, usually <1 km from feeding site. Nests in large (approx. 20 cm) hollows in trees, stumps or limbs, usually in Eucalypts.	None – Very low density of Sheoak, but woodland degraded. Nearest records >5km from site. Not recorded on Project Site. No chew cones.	8	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Charadrius leschenaultii Greater Sand-plover	V	V	A dual credit species with <5 ha patch size and <10% surrounding native vegetation requirement. It does not require survey as important habitat areas have been mapped and breeding occurs outside of Australia. Breeds in central Asia wintering in Australia. Stronghold is within the far northwest of Australia. In NSW, the species has been recorded between the northern rivers and the Illawarra. Restricted to coastal areas, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	None – No suitable coastal habitat on site. Not recorded on Project Site.	1	
Chthonicola sagittata Speckled Warbler	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Within NSW most frequently reported from the hills and tablelands of the Great Dividing Range, rarely from the coast. The species inhabits a wide range of Eucalypt-dominated communities with a grassy understorey, a sparse shrub layer, often on rocky ridges or in gullies. Sedentary and requires large, relatively undisturbed remnants to persist in an area. Forages on the ground for seeds and insects, and nests in a slight hollow in the ground or at the base of low dense plants.	Low – No suitable rocky ridge and gully habitat. No breeding habitat. Not recorded in 10 km radius. Not recorded on Project Site.	None	BAM Predicted Species
Circus assimilis Spotted Harrier	V	-	An ecosystem credit species with patch size <5 ha and 11-30% surrounding native vegetation requirement. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	None – No suitable habitat on site. Habitat degraded and isolated. Not recorded on Project Site.	9	
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the Great Dividing Range. Nests in tree or stump hollows greater than 6cm.	Low – No suitable habitat on site. Habitat degraded and isolated. Not recorded on Project Site.	1	BAM Predicted Species

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Daphoenositta chrysoptera Varied Sittella	V	-	An ecosystem credit species with patch size <5 ha and 11-30% surrounding native vegetation requirement. Sedentary, occurs across NSW from the coast to the far west. An ecosystem credit species with patch size <5ha. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	None – No suitable structurally complex habitat on site. Habitat degraded and isolated. Not recorded on Project Site.	21	
Ephippiorhynchus asiaticus Black-necked Stork	E1	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. This species breeds during summer, nesting in or near a freshwater swamp.	None – No suitable wetland habitat on site. Not recorded on Project Site.	3	
Epthianura albifrons White-fronted Chat	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Short slender bill, long spindly legs, a short square-tipped tail and rounded wings. Detectable all year, gregarious species, usually found foraging on bare or grassy ground in wetland areas. The White-fronted Chat lives in salt marsh and other damp areas with low vegetation such as swampy farmland and roadside verges.	None – No suitable wetland habitat on site. Not recorded on Project Site.	254	
Falco subniger Black Falcon	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. It that does not require survey due to assumed presence. Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In NSW there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling over hundreds of kilometres. The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees.	None – No suitable wooded watercourse habitat on site. Not recorded on Project Site.	1	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Glossopsitta pusilla Little Lorikeet	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. The species occurs from the coast to western slopes of the Great Dividing Range and inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely flowering eucalypts and a variety of other species including melaleucas and mistletoes. Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially <i>E. viminalis</i> , <i>E. blakelyi</i> and <i>E. dealbata</i> . Most breeding records are from the western slopes.	Low – Habitat lacks suitable habitat complexity, shrub cover and feed species. Habitat degraded and isolated. Not recorded on Project Site.	45	BAM Predicted Species
Haematopus fuliginosus Sooty Oystercatcher	V	-	A species credit species with patch size <5 ha and <10% surrounding native vegetation requirement. It may be surveyed all year round but requires a survey to assess breeding and a survey to assess winter roosting. Evenly distributed along NSW coast, including offshore islands. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds almost exclusively on offshore islands, and occasionally on isolated promontories.	None – No suitable wetland habitat on site. Not recorded on Project Site.	1	
Haematopus longirostris Pied Oystercatcher	E1	-	A species credit species with patch size <5 ha and <10% surrounding native vegetation requirement. It may be surveyed all year round but requires a survey to assess breeding and a survey to assess winter roosting. Scattered along NSW coast. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches; occasionally saltmarsh or grassy areas.	None – No suitable wetland habitat on site. Not recorded on Project Site.	3	
Haliaeetus leucogaster White-bellied Sea-Eagle	V	-	A dual credit species with <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being July to December. This in order to detect breeding, especially where a large stick nest is found. In NSW the species is widespread along the east coast, and along all major inland rivers and waterways. Typically occupies coastal areas with large areas of open water. Feeds mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. The species has highly specific nesting requirements and needs live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines. Presence of breeding confirmed by a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period. Nesting occurs between June and September.	Low – Broadly suitable foraging habitat but isolated and degraded. Within 1km of creek, but no suitable large trees or nests present. Not recorded on Project Site.	340	BAM Candidate Species BAM Predicted Species

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Hieraaetus morphnoides Little Eagle	V	-	A dual credit species with <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months for species credits, being August to October. This in order to detect breeding, especially where a large stick nest is found. Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	None – Marginally suitable but highly disturbed habitat on site. Not recorded on Project Site.	23	
Ixobrychus flavicollis Black Bittern	V	-	An ecosystem credit species with patch size <5 ha and 11-30% surrounding native vegetation requirement. Species with a wide distribution that is primarily a vagrant to NSW. Nomadic but detectable all year in both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Breeds in large stick nests, built in spring are located on a branch overhanging water.	None – No estuarine habitat. Not recorded on Project Site.	11	
Lathamus discolor Swift Parrot	E1	CE	A dual credit species with <5 ha patch size and <10% surrounding native vegetation requirement. It does not require survey as areas of important habitat have been mapped. A migratory species that travels to the mainland from March to October, the species breeds in Tasmania from September to January. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus robusta, Corymbia maculata and C. gummifera dominated coastal forests are also important habitat.	Low – Coastal winter foraging trees at low density in urban landscape. Not recorded on Project Site.	19	BAM Candidate Species BAM Predicted Species
Limicola falcinellus Broad-billed Sandpiper	V	-	A dual credit species with patch size <5 ha and <10% surrounding native vegetation requirement. It does not require survey as important areas of habitat have been mapped and breeding occurs outside of Australia. The eastern form of this species breeds in northern Siberia before migrating southwards in winter to Australia. Overwinter on the northern coast, particularly in the north-west, only occasionally on the southern coast. In NSW, the main site for the species is the Hunter River estuary, only occasionally reaching the Shoalhaven estuary. Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	None – No suitable coastal habitat on site. Not recorded on Project Site.	2	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Limosa limosa Black-tailed Godwit	V	C	A dual credit species with patch size <5 ha and 11-30% surrounding native vegetation requirement. It does not require survey as important area have been mapped and breeding occurs outside of Australia. A migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Can be found around muddy lakes and swamps, wet fields and sewerage treatment works.	None – No suitable wetland habitat on site. Not recorded on Project Site.	14	
Lophochroa leadbeateri Major Mitchell's Cockatoo	V	-	A dual credit species with patch size <5 ha and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being September to December. This is in order to detect breeding. Found across arid and semi-arid inland from south western Queensland south to north west Victoria, north into the south-west of the Northern Territory, and across to the west coast between Shark Bay and Jurien. In NSW it is found as far east as Bourke and Griffith, sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Nesting in tree hollows throughout second half of year.	None – Outside of natural distribution. Not recorded on Project Site.	2	
Lophoictinia isura Square-tailed Kite	V	-	A dual credit species with <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months for species credits, being September to January. This in order to detect breeding, especially where a large stick nest is found. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February. Survey potential nest sites from September to January.	None – No suitable timbered watercourse habitat on site. Not recorded on Project Site.	6	
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Low – Habitat broadly suitable but degraded (lacking structural diversity) and isolated. Not recorded on Project Site.	None	BAM Predicted Species

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	V	-	An ecosystem credit species with patch size 5-24 ha and 11-30% surrounding native vegetation requirement. Widespread through NSW, but rarely recorded east of Great Dividing Range. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Breeds solitarily or co-operatively, with up to five or six adults, from June to December.	None – No suitable box-ironbark woodland habitat on site. Not recorded on Project Site.	5	
Neophema pulchella Turquoise Parrot	V	-	An ecosystem credit species with patch size <5 ha and 11-30% surrounding native vegetation requirement. Inhabits fringes of eucalypt woodlands, often adjacent to clearings, ridges and farmland creeks. Typically forages on the ground under trees. Distributed from southern Queensland to northern Victoria, extending from the coast to the western slopes of the Great Dividing Range. Nesting occurs from December to August in tree hollows.	None – No suitable edge of large woodland area. No suitable nesting trees. Not recorded on Project Site.	3	
Ninox strenua Powerful Owl	V	-	A dual credit species with a <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months for species credits, being May to August. This in order to detect breeding, especially where a suitable nesting hollow is found. Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Roosts by day in dense vegetation comprising species such as S. glomulifera and A. littoralis. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450 ha.	None – No suitable large tracts of vegetation on or near the site. No suitable nesting trees. Not recorded on Project Site.	94	
Pandion cristatus Eastern Osprey	V	-	A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being April to November. This in order to detect breeding, especially where a large nest is found. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	None – No suitable coastal habitat on site. Not recorded on Project Site.	24	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Petroica boodang Scarlet Robin	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Breeds on ridges, hills and foothills between July and January.	Low – Broadly suitable foraging habitat but degraded and isolated. No breeding habitat. Not recorded on Project Site.	6	BAM Predicted Species
Petroica phoenicea Flame Robin	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains) and are occasionally seen in heathland or other shrublands in coastal areas.	Low – Broadly suitable winter foraging habitat but degraded and isolated. No breeding habitat. Not recorded on Project Site.	6	BAM Predicted Species
Petroica rodinogaster Pink Robin	V	-	An ecosystem credit species with patch size <5 ha and 11-30% surrounding native vegetation requirement. A species of far southeast NSW where it inhabits rainforest and wet sclerophyll forest. The species disperses north and west and into drier, more open habitats in winter (May to August), regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Potential seasonal migrant to Sydney area.	None – Broadly suitable foraging habitat but isolated and degraded. Not recorded on Project Site.	1	
Ptilinopus superbus Superb Fruit-Dove	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Occurs mainly north from NE NSW, much less common further south and largely confined to pockets of habitat south to Moruya. Vagrants occur south to VIC and TAS. Inhabits rainforest and closed forests, may also forage in eucalypt or acacia woodland with fruit-bearing trees. Nests 5-30 m above ground in rainforest/rainforest edge tree and shrub species. Part of the population migratory/nomadic. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn.	None – No suitable rainforest or closed forest habitat on site. Not recorded on Project Site.	4	
Rostratula australis Australian Painted Snipe	E1	E	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. The species nests on the ground amongst tall reed-like vegetation near water. Habitat for the species includes the fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	None – No suitable wetland habitat on site. Not recorded on Project Site.	4	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Stagonopleura guttata Diamond Firetail	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. Scattered distribution over the rest of NSW, though very rare west of Darling River. Typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, and grasslands. Often found along rivers and creeks, and sometimes in lightly wooded farmland. Groups separate into small colonies to breed, between August and January.	Low – Broadly suitable habitat but degraded and isolated. Not common on coast and no nearby records. Not recorded on Project Site.	None	BAM Predicted Species
Sternula albifrons Little Tern	E1	-	A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being September to March. Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. It breeds in spring and summer along the entire east coast from Tasmania to northern Queensland, and is seen until May, with only occasional birds seen in winter month. Almost exclusively coastal, preferring sheltered environments, however also occurring kilometres from the sea in harbours, inlets and rivers.	None – No suitable coastal habitat on site. Not recorded on Project Site.	7	
Stictonetta naevosa Freckled Duck	V	-	An ecosystem credit species with patch size <5 ha and <10% surrounding native vegetation requirement. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Nesting usually occurs between October and December but can take place at other times when conditions are favourable.	None – No suitable wetland habitat on site. Not recorded on Project Site.	1	
Tyto longimembris Eastern Grass Owl	V	-	An ecosystem credit species with a 25-100 ha patch size and 11-30% surrounding native vegetation requirement. Recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east. The species is found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	None – No suitable tall grass or swampy habitat on site. Not recorded on Project Site.	2	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Tyto novaehollandiae Masked Owl	V	-	A dual credit species with a <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months for species credits, being May to August. This in order to detect breeding, especially where a suitable nesting hollow is found. Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt forest and woodland from sea level to 1100 m. Roosts and breeds in large (>20cm) hollows in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. The typical diet consists of tree-dwelling and ground mammals, especially rats.	None – No roosting habitat or edge of forest foraging habitat. >6km from nearest record. Not recorded on Project Site.	4	
Xenus cinereus Terek Sandpiper	V	-	A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It does not require survey as important areas have been mapped and breeding occurs outside of Australia. A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally, roosts communally amongst mangroves or dead trees, often with related wader species.	None – No suitable estuarine habitat on site. Not recorded on Project Site.	1	

Table A4 Likelihood of Occurrence of Threatened Species of Mammals

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Cercartetus nanus Eastern Pygmy-possum	V	-	A species credit species with a <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months for species credits, being October to March. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Primarily feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes. Shelters in a variety of features including hollows and rotten stumps, and breeds by making a nest in tree hollows and sometimes in tree forks or under bark. Frequently spends time in torpor especially in winter therefore targeted surveys in Oct-March.	None – No suitable sheltered habitat or foraging resources. Records >5km from site. Not recorded on Project Site.	7	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Chalinolobus dwyeri Large-eared Pied Bat	V	V	A species credit species with a <5 ha patch size and 11-30% surrounding native vegetation requirement. It has specific survey months, being November to January. This in order to detect breeding. It has a specific cliff habitat requirement, being within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels. Potential foraging habitat is PCTs associated with the species within 100m of the specific habitat requirement. The species has a distribution from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands.	None – No suitable roosting or sandstone escarpment habitat on site. Not recorded on Project Site.	3	
Dasyurus maculatus Spotted-tailed Quoll	V	E	An ecosystem credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. The species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Are known to traverse their home ranges along densely vegetated creeklines. The species has been shown to use small patches and highly fragmented landscapes.	Low – Broadly suitable habitat, but degraded and isolated. Not recorded on Project Site.	3	BAM Predicted Species
Falsistrellus tasmaniensis Eastern False Pipistrelle	V	-	An ecosystem credit species with a 5-24 ha patch size and 31-70% surrounding native vegetation requirement. The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. It prefers moist habitats, with trees taller than 20 m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hibernates in winter.	None – No records within 5km or suitable moist habitat. Not recorded on Project Site.	18	
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	V	-	An ecosystem credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. The species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark. The species typically breeds in hollows and changes breeding sites regularly (every few days). However, it has been known to occasionally aggregate in large breeding groups (including in buildings).	Low – Records within 1km of site. Broadly suitable foraging habitat and might roost/breed in buildings. Not recorded on Project Site.	14	BAM Predicted Species

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<p>Miniopterus australis Little Bent-winged Bat</p>	V	-	<p>A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being December to February. This in order to detect breeding. It has a specific cave habitat requirement for breeding. The species occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.</p>	<p>Low – No records within 5km of site. Broadly suitable foraging habitat and might roost in buildings. Not recorded on Project Site.</p>	9	<p>BAM Candidate Species BAM Predicted Species</p>
<p>Miniopterus orianae oceanensis Large Bent-winged Bat</p>	V	-	<p>A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being December to February. This in order to detect breeding. It has a specific cave habitat requirement for breeding. Occurs along the east and north-west coasts of Australia. Primary roosting habitat comprises caves, but they also use derelict mines, storm water tunnels, buildings and other man-made structures. At other times of the year, populations disperse within about 300 km range of maternity caves. Foraging habitat is broad and the species hunts in forested areas, catching moths and other flying insects above the treetops.</p>	<p>Low – Records within 2km of site. Broadly suitable foraging habitat and might roost in buildings. Not recorded on Project Site.</p>	104	<p>BAM Candidate Species BAM Predicted Species</p>
<p>Myotis Macropus Southern Myotis</p>	V	-	<p>A species credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months, being October to March. It has specific breeding habitat requirements being hollow-bearing trees, bridges, caves or artificial structures, within 200 m of riparian zone. Mainly coastal but may occur inland along large river systems. Species is dependent on pools/ stretches of water 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies for foraging. Habitat within 200 m of waterways is used for breeding and roosting. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.</p>	<p>None – No records within 5km. No suitable waterways or nearby roosting habitat on site. Not recorded on Project Site.</p>	47	<p>BAM Candidate Species</p>
<p>Petaurus australis Yellow-bellied Glider</p>	V	-	<p>An ecosystem credit species with a 25-100 ha patch size and 31-70% surrounding native vegetation requirement. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. An ecosystem credit species that requires a 5-25ha patch size. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Very mobile species known to occupy large home ranges between 20 to 85 ha. Dispersal requires continuous habitat connectivity (gliding distance around 120m). Den, often in family groups, in hollows of large trees.</p>	<p>None – No records within 5km of site. No tall mature forest, connected habitat, or hollows on site. Not recorded on Project Site.</p>	1	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Petaurus norfolcensis Squirrel Glider	V	-	A species credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It may be surveyed all year round, but sites with bipinnate acacia, autumn winter flowering trees (<i>E. robusta</i>) and shrubs (<i>Banksia</i> spp.) should be surveyed March to August. The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia mid-storey. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely connected (i.e. no more than 50 m apart).	None – No records within 10km. No suitable forest/heath habitat or hollows on site. Not recorded on Project Site.	None	BAM Candidate Species
Petrogale penicillate Brush-tailed Rock-wallaby	E1	V	A species credit species with a 5-24 ha patch size and 11-30% surrounding native vegetation requirement. It may be surveyed year-round but may be more readily detected in winter when sunning itself in open areas. Occurring from Shoalhaven to the Queensland border the species is now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. The species inhabits rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north.	None- No records within 5km. No rocky escarpment habitats on site. Not recorded on Project Site.	1	
Phascolarctos cinereus Koala	V	V	A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It may be surveyed all year round. Important habitat is defined by the density of koalas and quality of habitat determined by on-site survey. Fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. A dual credit species with a patch size <5ha. Inhabits eucalypt woodlands and forests feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Low – Records from bush at Holsworthy. Broadly suitable habitat on site but not well connected. Not recorded on Project Site.	110	BAM Candidate Species BAM Predicted Species
Pteropus poliocephalus Grey-headed Flying-fox	V	V	A dual credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months for species credits, being October to December. Foraging habitat is broad, but breeding habitat is specific to camps that are found to contain breeding females. Generally, this species is found within 200km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Moderate – Many records nearby. Broadly suitable foraging habitat. No roosting camp habitat on site. Not recorded on Project Site.	1857	BAM Candidate Species BAM Predicted Species

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	V	-	An ecosystem credit species with a <5 ha patch size and 11-30% surrounding native vegetation requirement. A wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees. Breeding has been recorded from December to mid-March. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	None – No records within 5km. Broadly suitable foraging habitat and might roost in buildings, but incorrect PCT. Not recorded on Project Site.	18	
Scoteanax rueppellii Greater Broad-nosed Bat	V	-	An ecosystem credit species with a 5-24 ha patch size and 31-70% surrounding native vegetation requirement. The species is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks. Although this species usually roosts in tree hollows, it has also been found in buildings.	None – No records within 5km. Broadly suitable foraging habitat and might roost in buildings, but incorrect PCT and not >5ha. Not recorded on Project Site.	16	

Table A5 Likelihood of Occurrence of Threatened Species of Reptiles

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Chelonia mydas Green Turtle	V	V	A species credit species with a <5 ha patch size and 31-70% surrounding native vegetation requirement. It has specific survey months for species credits, being December to April. A large sea-turtle that grows up to 1 m in length. Its heart-shaped shell is olive-green, brown and black. The species is widely distributed in tropical and sub-tropical seas and spend most of its life at sea.	None – No suitable habitat on site. Not recorded on Project Site.	1	
Varanus rosenbergi Rosenberg's Goanna	V	-	An ecosystem credit species with a 5-24 ha patch size and 31-70% surrounding native vegetation requirement. Occurs on Sydney sandstone in Wollemi National Park, Goulburn and ACT regions and near Cooma in the south. Found in heath, open forest and woodland. Associated with termite mounds of which the species nests in. Individuals require large areas of habitat. Shelters in large hollow logs, rock crevices and in burrows, which they may dig for themselves, or use burrows constructed by other species (e.g. rabbit burrows).	None – No suitable large areas of habitat or termite mounds on site. Not recorded on Project Site.	1	

Table A6 Likelihood of Occurrence of Threatened Species of Amphibians

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Litoria aurea</i> Green and Golden Bell Frog	E1	V	A species credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It has specific survey months, being November to March. It has specific habitat constraints being within 1km of wet areas, swamps or waterbodies. Patchy distribution from Brunswick Heads to Victoria. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast. Inhabits marshes, dams and stream-sides, particularly those containing Bullrushes <i>Typha</i> spp. or Spikerushes <i>Eleocharis</i> spp.. Optimum habitat includes waterbodies that are unshaded, free of predatory fish such as Plague Minnow <i>Gambusia holbrooki</i> , have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	None – Many records in Greenacre/Chullora. No suitable aquatic habitat on site. Not recorded on Project Site.	16076	BAM Candidate Species
<i>Pseudophryne australis</i> Red-crowned Toadlet	V	-	A species credit species with a <5 ha patch size and 11-30% surrounding native vegetation requirement. It may be surveyed all year round. The species is restricted to the Sydney Basin, from Nowra to Pokolbin and west to Mt Victoria. Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter.	None – No suitable sandstone habitat on site. Not recorded on Project Site.	12	

Table A7 Likelihood of Occurrence of Threatened Species of Gastropods

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	E1	-	A species credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It may be surveyed all year round. Survey for live specimen's in early morning or evening during or after rain. Lives in small areas on the Cumberland Plain, west of Sydney. Can occasionally be found around paddock trees and under rubbish. The species is reliant on a good cover of coarse woody debris and uses soil cracks for shelter. Primarily inhabits Cumberland Plain Woodland. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Can dig several centimetres into soil to escape drought.	Moderate – Records within 4km of site. Suitable habitat exists, but isolated and degraded. No records from targeted surveys conducted on Project Site.	38	BAM Candidate Species

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Pommerhelix duralensis Dural Land Snail	E	E	A species credit species with a <5 ha patch size and <10% surrounding native vegetation requirement. It may be surveyed all year round and has specific habitat constraints being rocky areas, dead timber, leaf litter and shed bark. Species found within LGAs: The Hills Shire, Hawkesbury Shire and Hornsby Shire. Records from the Blue Mountains City, Penrith City and Parramatta City may represent this species. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	None – No records within 10km of site. No soil interface habitat. Not recorded on Project Site.	None	BAM Candidate Species

Table A8 Likelihood of Occurrence of Threatened Populations

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Acacia prominens Gosford Wattle, population in the Hurstville and Kogarah LGAs	E2	-	An erect or spreading tree to 18m height that has a prominent mid-vein and one gland at base of its phyllodes. Flowers mid-Jul to early Sep but can be identified by foliage year-round. An isolated population disjunct from other populations and at the southern limit of the range of the species. Occurs at a few sites along the railway line at Penhurst, at Carss Bush Park, Carss Park and there is an unconfirmed siting at Oatley Park, Oatley. Grows in open situations on clayey or sandy soils.	None – Population not within 5km of site or same LGA. Not recorded on Project Site.	15	
Allocasuarina diminuta subsp. mimica population in the Sutherland Shire and Liverpool City LGAs	E2	-	A shrub or small tree to 5m high with slender branchlets to 23cm long. Occurs along sandstone ridges and upper hillsides in the region northwest from Heathcote, towards Menai and Holsworthy, in heathy and low open woodland communities. Habitats include heathy woodland, heathlands and low open woodlands.	None – Population not within 5km of site or same LGA. Not recorded on Project Site.	1	
Dillwynia tenuifolia Kemps Creek	E2	-	Low spreading pea-flower shrub to one metre high. Best surveyed Aug-Sept when key flowering occurs. Occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool LGA. The population grows on a small outlier of the Berkshire Park Soil Landscape within a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland. Portions of the site contain a form of Shale Gravel Transition Forest.	None – Population not within 10km of site, or in Kemps Creek. Not recorded on Project Site.	None	BAM Candidate Population

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
<i>Epthianura albifrons</i> White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2	-	Short slender bill, long spindly legs, a short square-tipped tail and rounded wings. Detectable all year, gregarious species, usually found foraging on bare or grassy ground in wetland areas. The White-fronted Chat lives in salt marsh and other damp areas with low vegetation such as swampy farmland and roadside verges. Two isolated sub-populations of White-fronted Chats are currently known from the Sydney Metropolitan Catchment Management Area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay.	None – No suitable saltmarsh or swamp habitat on site. Nearest known population >6km from site. Not recorded on Project Site.	254	
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs	E2	-	A climber with twining stems to 4m high that is best surveyed when flowering in spring-summer. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range. Grows in vine thickets and open shale woodland.	Low - Records within 3km of site. Broadly suitable habitat exists but is degraded. Not recorded on Project Site.	337	BAM Candidate Population
<i>Perameles nasuta</i> Long-nosed Bandicoot population in inner western Sydney	E2	-	Population occupies area within Marrickville and Canada Bay LGA, likely to also be found in Canterbury, Ashfield and Leichhardt LGAs. Habitat includes shelter underneath older houses and buildings, foraging in parklands and backyards.	None – No suitable habitat on site. Outside known population by >9km. Not recorded on Project Site.	24	
<i>Pomaderris prunifolia</i> population in the Parramatta, Auburn, Strathfield and Bankstown LGAs	E2	-	Shrub to 3m high, stems with rusty stellate hairs. Best detected when flowering in October. Known from only three sites within the listed LGAs, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs along a road reserve near a creek, among grass species on sandstone. At Rookwood Cemetery it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest (CRCIF) on shale soils.	None – Records within 3km of site, but no creek or CRCIF habitat. Not recorded on Project Site.	19	
<i>Prostanthera saxicola</i> population in Sutherland and Liverpool LGAs	E2	-	Primarily in Eucalypt forest, heath and low shrub land, often in damp or moist sites. This population is restricted to the named LGAs (Liverpool and Sutherland) in the southern to south-western parts of Sydney. Records are mainly between Holsworthy station and Sutherland station, north from Lucas Heights and south of the Georges River.	None – Record over 5km from site and not within LGA. No suitable damp forest habitat. Not recorded on Project Site.	1	

Species Name	BC	EPBC	Key Information	Likelihood	No.	BAM Info.
Wahlenbergia multicaulis Tadgell's Bluebell population in the Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs	E2	-	A perennial, tufted herb, typically few-stemmed, to 75cm high. Usually flowers throughout the year, although a late spring/early summer peak has been observed. There are 13 known sites, two of which are in northern Sydney (Thornleigh and Mt Ku-Ring-Gai) with the remainder in western Sydney (Rookwood, Chullora, Bass Hill, Bankstown, Georges Hill, Campsie, South Granville and Greenacre). Most sites are closely aligned with the poorly drained, yellow podsolic Villawood Soil Series. Typically found in damp, disturbed sites and grows in a variety of habitats including forests, woodland, scrub, grassland and the edges of watercourses and wetlands. In Hornsby LGA it occurs in or adjacent to sandstone gully forest. In Western Sydney it is found in remnants of Cooks River/ Castlereagh Ironbark Forest.	None – No suitable damp forest or Cooks River / Castlereagh Ironbark Forest on Villawood Soils present. Not recorded on Project Site.	87	

Table A9 Likelihood of Occurrence of Threatened Ecological Communities

Species Name	BC	EPBC	Key Information	Likelihood
Agnes Banks Woodland in the Sydney Basin Bioregion	E4B	E	Low woodland dominated by Eucalyptus sclerophylla and Angophora bakeri with a diverse understorey of sclerophyllous shrubs species including Banksia oblongifolia, Conospermum taxifolium, Leptospermum trinervium, Dillwynia sericea, Monotoca scoparia and Persoonia nutans, and ground stratum species including Lepidosperma urophorum, Platysace ericoides, Pimelea linifolia, Mitrasacme polymorpha, Trachymene incisa and Stylidium graminifolium. Restricted to small areas of sand dunes overlying Tertiary Alluvium at Agnes Banks on the east bank of the Hawkesbury River in the Penrith LGA.	Absent
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	E3	-	Associated with coastal sand plains of marine or aeolian origin. It occurs on deep, freely draining to damp sandy soils on flat to moderate slopes within a few km of the sea and at altitudes below 100 m.	Absent
Blue Gum High Forest in the Sydney Basin Bioregion	E4B	CE	Blue Gum High Forest is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Dominated by either Eucalyptus pilularis (Blackbutt) or E. saligna (Sydney Blue Gum). Typically associated with soils derived from Wianamatta Shale (Tozer 2003), though may occur in adjacent areas underlain by Hawkesbury Sandstone. Found on the north shore and northern suburbs of Sydney and has been recorded from the LGAs of Lane Cove, Willoughby, Ku-ring-gai, Hornsby, Baulkham Hills, Ryde and Parramatta within the Sydney Basin Bioregion and may occur elsewhere in the Bioregion.	Absent
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	E3	CE	Blue Mountains Shale Cap Forest is found on deep fertile soils formed on Wianamatta Shale, on moist sheltered sites at lower to middle altitudes of the Blue Mountains and Wollemi areas. Extensive occurrences of shale are at Springwood, Berambing to Kurrajong Heights, Mountain Lagoon and Colo Heights.	Absent
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	V2	E	Dominated by Eucalyptus parramattensis subsp. parramattensis, Angophora bakeri and E. sclerophylla. Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Occurs within the LGAs of Bankstown, Blacktown, Campbelltown, Hawkesbury, Liverpool and Penrith (James 1997). The main occurrence of Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion is in the Castlereagh area of the Cumberland Plain, with small patches occurring at Kemps Creek and Longneck Lagoon.	Absent

Species Name	BC	EPBC	Key Information	Likelihood
Castlereagh Swamp Woodland Community	E3	-	Low woodland, often having dense stands of Paperbark trees <i>Melaleuca decora</i> along with other canopy trees, such as <i>Eucalyptus parramattensis</i> . Occurs in western Sydney in the Castlereagh and Holsworthy areas, on deposits from ancient river systems along today's intermittent creeklines, often in poorly drained depressions. There is now only 616 ha remaining intact, which mainly occurs in the Hawkesbury, Liverpool and Penrith LGAs.	Absent
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	V	Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea.	Absent
Coastal Upland Swamp in the Sydney Basin Bioregion	E3	E	Occurs primarily on impermeable sandstone plateaus in the headwater valleys of streams and on sandstone benches with abundant seepage moisture. Characterised by highly diverse and variable mosaics of vegetation related to variability in soil conditions and fire regimes. Trees are typically absent from the community, but may be present as scattered individuals or clumps of mallee or arborescent eucalypts.	Absent
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E3	CE	Predominantly open-forest to low woodland structure usually with trees of <i>Eucalyptus fibrosa</i> and <i>Melaleuca decora</i> , sometimes with <i>E. longifolia</i> . Relatively dense shrub stratum is typical, commonly with <i>M. nodosa</i> and <i>Lissanthe strigosa</i> , and to a lesser extent <i>M. decora</i> . Usually occurs on clay soils on Tertiary alluvium, or on shale soils on Wianamatta Shale including the Birrong Soil Landscape and associated shale lowlands. Known to occur in the Auburn, Bankstown, Blacktown, Canterbury, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Strathfield LGAs.	Some affinities and mapped nearby.
Cumberland Plain Woodland in the Sydney Basin Bioregion	E4B	CE	Typically comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain. The community typically occurs on flat to undulating or hilly terrain up to about 350 m elevation but may also occur on locally steep sites and at slightly higher elevations. Restricted to the Sydney Basin bioregion and is currently known to occur within the LGAs of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion.	Present
Duffys Forest Ecological Community in the Sydney Basin Bioregion	E3	-	Open-forest or woodland community dominated by Red Bloodwood <i>Corymbia gummifera</i> , Black Ash <i>Eucalyptus sieberi</i> , Smooth-barked Apple <i>Angophora costata</i> , and frequently a stringybark <i>E. capitellata</i> or <i>E. oblonga</i> .	Absent
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E4B	E	Predominantly a sclerophyllous heath or scrub community although, depending on site topography and hydrology, some remnants contain small patches of woodland, low forest or limited wetter areas. Occurs on disjunct patches of nutrient poor aeolian (wind blown) dune sand.	Absent
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes.	Absent
Hygrocybeae Community of Lane Cove Bushland Park in the Sydney Basin Bioregion	E4B	-	An assemblage of more than 20 species of fungi in the family Hygrophoraceae (Fungi, Basidiomycota, Agaricales, Hygrophoraceae). Known to occur in Lane Cove Bushland Park, Lane Cove Local Government Area, Sydney Basin Bioregion. Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.	Absent

Species Name	BC	EPBC	Key Information	Likelihood
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	E3	-	Low open sclerophyll forest community with a distinct mesophyll element found on sand, often in association with areas of sclerophyll heath and scrub. Occurs in the Sutherland Shire and in the City of Rockdale (Leo Smith Reserve). Within Sutherland Shire the major occurrences are on the Kurnell Peninsula, with other stands near Bundeena.	Absent
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. Plant species of this community are predominantly rainforest species. Littoral Rainforest occurs only on the coast.	Absent
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E3	CE	Occurs along the NSW coast, usually within 2 km of the ocean on a variety of substrates. Variable structure and composition, typically with closed canopy. Generally rainforest species with vines a major component.	Absent
Moist Shale Woodland in the Sydney Basin Bioregion	E3	CE	Similar to CPW. It differs in having a shrub understorey that contains plants from moist habitats. Dominant canopy trees include <i>Eucalyptus tereticornis</i> , <i>E. moluccana</i> , <i>E. crebra</i> and <i>Corymbia maculata</i> . Moist Shale Woodland usually occurs on soils derived from Wianamatta Shale on high country in the southern half of the Cumberland Plain, and occurs mainly in Wollondilly LGA.	Absent
Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E3	-	General structural form is open-forest but may now exist as woodland or remnant trees. Occurs entirely within the Pittwater Local Government Area, on the Barrenjoey Peninsula and Western Pittwater Foreshores. Remnants are typically small and on private property, however there are a few remnants in Council reserves and one remnant within Ku-ring-gai Chase NP.	Absent
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Occurs on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> , <i>E. amplifolia</i> , <i>Angophora floribunda</i> and <i>A. subvelutina</i> .	Absent
Shale Gravel Transition Forest in the Sydney Basin Bioregion	E3	CE	Open-forest structure, usually with trees of <i>Eucalyptus fibrosa</i> sometimes with <i>E. moluccana</i> and <i>E. tereticornis</i> . <i>Melaleuca decora</i> is frequently present in a small tree stratum. Occurs primarily in areas where shallow deposits of Tertiary alluvium overlie shale soils but may also occur in association with localised concentrations of iron-indurated gravel. Shale Gravel Transition Forest grades into C as alluvial and ironstone influences decline.	Absent
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	E4B	CE	Occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. The main tree species include <i>Eucalyptus tereticornis</i> , <i>E. punctata</i> , <i>E. globoidea</i> , <i>E. eugenioides</i> , <i>E. fibrosa</i> and <i>E. crebra</i> . Occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly LGAs.	Absent
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E3	-	Primarily associated with the heads and upper slopes of sandstone gullies, which are downslope from residual shale or ironstone caps. Dominant trees include <i>Angophora costata</i> , <i>Eucalyptus piperita</i> and occasionally <i>E. pilularis</i> , particularly around Helensburgh. <i>Corymbia gummifera</i> occurs frequently within the community, although generally at lower abundance than the other eucalypts. Recorded from the LGAs of Campbelltown, Hurstville, Kogarah, Sutherland, Wollondilly and Wollongong.	Absent

Species Name	BC	EPBC	Key Information	Likelihood
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	E	Found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> is the dominant species northwards from Bermagui. Other trees including <i>Acmena smithii</i> , <i>Glochidion</i> spp. and <i>Melaleuca</i> spp. may be present as subordinate species. Present within Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown LGAs (+ many more). Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation.	Absent
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Dominant trees include <i>Eucalyptus robusta</i> , <i>Melaleuca quinquenervia</i> and, south from Sydney, <i>E. botryoides</i> and <i>E. longifolia</i> . Generally, occurs below 20 m (though sometimes up to 50 m) elevation. Sydney LGAs where this occurs include; Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland.	Absent
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E3	-	Mosaic community with considerable variation due to fluctuating water levels and seasonal conditions. Characteristic vegetation is sedges and aquatics particularly <i>Eleocharis sphacelata</i> , <i>Baumea juncea</i> , <i>B. rubiginosa</i> , <i>B. articulata</i> , <i>Gahnia sieberiana</i> , <i>Ludwigia peploides</i> and <i>Persicaria</i> spp. There may be patches of emergent trees such as <i>Melaleuca quinquenervia</i> and shrubs. Restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas. These areas are generally on the sands of the Warriewood and Tuggerah Soil Landscapes. Occurs in the LGAs of Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Woollahra, Waverley, Botany, Rockdale, Randwick, Sutherland and Wollongong.	Absent
Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	E4B	CE	Open forest with dominant canopy trees including <i>Syncarpia glomulifera</i> , <i>Eucalyptus punctata</i> , <i>E. paniculata</i> and <i>E. eugenoides</i> . In areas of high rainfall (over 1050mm per annum) <i>E. saligna</i> is more dominant. Heavily fragmented in Sydney, remnants occur in the Baulkham Hills, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Hurstville LGAs. Occurs close to the shale/sandstone boundary on the more fertile shale influence soils.	Absent
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Found in the NSW North Coast, Sydney Basin and South East Corner Bioregions, on seacliffs and coastal headlands. Typically closed tussock grassland, but may be open shrubland or open heath with a grassy matrix between the shrubs.	Absent
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE	A dry vine scrub community of the Cumberland Plain, western Sydney. Very restricted and occurs most commonly in the far southern section of the Cumberland Plain, in the Razorback Range near Picton. Outlying occurrences have been recorded at Grose Vale and Cattai. Restricted to hilly country where it occurs on the sheltered lower slopes and in gullies.	Absent
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE	A dry vine scrub community of the Cumberland Plain, western Sydney. Canopy trees include <i>Melaleuca styphelioides</i> , <i>Acacia implexa</i> and <i>Alectryon subcinerus</i> . There are many rainforest species in the shrub layer, such as <i>Notolaea longifolia</i> , <i>Clerodendrum tomentosum</i> and <i>Pittosporum revolutum</i> . Restricted to hilly country where it occurs on the sheltered lower slopes and in gullies. Generally found at higher elevation, in areas receiving higher rainfall than much of the CPW. Occurs on clay soils derived from Wianamatta shale. There are 338 ha remaining intact, the majority of these occurring in the Wollondilly LGA, but occurring to a lesser extent in the Baulkham Hills, Camden, Hawkesbury, Parramatta and Ryde LGAs.	Absent

APPENDIX B

Flora Data

Table B1 Flora Species List and BAM Plot Floristic Data for the BNPS Site

Species Name	Common Name	Status	Growth Form / Weed Status	Cover	Abund.
Alliaceae					
<i>Agapanthus praecox</i>	African Lily	Introduced	-	-	-
Anthericaceae					
<i>Chlorophytum comosum</i>	Spider Plant	Introduced	-	-	-
Apocynaceae					
<i>Araujia sericifera</i>	Moth Vine	Introduced	High Threat Weed	0.1	1
Araliaceae					
<i>Schefflera actinophylla</i>	Umbrella Tree	Introduced	High Threat Weed	-	-
Araucariaceae					
<i>Araucaria heterophylla</i>	Norfolk Island Pine	Introduced	-	1	1
Asparagaceae					
<i>Asparagus virgatus</i>	Asparagus Fern	Introduced	-	0.1	2
Asteraceae					
<i>Bidens pilosa</i>	Cobblers Peg	Introduced	High Threat Weed	0.1	2
<i>Conyza bonariensis</i>	Fleabane	Introduced	-	-	-
<i>Dimorphotheca ecklonis</i>	Cape Daisy	Introduced	-	-	-
<i>Ozothamnus diosmifolius</i>	White Dogwood	Native	Shrub	-	-
Berberidaceae					
<i>Nandina domestica</i>	Japanese Sacred Bamboo	Introduced	-	-	-
Bignoniaceae					
<i>Jacaranda mimosifolia</i>	Jacaranda	Introduced	-	-	-
Casuarinaceae					
<i>Allocasuarina littoralis</i>	Black She-oak	Native	Tree	1	2
<i>Allocasuarina torulosa</i>	Forest Oak	Native	Tree	-	-
<i>Casuarina cunninghamiana</i>	River Oak	Native	Tree	-	-
<i>Casuarina glauca</i>	Swamp Oak	Native	Tree	-	-
Chenopodiaceae					
<i>Einadia hastata</i>	Berry Saltbush	Native	Forb	-	-
<i>Einadia nutans</i> subsp. <i>linifolia</i>	-	Native	Forb	-	-
Convolvulaceae					
<i>Dichondra repens</i>	Kidney Weed	Native	Forb	-	-
Cyperaceae					
<i>Carex inversa</i>	-	Native	Sedge (Grass & grasslike)	-	-
<i>Cyperus gracilis</i>	Slender Flat-sedge	Native	Sedge (Grass & grasslike)	-	-
Elaeocarpaceae					
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	Native	Shrub	-	-
Fabaceae - Faboideae					
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea	Native	Shrub	-	-
<i>Glycine clandestina</i>	-	Native	Vine (Other)	-	-
<i>Hardenbergia violacea</i>	False Sarsaparilla	Native	Vine (Other)	-	-
<i>Indigofera australis</i>	Australian Indigo	Native	Shrub	-	-
<i>Kennedia rubicunda</i>	Dusky Coral Pea	Native	Vine (Other)	-	-
Fabaceae - Mimosoideae					
<i>Acacia binervia</i>	Coastal Myall	Native	Tree	-	-
<i>Acacia falcata</i>	Sickle Wattle	Native	Shrub	0.5	2
<i>Acacia implexa</i>	Hickory Wattle	Native	Shrub	-	-
<i>Acacia myrtifolia</i>	Red-stemmed Wattle	Native	Shrub	-	-
<i>Acacia parramattensis</i>	Parramatta Wattle	Native	Tree	0.1	1
<i>Acacia podalyriifolia</i>	Queensland Wattle	Native/Introduced	Shrub	-	-
Iridaceae					
<i>Dietes grandiflora</i>	Dietes	Introduced	-	-	-
Lauraceae					

Species Name	Common Name	Status	Growth Form / Weed Status	Cover	Abund.
<i>Cinnamomum camphora</i>	Camphor Laurel	Introduced	High Threat Weed	-	-
Lomandraceae					
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Native	Rush (Grass & grasslike)	1	1
Malvaceae					
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	Native/Introduced	Tree	-	-
<i>Hibiscus</i> sp. cultivar	A Hibiscus Hybrid	Introduced	-	-	-
<i>Modiola caroliniana</i>	Red-flowered Mallow	Introduced	-	-	-
Melastomataceae					
<i>Tibouchina urvilleana</i>	Purple Glory Bush	Introduced	-	-	-
Meliaceae					
<i>Melia azedarach</i>	White Cedar	Native	Tree	-	-
Moraceae					
<i>Ficus obliqua</i>	Small-leaved Fig	Native	Tree	-	-
Myrtaceae					
<i>Acmena smithii</i>	Lilly Pilly	Native	Tree	-	-
<i>Angophora bakeri</i>	Narrow-leaved Apple	Native	Tree	-	-
<i>Angophora costata</i>	Smooth-barked Apple	Native	Tree	-	-
<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	Native	Shrub	-	-
<i>Callistemon pinifolius</i>	Pine-leaved Bottlebrush	Native	Shrub	0.5	2
<i>Callistemon viminalis</i>	Weeping Bottlebrush	Native	Tree	1	2
<i>Callistemon salignus</i>	Willow Bottlebrush	Native	Shrub	1	2
<i>Corymbia citriodora</i>	Lemon-scented Gum	Introduced	-	-	-
<i>Corymbia maculata</i>	Spotted Gum	Native	Tree	6	3
<i>Corymbia torelliana</i>	Cadaghi	Introduced	High Threat Weed	-	-
<i>Eucalyptus acmenoides</i>	White Mahogany	Native	Tree	-	-
<i>Eucalyptus botryoides</i>	Bangalay	Native	Tree	-	-
<i>Eucalyptus canaliculata</i>	Grey Gum	Native	Tree	-	-
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Native	Tree	-	-
<i>Eucalyptus longifolia</i>	Woollybutt	Native	Tree	1	1
<i>Eucalyptus melliodora</i>	Yellow Box	Native	Tree	-	-
<i>Eucalyptus microcorys</i>	Tallowwood	Native	Tree	-	-
<i>Eucalyptus moluccana</i>	Grey Box	Native	Tree	30	9
<i>Eucalyptus paniculata</i>	Grey Ironbark	Native	Tree	5	2
<i>Eucalyptus punctata</i>	Grey Gum	Native	Tree	5	2
<i>E. saligna</i> x <i>E. botryoides</i>	-	Native	Tree	-	-
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Threatened Sp.	Tree	-	-
<i>Eucalyptus sideroxylon</i>	Mugga Ironbark	Native	Tree	-	-
<i>Eucalyptus tereticornis</i>	Forest Red Gum	Native	Tree	3	1
<i>Kunzea ambigua</i>	Tick Bush	Native	Shrub	-	-
<i>Leptospermum petersonii</i>	Lemon-scented Teatree	Native/Introduced	Shrub	0.5	1
<i>Lophostemon confertus</i>	Brush Box	Native/Introduced	Tree	5	2
<i>Melaleuca armillaris</i>	Bracelet Honey-myrtle	Native	Shrub	-	-
<i>Melaleuca decora</i>	-	Native	Shrub	-	-
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Native	Tree	-	-
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	Native	Shrub	-	-
<i>Melaleuca thymifolia</i>	Thyme Honey-myrtle	Native	Shrub	0.1	2
<i>Tristanopsis laurina</i>	Water Gum	Native	Tree	-	-
Ochnaceae					
<i>Ochna serrulata</i>	Mickey Mouse Plant	Introduced	High Threat Weed	0.1	1
Plantaginaceae					
<i>Plantago lanceolata</i>	Lamb's Tongue	Introduced	-	0.1	3
Poaceae					
<i>Aristida vagans</i>	Threeawn Speargrass	Native	Tussock Grass (Grass & grasslike)	-	-
<i>Axonopus compressus</i>	Broad-leaf Carpet Grass	Introduced	-	0.5	20
<i>Bothriochloa macra</i>	Red Grass	Native	Tussock Grass (Grass & grasslike)	0.1	10

Species Name	Common Name	Status	Growth Form / Weed Status	Cover	Abund.
<i>Briza subaristata</i>	-	Introduced	High Threat Weed	0.1	5
<i>Bromus catharticus</i>	Prairie Grass	Introduced	-	-	-
<i>Cenchrus clandestinus</i>	Kikuyu	Introduced	High Threat Weed	-	-
<i>Cynodon dactylon</i>	Couch	Native	Other Grass (Grass & grasslike)	1	50
<i>Ehrharta erecta</i>	Panic Veldtgrass	Introduced	High Threat Weed	20	1000
<i>Eleusine indica</i>	Crowsfoot Grass	Introduced	-	-	-
<i>Eragrostis curvula</i>	African Lovegrass	Introduced	High Threat Weed	-	-
<i>Microlaena stipoides</i>	Weeping Grass	Native	Tussock Grass (Grass & grasslike)	0.5	30
<i>Paspalidium distans</i>	-	Native	Tussock Grass (Grass & grasslike)	-	-
<i>Paspalum dilatatum</i>	Paspalum	Introduced	High Threat Weed	1	500
<i>Rytidosperma monticola</i>	-	Native	Tussock Grass (Grass & grasslike)	-	-
<i>Rytidosperma racemosum</i>	-	Native	Tussock Grass (Grass & grasslike)	-	-
<i>Setaria parviflora</i>	-	Introduced	-	-	-
<i>Sporobolus creber</i>	Western Rat-tail Grass	Native	Tussock Grass (Grass & grasslike)	0.1	5
<i>Themeda triandra</i>	Kangaroo Grass	Native	Tussock Grass (Grass & grasslike)	-	-
Polygonaceae					
<i>Rumex brownii</i>	Swamp Dock	Native/Introduced	Forb	-	-
Portulacaceae					
<i>Portulaca oleracea</i>	Pigweed	Native	Forb	-	-
Proteaceae					
<i>Banksia integrifolia</i>	Coast Banksia	Native	Tree	-	-
<i>Banksia serrata</i>	Old-man Banksia	Native	Tree	-	-
<i>Grevillea</i> sp. cultivar	A Grevillea Hybrid	Introduced	-	-	-
<i>Stenocarpus sinuatus</i>	Firewheel Tree	Native	Tree	-	-
Rosaceae					
<i>Eriobotrya japonica</i>	Loquat	Introduced	-	-	-
<i>Photinia</i> sp.	Photinia	Introduced	-	-	-
Rutaceae					
<i>Murraya paniculata</i>	Murraya	Introduced	-	-	-
Theaceae					
<i>Camellia</i> sp. cultivar	A Camellia Hybrid	Introduced	-	-	-

Status and nomenclature according to PlantNet (RBGTD 2020). Growth form and weed status according to BAM (OEI 2017a).

APPENDIX C

BAM Field Datasheets

APPENDIX D

BioNet Vegetation Classification Profile

APPENDIX E

Fauna Data

Table E1 Fauna Species List

Species Name	Common Name	Status	Sighting Type
AVES			
Artamidae			
<i>Cracticus tibicen</i>	Australian Magpie	Native	Sighted
Cacatuidae			
<i>Cacatua galerita</i>	Sulphur Crested Cockatoo	Native	Sighted
Columbidae			
<i>Columba livia</i>	Rock Dove	Introduced	Sighted
<i>Ocyphaps lophotes</i>	Crested Pigeon	Native	Sighted
<i>Streptopelia chinensis</i>	Spotted Turtle Dove	Introduced	Sighted
Cuculidae			
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	Native	Sighted
Meliphagidae			
<i>Manorina melanocephala</i>	Noisy Miner	Native	Sighted
Psittacidae			
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	Native	Sighted
Threskiornithidae			
<i>Threskiornis molucca</i>	Australian White Ibis	Native	Sighted

Status and nomenclature according to DPIE 2020a

APPENDIX F

Biodiversity Credit Reports

APPENDIX G

Protected Matters Search Report

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