

Meadowbank Education and Employment Precinct Schools Project Biodiversity Development Assessment Report

SSD 18_9343

Prepared by Ecological Australia Pty Ltd

For School Infrastructure NSW

10 October 2019



Item	Biodiversity Development Assessment Report
Project Name	Meadowbank Education and Employment Precinct Schools Project
Project Number	18SYD-10784
Date	10 October 2019
Project Manager	Danielle Adams-Bennett, Nicole McVicar
Prepared by	Danielle Adams-Bennett, Nicole McVicar
Reviewed by	Matthew Dowle, Michelle Frolich and Nicole McVicar
Approved by	Matthew Dowle and David Bonjer
Status	Final
Version Number	8
Last saved on	10 October 2019

This report should be cited as ‘Eco Logical Australia 2019 Meadowbank Education and Employment Precinct Schools Project. Prepared for Urbis c/o WoodsBagot.’

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by WoodsBagot to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed State Significant Development (SSD) at Meadowbank TAFE, Meadowbank within Lot 10 DP1232584 (the Development Site) in the Ryde City Council Local Government Area (LGA).

The State Significant Development Application (SSD 1B-9343) involves impacts on two Threatened Ecological Communities (TEC) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act); Blue Gum High Forest in the Sydney Basin Bioregion (BGHF) listed as a Critically Endangered Ecological Community (CEEC), and Sydney Turpentine-Ironbark Forest (STIF) listed as an Endangered Ecological Community (EEC). A BDAR was requested to be completed through the Secretary's Environmental Assessment Requirements (SEARs). Proposed impacts to threatened species must be assessed under the new NSW BC Act enacted on the 25 August 2017. This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2016 (BAM) established under Section 6.7 of the BC Act.

The Development Site is an area of 3.3 ha located on Department of Education property adjacent to the Meadowbank TAFE in Western Sydney bounded by Rhodes Street to the north east, the Meadowbank TAFE Campus to the south east and the railway line along the western boundary in Meadowbank. The Development Site was subject to vegetation disturbance as a result of historical clearing, mainly for the construction of buildings and on grade carparks. The vegetation along the western edge of the rail embankment is degraded by weed infestation.

Two Plant Community Types (PCTs) occurring in varying condition are present within the Development Site. The PCTs have been mapped as PCT 1237 - *Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion* (0.96 ha) and PCT 1281 *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*. The two PCTs were then split into four vegetation zones based on the varying condition states.

Part of PCT 1237 conforms to the CEEC 'Blue Gum High Forest in the Sydney Basin Bioregion' and the whole of PCT 1281 conforms to the EEC 'Sydney Turpentine-Ironbark Forest', listed under the BC Act.

It is noted that Blue Gum High Forest (BGHF) and Sydney Turpentine-Ironbark Forest (STIF) can also be listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Critically Endangered Ecological Communities (CEECs). However, the condition of the vegetation representing the PCTs within the study area did not meet the minimum condition thresholds for the listing criteria under the EPBC Act.

During the field survey two threatened flora species listed under the BC Act and EPBC Act, *Eucalyptus nicholii* (Narrow-leaved Peppermint) and *Syzygium paniculatum* (Magenta Lilly Pilly) were recorded within and in close proximity to the Development Site. It is considered highly likely that both of these species are cultivated and planted specimens, and therefore do not represent the listed entities under the BC and EPBC Acts.

No other threatened flora or fauna species were recorded within the study area.

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the Development Site and methodologies to minimise impacts during

construction and operation of the development. Following consideration of all the above aspects, the residual unavoidable direct impacts of the project were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit Calculator (BAMC).

A small amount of vegetation within the Development Site will be directly impacted, resulting in the clearing/modification of 0.56 ha of PCT 1237 and 0.03 ha of PCT 1281. The proposal will also involve indirect impacts to 0.02 ha of PCT 1281 which will include trimming of the outer branches on the eastern edge of this patch.

Table 1: Summary of PCTs recorded, proposed impacts and credits required

PCT ID	Veg Zone	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
1237	1	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (EEC low condition)</i>	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.34	7
1237	2	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (EEC moderate condition)</i>	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.03	1
1237	3	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (Non EEC low condition)</i>	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.19	0*
1281	4	<i>Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (EEC good condition)</i>	Wet Sclerophyll Forests (Grassy sub-formation)	0.03 0.02	1 0**

* This vegetation zone had a vegetation integrity score of 12, which is below the offset threshold.

** Vegetation clearance will be confined to trimming of outer branches and will not change the composition of this PCT

A total of nine (9) ecosystem credits are required to offset 0.59 ha of unavoidable impacts to PCTs on the Development Site (Table 1). However, offsets were not required for vegetation zone 3 as the vegetation integrity score for this zone was below the offset threshold (< 17) for a PCT that is an EEC or CEEC, in accordance with the BAM. Habitat for candidate species credit species was not recorded in the study area, therefore, no species credits are required to be offset for the development.

Serious and Irreversible Impacts (SAIL) values have been considered in this assessment. BGHF and STIF are both listed as a SAIL in the BioNet threatened biodiversity data collection. The SAIL threshold for these communities are yet to be published by OEH. As such, detailed consideration of whether impacts on candidate SAILs are serious and irreversible is provided in the BDAR. Given the small area of low condition BGHF to be impacted and area of STIF to be partially cleared and small amount of trimming of outer branches, it is considered unlikely that the development would result in a SAIL.

Contents

1. Stage 1: Biodiversity assessment	1
1.1 Introduction.....	1
1.1.1 Response to SEARs	1
1.1.2 General description of the Development Site.....	2
1.1.3 Development Site footprint	2
1.1.4 Sources of information used	2
1.2 Legislative context	7
1.3 Landscape features.....	7
1.3.1 IBRA regions and subregions.....	7
1.3.2 Mitchell Landscapes	7
1.3.3 Rivers and streams	8
1.3.4 Wetlands	8
1.3.5 Connectivity features	8
1.3.6 Areas of geological significance and soil hazard features	8
1.3.7 Site context	9
1.4 Native vegetation	9
1.4.1 Plant Community Types present	10
1.4.2 Vegetation integrity assessment.....	14
1.4.3 Use of local data.....	15
1.5 Threatened species.....	19
1.5.1 Ecosystem credit species.....	19
1.6 Species credit species	19
1.6.1 Candidate Species credit species	19
1.6.2 Use of local data.....	40
1.6.3 Expert reports	40
2. Stage 2: Impact Assessment	41
2.1 Avoiding impacts	41
2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat	41
2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat	42
2.1.3 Prescribed biodiversity impacts	43
2.2 Assessment of impacts	44
2.2.1 Direct impacts	44
2.2.2 Change in vegetation integrity	46
2.2.3 Indirect impacts.....	46
2.2.4 Prescribed biodiversity impacts	47
2.2.5 Mitigating and managing impacts.....	47
2.2.6 Serious and Irreversible Impacts (SII).....	52
2.3 Risk Assessment.....	55
2.4 Adaptive management strategy	56
2.5 Impact Summary.....	56

2.5.1 Serious and Irreversible Impacts (SAII).....	56
2.5.2 Impacts requiring offsets	57
2.5.3 Impacts not requiring offset.....	57
2.5.4 Areas not requiring assessment	57
2.5.5 Credit summary	59
2.6 Offset options	60
3. References.....	64
Appendix A: Definitions	66
Appendix B: Vegetation plot data.....	68
Appendix C: Plot photos.....	72
Appendix D: Biodiversity credit report.....	76

List of Figures

Figure 1: Site Map	4
Figure 2: Location Map.....	5
Figure 3: Proposed development.....	6
Figure 4: Plant Community Type and other vegetation.....	16
Figure 5: Vegetation Zone and Survey Plot.....	17
Figure 6: Threatened Ecological Communities.....	18
Figure 7: Type of vegetation clearing impacts	45
Figure 8: Potential Serious and Irreversible Impacts	54
Figure 9: Impacts requiring offset	61
Figure 10: Impacts not requiring offsets	62
Figure 11: Areas not requiring assessment.....	63

List of Tables

Table 1: Summary of PCTs recorded, proposed impacts and credits required.....	iii
Table 2: SEARs and Relevant Reference.....	2
Table 3: Legislative context.....	7
Table 4: Mitchell Landscapes (DECC 2002)	8
Table 5: Areas of geological significance and soil hazard features	9
Table 6: Full-floristic and vegetation integrity plots	9
Table 7: Plant Community Types and Vegetation Zones	11
Table 8: PCT selection justification	12
Table 9: Vegetation integrity.....	15
Table 10: Habitat suitability for threatened species.....	20
Table 11: Justification for exclusion of candidate species credit species	28
Table 12: Targeted surveys	39
Table 13: Weather conditions	39
Table 14: Survey effort.....	39
Table 15: Locating a project to avoid and minimise impacts on vegetation and habitat	41
Table 16: Designing a project to avoid and minimise impacts on vegetation and habitat.....	42
Table 17: Prescribed biodiversity impacts	44
Table 18: Locating a project to avoid and minimise prescribed biodiversity impacts.....	44

Table 19: Designing a project to avoid and minimise prescribed biodiversity impacts.....	44
Table 20: Direct impacts to native vegetation	46
Table 21: Direct impacts on threatened ecological communities	46
Table 22: Change in vegetation integrity	46
Table 23: Indirect impacts.....	47
Table 24: Measures proposed to minimise impacts	48
Table 25: Candidate Serious and Irreversible Impacts.....	52
Table 26: Evaluation of an impact on a TEC.....	52
Table 27: Likelihood criteria.....	55
Table 28: Consequence criteria.....	55
Table 29: Risk matrix.....	56
Table 30: Risk assessment.....	56
Table 31: Impacts to native vegetation that require offset.	57
Table 32: Ecosystem credits required	59
Table 33: Species matrix (species recorded by plot).....	68
Table 34: Vegetation integrity data (Composition, Structure and function)	71

Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BGHF	Blue Gum High Forest in the Sydney Basin Bioregion
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FM Act	NSW Fisheries Management Act 1994
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development

Abbreviation	Description
STIF	Sydney Turpentine-Ironbark Forest
TEC	Threatened Ecological Community
VI	Vegetation Integrity
VIS	Vegetation Information System
WM Act	NSW Water Management Act 2000

1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Eco Logical Australia on behalf of the NSW Department of Education (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 18_9343) for the new Meadowbank Education and Employment Precinct Schools Project (hereafter referred to as MEEPSP) at 2 Rhodes Street, Meadowbank (the site).

The K-12 Meadowbank Schools will cater for 1,000 primary school students and 1,620 high school students. The proposal seeks consent for:

- A multi-level, multi-purpose, integrated school building with a primary school wing and high school wing. The school building is connected by a centralised library that is embedded into the landscape. The school building contains:
 - Collaborative general and specialist learning hubs, with a combination of enclosed and open spaces;
 - Adaptable classroom home bases;
 - Four level central library, with primary school library located on ground floor and high school library on levels 1 to 3.
 - Laboratories and workshops;
 - Staff workplaces;
 - Canteens;
 - Indoor gymnasium;
 - Multipurpose communal hall;
 - Outdoor learning, play and recreational areas (both covered and uncovered).
- Associated site landscaping and public domain improvements;
- An on-site car park for 60 parking spaces; and
- Construction of ancillary infrastructure and utilities as required.

1.1.1 Response to SEARs

The purpose of this BDAR is to assess the impacts of the proposed development in accordance with NSW *Biodiversity Conservation Act 2016* (BC Act), and has been prepared by Danielle Adams-Bennett and reviewed by Michelle Frolich who is an Accredited Person under the BC Act. The contents of this BDAR complies with the minimum requirements outlined in Table 25 of the Biodiversity Assessment Methodology (BAM: OEH, 2017).

The BDAR is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD 18_9343. This table identifies the SEARs and relevant reference within this report.

Table 2: SEARs and Relevant Reference

Sears Item	Report Reference
18. Flora and Fauna Assessment	Eco Logical Australia 2019. Meadowbank Education and Employment Precinct Schools Project - Biodiversity Development Assessment Report

1.1.2 General description of the Development Site

The Development Site is located within Lot 10 in DP1232584 in the Ryde Local Government Area (LGA). This report includes two base maps, the Site Map and the Location Map (Figure 1 and Figure 2).

The Development Site is an area of 3.3 ha located on Department of Education property adjacent to the Meadowbank TAFE in Western Sydney bounded by Rhodes Street to the north east, the Meadowbank TAFE Campus to the south east and the railway line along the western boundary in Meadowbank.

The Development Site currently consists of car parks, planted and regrowth native trees, buildings, outdoor recreation areas and other infrastructure associated with Meadowbank TAFE. The study area has been subject to native vegetation disturbance as a result of past clearing and is degraded by weed infestation in the rail embankment along the western boundary.

Two Plant Community Types (PCTs) are identified within the Development Site. These PCTs have been mapped as PCT 1237 - *Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion* and PCT 1281 *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*.

PCT 1237 conforms to the Critically Endangered Ecological Community (CEEC) 'Blue Gum High Forest in the Sydney Basin Bioregion (BGHF)' which is listed under the BC Act.

PCT 1281 conforms to the Endangered Ecological Community (EEC) 'Sydney Turpentine-Ironbark Forest (STIF)' which is listed under the BC Act.

It is noted that both PCTs can also be listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as a Critically Endangered Ecological Community (CEEC). However, the condition of the vegetation within the study area did not meet the minimum condition thresholds for the listing criteria under the EPBC Act.

1.1.3 Development Site footprint

The Development Site proposed footprint includes demolition of all existing buildings within the site and construction of a new education facility within the property which will incorporate a primary school and high school together with passive and active recreation facilities and sports courts (Figure 3). The Development Site boundary includes both the operational and construction footprint (Figure 1) associated with all temporary construction facilities and infrastructure.

1.1.4 Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification, BioNet (Wildlife Atlas) 5 km database search (OEH 2018a) and EPBC Act Protected Matters Search Tool 5 km database search (DoEE 2018)
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2016)
- Aerial imagery (SIXMaps) and Public NSW Aerial Imagery (DFSI 2017)
- Additional GIS datasets including soil, topography, geology and drainage

- Arboricultural Assessment Report August 2018. Prepared by Earthscape Horticultural Services for Urbis.

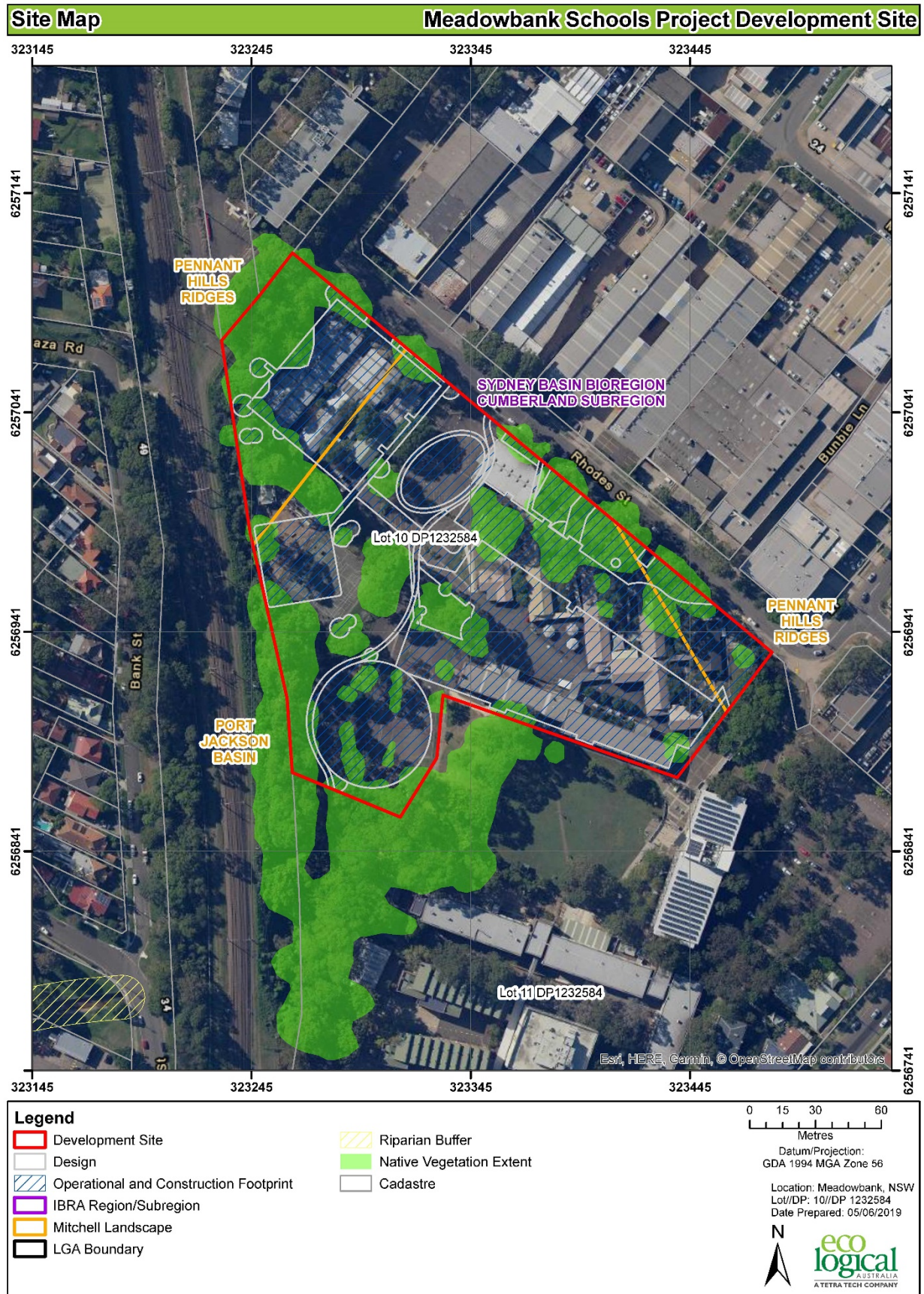


Figure 1: Site Map

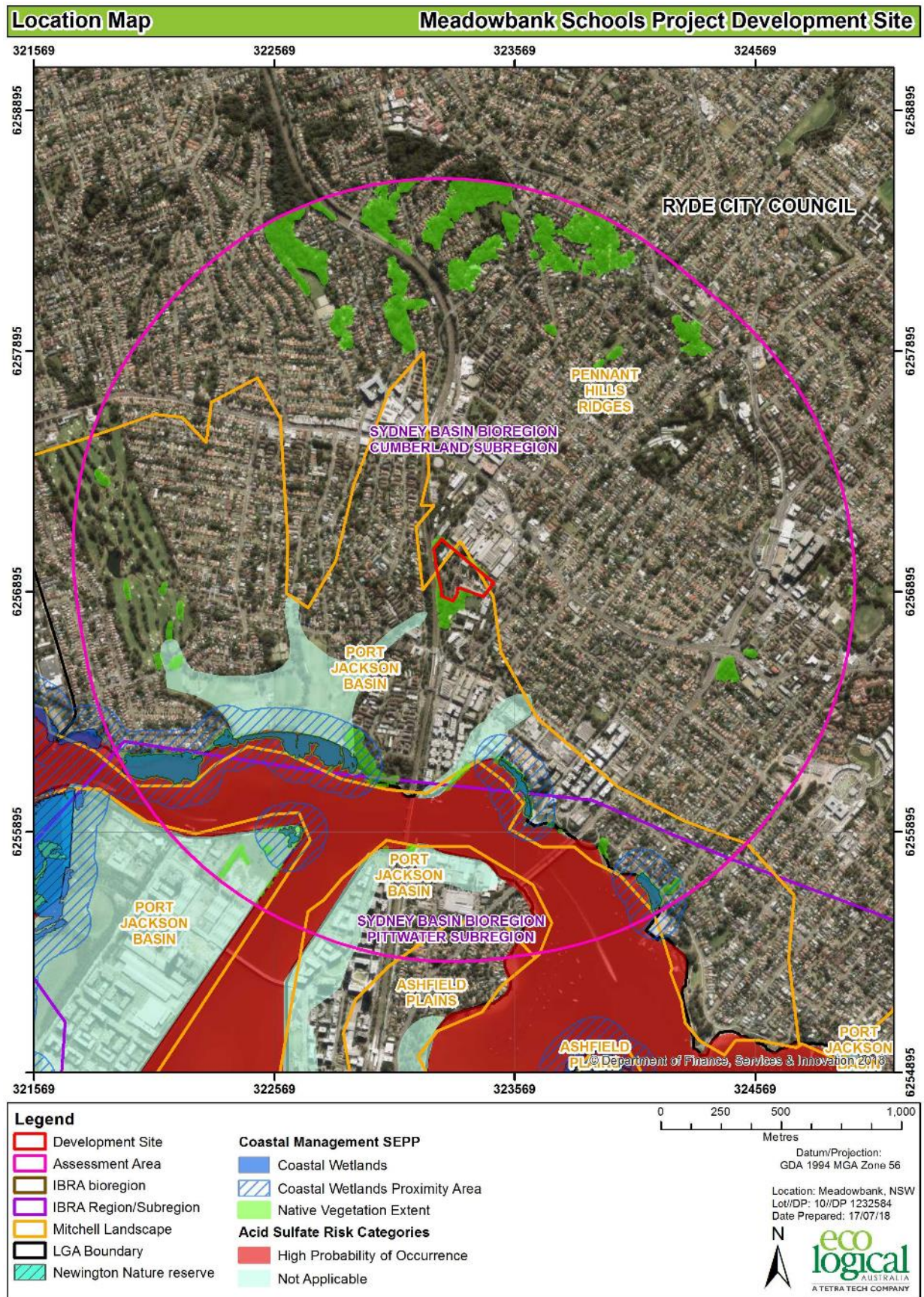


Figure 2: Location Map

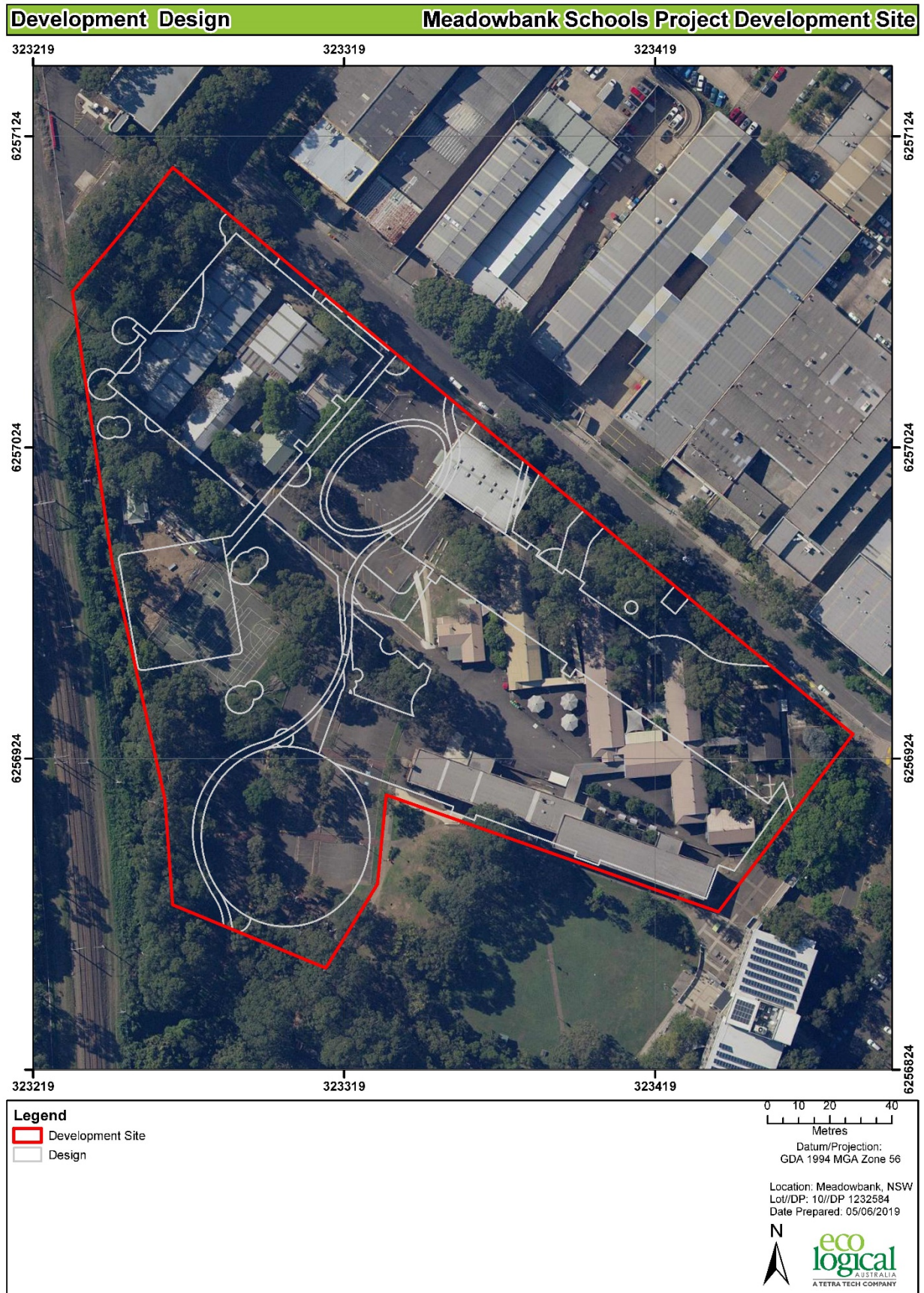


Figure 3: Proposed development

1.2 Legislative context

Table 3: Legislative context

Name	Relevance to the project
Commonwealth	
Environmental Protection and Biodiversity Conservation Act 1999	Matters of national Environmental Significance have not been identified or considered likely to occur on the Development Site. This report does not further assess impacts to MNES.
Environmental Planning and Assessment Act 1979 (EP&A Act)	The proposed development requires consent under the EP&A Act.
NSW	
Biodiversity Conservation Act 2016	The proposed development requires submission of a Biodiversity Development Assessment Report (i.e. this report) as detailed in the SEARs for the SSD.
Fisheries Management Act 1994	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.
Local Land Services Amendment Act 2016	The LLS Act does not apply to this development.
Water Management Act 2000	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.
Planning Instruments	
SEPP Coastal Management 2018	This SEPP does not apply to the Development Site
SEPP 44 – Koala Habitat Protection	SEPP 44 - Koala Habitat does not apply to the Ryde LGA. In addition, SEPP 44 does not apply to this site as the area of native vegetation on site does not contain Feed trees as listed in Schedule 2 Feed Trees.
City of Ryde Local Environment Plan 2014	The subject site is zoned SP2 - Infrastructure: Educational Establishment under the City of Ryde LEP.
City of Ryde Development Control Plan (DCP) 2014	The City of Ryde DCP has been reviewed for additional provisions that may relate to the Development Site. No additional provisions are required.

1.3 Landscape features

1.3.1 IBRA regions and subregions

The Development Site and Assessment Area fall within the Sydney Basin IBRA region and Cumberland Plain subregion (Figure 1), with part of the Assessment Area also falling within the Pittwater IBRA subregion (Figure 2).

1.3.2 Mitchell Landscapes

The Development Site and Assessment Area fall within two Mitchell Landscapes as outlined in Table 4 and as shown on Figure 1 and Figure 2 respectively.

Table 4: Mitchell Landscapes (DECC 2002)

Mitchell landscape	Description
Pennant Hills Ridges	88% cleared. Rolling to moderately steep hills on horizontal Triassic shales and siltstones. General elevation 10 to 90m, local relief 60m. Deep red texture-contrast soils on narrow hillcrests, red and brown to yellow texture-contrast soils on slopes becoming slightly harsher in drainage lines. Tall open forest of Sydney blue gum (<i>Eucalyptus saligna</i>), Turpentine (<i>Syncarpia glomulifera</i>), Blackbutt (<i>Eucalyptus pilularis</i>), white stringybark (<i>Eucalyptus globoidea</i>), Grey ironbark (<i>Eucalyptus paniculata</i>), Forest oak (<i>Allocasuarina torulosa</i>) and Rough-barked apple (<i>Angophora floribunda</i>). Rainforest elements in protected moist gully heads with Sweet pittosporum (<i>Pittosporum undulatum</i>), cheese tree (<i>Glochidion ferdinandi</i>), Sandpaper fig (<i>Ficus coronata</i>) and Black wattle (<i>Callicoma serratifolia</i>).
Port Jackson Basin	85% cleared. Deep elongated harbour with steep cliffed margins on horizontal Triassic quartz sandstone. Small pocket beaches and more extensive Quaternary estuary fill of muddy sand at the head of most tributary streams. General elevation 0 to 80m, local relief 10 to 50m. Sandstone slopes and cliffs have patches of uniform or gradational sandy soil on narrow benches and within joint crevices that support forest and woodland of Sydney peppermint (<i>Eucalyptus piperita</i>), Smooth-barked apple (<i>Angophora costata</i>), Red bloodwood (<i>Corymbia gummifera</i>) and Blackbutt (<i>Eucalyptus pilularis</i>). Sheltered gullies contain some Turpentine (<i>Syncarpia glomulifera</i>), Coachwood (<i>Ceratopetalum apetalum</i>) and Water gum (<i>Tristanopsis laurina</i>). Estuarine sands were originally dominated by saltmarsh but have been taken over by Grey mangrove (<i>Avicennia marina</i>) in the past century.

1.3.3 Rivers and streams

Two first order streams, Charity Creek and an unnamed creek, one second order creek, Archer Creek, one fourth order stream, Parramatta River, and their riparian buffers are mapped within the Assessment Area (Figure 2). The unnamed creek is located approximately 50 m to the south-east of the Development Site. No rivers or streams are located within the Development Site.

1.3.4 Wetlands

Five wetlands identified in the Coastal Management SEPP are mapped within the Assessment Area, with the closest wetland located approximately 680m to the south east of the Development Site along the Parramatta River (Figure 2). The Development Site does not contain any important wetlands.

1.3.5 Connectivity features

Vegetation within the Development Site is highly fragmented and connectivity of vegetation is disrupted by major roads, residential dwellings and industrial areas. The vegetation within the Development Site is considered to be of low value on a local and broader scale. The Development Site is unlikely to support or form part of flyway for migratory species but could provide opportunistic perching/ resting habitat.

1.3.6 Areas of geological significance and soil hazard features

The Development Site contains the areas of geological significance and soil hazard features as outlined in Table 5. The Development Site falls in the Lucas Heights residual soil landscape. This landscape is characterised by gently undulating crests and ridges on plateau surfaces of the Mittagong formation. The Mittagong Formation is located stratigraphically between the Ashfield Shale and Hawkesbury Sandstone. This soil group has stony soil, low soil fertility and low available water capacity (Murphy et al., 1993). Within the Assessment Area, the Parramatta River has been identified as a high probability of occurrence for acid sulphate soils (Figure 2) under the Acid Sulphate Soils Risk mapping (Department of Land and Water Conservation 1998). The Development Site does not contain land identified as being at risk of having acid sulphate soils.

Table 5: Areas of geological significance and soil hazard features

Area of geological significance or soil hazard feature	Feature type
Erosion Hazard	Soil erosion hazard for concentrated flows is high.
Surface Movement Potential	Soils are generally slightly reactive or moderately reactive where they exceed 1.5m.

1.3.7 Site context

1.3.7.1 Method applied

The site based method has been applied to this development.

1.3.7.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps (LPI 2015). The native vegetation cover within the 1,500 m Assessment Area is 50.8 ha and represents 6.13% (828.23 ha).

1.3.7.3 Patch size

Patch size was calculated using mapping specifically developed for this project that enabled vegetation to be mapped for all patches of intact native vegetation on and adjoining the Development Site. There are four patches on the Development Site which fall within the class of <2ha.

1.4 Native vegetation

The vegetation survey was undertaken within the Development Site on 12 July 2018 by Danielle Adams-Bennett to determine the PCTs present. Danielle is a BAM accredited assessor. Native vegetation extent within the Development Site is mapped in

Figure 2.

Four floristic vegetation plots were undertaken to identify PCTs on the Development Site in accordance with the BAM (Table 6 and Figure 5). These plots also included the collection of vegetation integrity survey plots to determine the condition of PCTs and stratify them into vegetation zones based on the same PCT and similar broad condition type.

Table 6: Full-floristic and vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Ancillary Code	Area within Development Site (ha)	Impact Area (ha)	Plots required	Plots surveyed
1	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Low	EEC	0.58	0.34	1	1
2	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the	Moderate	EEC	0.13	0.03	1	1

Veg Zone	PCT ID	PCT Name	Condition	Ancillary Code	Area within Development Site (ha)	Impact Area (ha)	Plots required	Plots surveyed
<i>Hornsby Plateau, Sydney Basin Bioregion</i>								
3	1237	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion - planted</i>	Low	Modified understorey / landscaped	0.36	0.19	1	1
4	1281	<i>Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion</i>	Good	EEC / Native understorey	0.22	0.03 0.02*	1	1
Total					1.29	0.59 0.02 *	4	4

* Vegetation clearance will be confined to trimming of outer branches and will not change the composition of this PCT and therefore this amount has not been included in the calculations.

1.4.1 Plant Community Types present

Two PCTs were mapped across four vegetation zones (Table 7 and Figure 4).

Justification for the selection of PCTs occurring on the Development Site was based on qualitative and quantitative analysis of full-floristic plot data, surrounding vegetation and landscape features, and is provided in Table 6 and section 1.4.1.1. It should be noted that due to the developed nature of the Development Site the placement of biometric plots was difficult. Plots 1, 2 and 3 were not able to be located in an area that did not contain concreted areas such as footpaths, the basketball court and / or carparks. The location of the plots was placed in the best possible location to collect the data. This also included modifying the 20m x 20m full floristic plot in plot 2 to a 40m x 10m plot where footpaths were unable to be avoided. The location of plot 3 overlapped with another zone towards the northern end where a *Eucalyptus saligna* (Blue Gum) was located. Therefore, the tree and other functional attributes, such as litter cover, was excluded from the BAMC for plot 3.

Due to the degraded nature of native vegetation and limited number of native species present, a quantitative analysis tool was generally considered impractical to define the PCT. Hence additional information including soil type, geographic location, surrounding vegetation and landscape position were also utilised. One of the two PCTs (PCT 1327) within the Development Site varied in its condition and was delineated into three vegetation zones (one of which was a planted condition comprising species that are not characteristic of this community but was assigned to a best-fit PCT). The other PCT present on site (PCT 1281) was in one condition class and was delineated into a single vegetation zone (Figure 5 and Table 6).

Table 7: Plant Community Types and Vegetation Zones

Veg Zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area within Development Site (ha)	Impact Area (ha)	Percent cleared
1	1237	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion</i>	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.58	0.34	90%
2	1237	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion</i>	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.13	0.03	90%
3	1237	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion – planted</i>	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.36	0.19	NA
4	1281	<i>Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion</i>	Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests (Grassy sub-formation)	0.22	0.03 0.02 *	90%

* Vegetation clearance will be confined to trimming of outer branches and will not change the composition of this PCT and therefore this amount has not been included in the calculations.

1.4.1.1 PCT selection justification

In determining the PCTs for the Development Site, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum, community composition, soils and landscape position. Reference was made to the PCT descriptions in the BioNet Vegetation Classification, the final scientific determination and other published documents describing the vegetation community (Table 6).

ELA considered all the native vegetation within the Development Site comprised of two native vegetation communities PCT 1237 - *Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion* and PCT 1281 *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*.

The majority of the Development Site was highly modified and predominantly composed of buildings, roads, maintained lawns, gardens and planted trees. Previous vegetation mapping within the Development Site (OEH, 2016) mapped vegetation as Urban Exotic/Native. Parts of the Development Site were consistent with this mapping. OEH has provided recent advice that all vegetation native to NSW must be assigned a PCT. A proportion of the Development Site consisted of planted native species which does not contain characteristic species of a local vegetation community by using a mixture of local and non-local indigenous species. For this assessment the PCT assigned to this community is based on

vegetation that has been assigned for native vegetation present within the Development Site. However, it is noted that the species are not characteristic species for this community.

Table 8: PCT selection justification

Veg Zone	PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
1 & 2	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	IBRA region, landform, soils vegetation formation and vegetation class	<i>Eucalyptus saligna</i> , <i>Eucalyptus pilularis</i> , <i>Eucalyptus paniculata</i> , <i>Eucalyptus acmenoides</i> and <i>Allocasuarina torulosa</i> present within canopy. The mid-storey contained native species occurring naturally and planted including <i>Pittosporum undulatum</i> , <i>Syzygium paniculatum</i> and <i>Ceratopetalum gummiferum</i> . The Development Site has been subjected to historical clearing and contains a landscaped understorey with some native species including <i>Dichondra repens</i> , <i>Cynodon dactylon</i> , <i>Microlaena stipoides</i> and <i>Lomandra longifolia</i> . Common exotic groundcovers within the area of this community were <i>Poa annua</i> , <i>Ehrharta erecta</i> , <i>Eragrostis curvula</i> , <i>Sida rhombifolia</i> , <i>Plantago lanceolata</i> , and <i>Bidens pilosa</i> .
3	1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	IBRA region, landform, soils, native vegetation present within the site	Species were made up of planted native species that are not characteristic species of this community such as <i>Eucalyptus citriodora</i> , <i>Melaleuca armillaris</i> , <i>Callitris rhomboidea</i> , <i>Callistemon viminalis</i> , <i>Eucalyptus botryoides</i> , <i>Melaleuca quinquenervia</i> , <i>Lophostemon confertus</i> , <i>Eucalyptus nicholii</i> and <i>Melaleuca styphelioides</i> .
4	1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	IBRA region, landform, soils vegetation formation and vegetation class	Characteristic tree species <i>Syncarpia glomulifera</i> , <i>Eucalyptus saligna</i> , <i>Angophora costata</i> , <i>Eucalyptus acmenoides</i> and <i>Corymbia gummifera</i> present within canopy. Mid-storey was comprised of <i>Pittosporum undulatum</i> , <i>Breynia oblongifolia</i> , and <i>Leucopogon juniperinus</i> . Groundcover species included <i>Lomandra longifolia</i> , <i>Lepidosperma laterale</i> , <i>Microlaena stipoides</i> and <i>Dianella caerulea</i> . Native vines included <i>Cayratia clematidea</i> and <i>Glycine tabacina</i> were present. Exotic groundcovers within the area of this patch included <i>Sida rhombifolia</i> , <i>Bidens pilosa</i> , <i>Plantago lanceolata</i> and <i>Setaria</i> sp.

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

Justification of PCT 1237 within the Development Site is based on the composition of species in the canopy and understory. Native tree species (planted and remnant) of this PCT in the site included remnant *Eucalyptus pilularis* (Blackbutt), *Eucalyptus saligna* (Blue Gum) and *Eucalyptus paniculata* (Grey Ironbark). The condition of this PCT is highly disturbed resulting from historical clearing with a midstorey that has been modified with areas containing planted native and exotic shrubs for landscaping and a portion of the PCT comprised of regrowth and exotic species in the understorey. The ground-layer species diverges considerably from the species originally present in this PCT, due to past land clearing and maintenance of vegetation within the site.

Three full-floristic and vegetation integrity survey plots was undertaken within this PCT in accordance with the BAM. Characteristic tree species *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus saligna* (Blue

Gum) were present within two of the plots. The understorey contained some native species including *Dichondra repens* (Kidney Weed), *Microlaena stipoides* (Weeping Meadow Grass), *Cyperus gracilis* (Slender Flat Sedge), *Oxalis perennans*, *Cynodon dactylon* (Couch) and *Lomandra longifolia*. Common exotic groundcovers within the area of this community were *Poa annua*, *Ehrharta erecta*, *Eragrostis curvula*, *Sida rhombifolia*, *Plantago lanceolata*, and *Bidens pilosa*.

The vegetation mapped as PCT 1237 in vegetation zones 1 and 2 is considered to be in low to moderate condition due to historical clearing, presence of exotic species and management (i.e. mown), and within one vegetation zone the understorey is represented by planted species. There is a high level of modification of this PCT with parts restricted to characteristic canopy species. However, the vegetation still contributes to the local occurrence of this PCT and is considered to be of moderate conservation significance.

Planted native vegetation that was assigned to this PCT (vegetation zone 3) is primarily based on adjacent vegetation, because species are not characteristic species for this PCT. The assignment of this vegetation zone to a PCT is a requirement of OEH, as noted above, and included the PCT that would most likely have occurred c.1750. The native tree species (planted) included *Eucalyptus citriodora* (Lemon-scented Gum), *Melaleuca armillaris*, *Callitris rhomboidea*, *Callistemon viminalis*, *Eucalyptus botryoides* (Bangalay), *Melaleuca quinquenervia*, *Lophostemon confertus* (Brush Box), *Eucalyptus nicholii* (Narrow-leaved Peppermint) and *Melaleuca styphelioides*, *Melaleuca linearifolia* (Flax-leaf Paperbark), *Melaleuca styphelioides* (Prickly-leaved Paperbark) and *Banksia integrifolia* (Coast Banksia). Due to the planted nature of this community in carparks and other landscaped areas, the understorey was predominantly absent with the exception of planted shrubs or groundcovers and/or areas of lawn.

1.4.1.3 PCT 1281 Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion

Justification of PCT 1281 within the Development Site is based on the composition of species in the canopy and understorey. Native tree species (remnant and regrowth) in this PCT included *Syncarpia glomulifera* (Turpentine), *Eucalyptus saligna* (Sydney Blue Gum), *Angophora costata* (Smooth-barked Apple), *Eucalyptus acmenoides* (White Mahogany), *Corymbia gummifera* (Red Bloodwood) and *Angophora floribunda* (Rough-barked Apple).

Mid-storey was comprised of *Pittosporum undulatum*, *Breynia oblongifolia* and *Leucopogon juniperinus*. Groundcover species included *Lomandra longifolia*, *Lepidosperma laterale*, *Entolasia* sp., *Microlaena stipoides* and *Dianella caerulea*. Native vines included *Cayratia clematidea* and *Glycine tabacina*. The groundcover was dominated by native species in the north of the patch with exotic species encroaching the understorey in the southern half of the patch, especially on the rail embankment.

The vegetation mapped as PCT 1281 is considered to be in moderate to good condition. Given the high level of modification and clearing of surrounding vegetation, this patch is considered to be of high conservation significance.

1.4.1.4 Threatened Ecological Communities Justification

Threatened Ecological Communities within the study area are mapped on Figure 6.

BioNet Vegetation Classification lists PCT 1237 as potentially comprising the TEC, 'Blue Gum High Forest in the Sydney Basin Bioregion' listed as critically endangered under the BC Act and EPBC Act.

Justification of PCT 1237 within the Development Site comprising the BC Act listed Blue Gum High Forest is based on the presence of diagnostic species in the upper and lower stratum, vegetation structure, similar vegetation mapped in the locality and characteristic soil of Blue Gum High Forest.

While the community has been subject to historical clearing and the original extent of the remnant vegetation has mostly been cleared for development, a review of aerial imagery from 1943 (SixMaps) reveal that patches of vegetation within the Development Site are likely to have been present in 1943, and persisting today. Characteristic tree species listed by NSW Scientific Committee 2011 for BGHF and observed within the study included, *Eucalyptus saligna* (Blue Gum), *Eucalyptus pilularis* (Blackbutt), *Eucalyptus paniculata* (Grey Ironbark) and *Angophora costata* (Sydney Red Gum).

Occurrences of the Blue Gum High Forest of the Sydney Basin Bioregion ecological community are considered to be part of the nationally listed ecological community (under the EPBC Act) if they are greater than one (1) hectare in size and:

- have a canopy cover greater than 10%; or
- have a canopy cover less than 10% and occur in areas of native vegetation in excess of five (5) hectares.

Although the Blue Gum High Forest within the development site had a canopy cover greater than 10%, it was below the 1 ha size threshold.

The BioNet Vegetation Classification lists PCT 1281 as potentially comprising the TEC 'Sydney Turpentine-Ironbark Forest' listed as endangered under the BC Act and critically endangered under the EPBC Act.

All of PCT 1281 within the study area was considered to represent the BC Act listed community due to the occurrence of characteristic canopy species. However, PCT 1281 did not represent the community listed under the EPBC Act.

Occurrences of Sydney Turpentine–Ironbark Forest are considered to be listed under the EPBC Act if patches are in good condition. Good condition is represented by vegetation that has some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey); and similar to BGHF if the tree canopy cover is greater than 10%; and the patch size is greater than one hectare. However, patches with a tree canopy cover of less than 10% are also included in the ecological community, if the patch of the ecological community is greater than one hectare in size; and it is part of a remnant of native vegetation that is 5 ha or more in area.

Within the study area, only 0.22 ha of STIF was identified in good condition and was not part of remnant vegetation that is 5 ha in area. Therefore, the vegetation within the study area does not meet the requirements of the Commonwealth listing.

1.4.2 Vegetation integrity assessment

A vegetation integrity assessment using the BAM Credit Calculator (BAMC) was undertaken and the results are outlined in Table 9. This calculation does not include the area of vegetation subject to pruning as this activity will not impact on the composition of the PCT and has therefore not been included in the BAM calculations. Approximately 2.55 ha will be cleared for the building footprint and roads impacting 0.60 ha of native vegetation and 0.17 ha of exotic vegetation.

Table 9: Vegetation integrity

Veg Zone	PCT ID	Condition	Ancillary Code	Impact Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	1237	Low	CEEC	0.34	15.6	33.9	64.8	32.5
2	1237	Moderate	CEEC	0.03	12	36.5	44.2	26.9
3	1237	Low		0.19	8.9	14.4	9.9	10.8
4	1281	Good	EEC	0.03	33.8	51.5	46.2	43.2

1.4.3 Use of local data

Use of local data instead of benchmark integrity scores is not proposed.

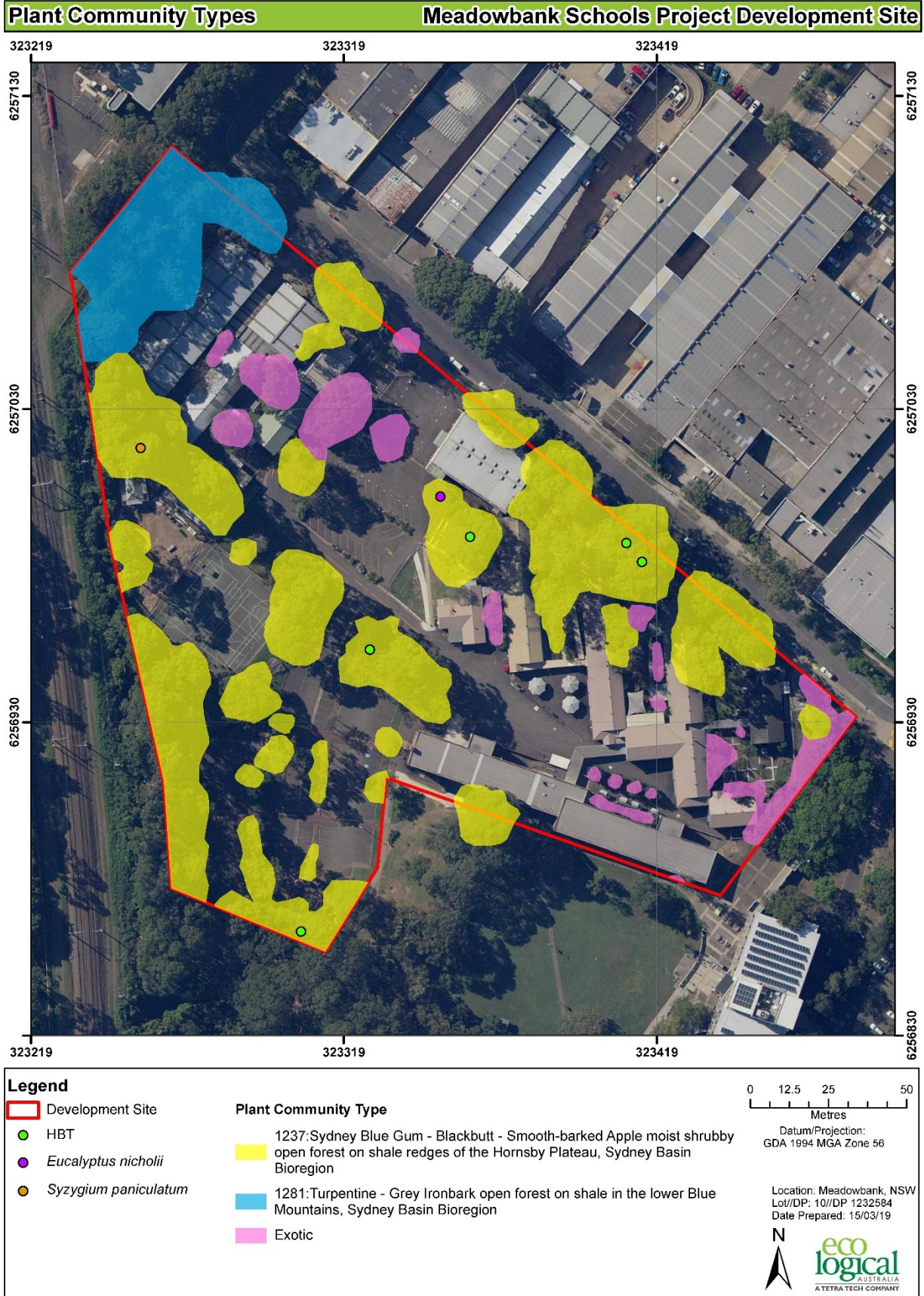


Figure 4: Plant Community Type and other vegetation

Vegetation Zones and Survey Plots Meadowbank Schools Project Development Site

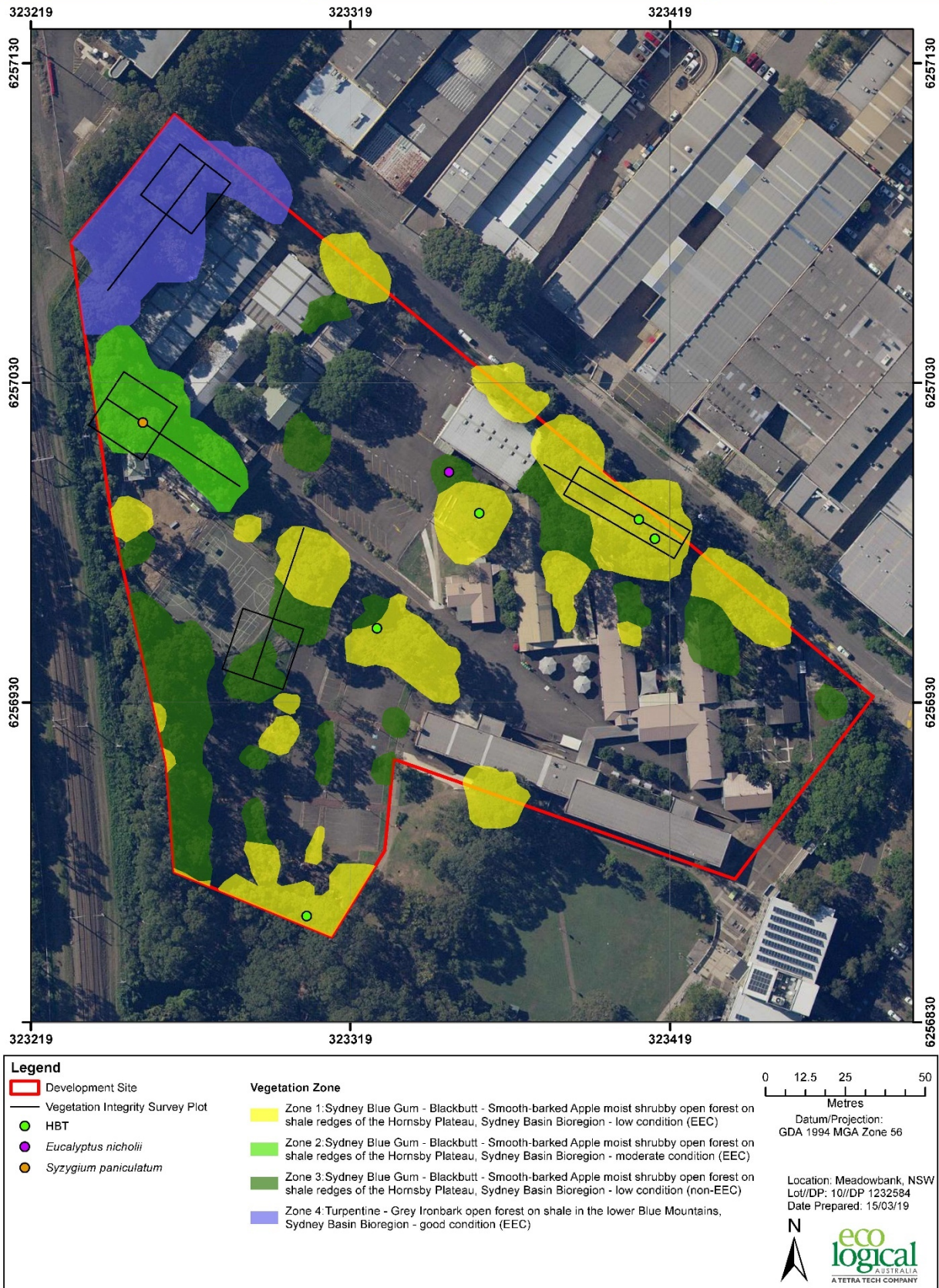


Figure 5: Vegetation Zone and Survey Plot

Threatened Ecological Communities Meadowbank Schools Project Development Site

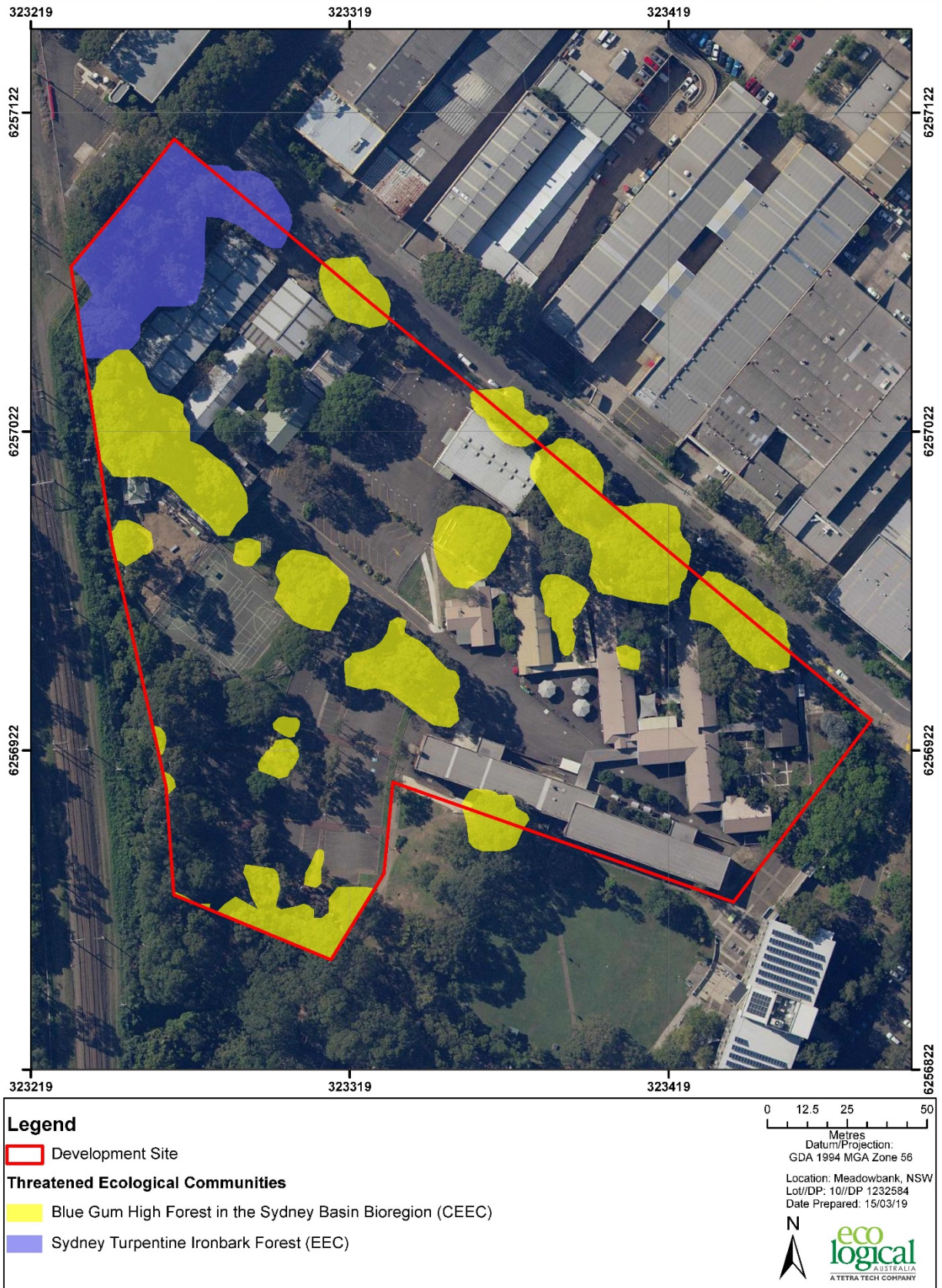


Figure 6: Threatened Ecological Communities

1.5 Threatened species

1.5.1 Ecosystem credit species

Ecosystem credit species predicted to occur at the Development Site through the PCTs and their sensitivity to gain class is included in **Table 10**.

1.6 Species credit species

1.6.1 Candidate Species credit species

Species credit species identified as candidate species requiring survey at the Development Site, their associated habitat constraints, geographic limitations and sensitivity to gain class are shown in Table 10.

An assessment of those candidate threatened species identified in Table 10 was undertaken to determine the likelihood of those species to occur in the Development Site based on the presence or absence of necessary habitat components or habitat constraints in accordance with Chapter 6.4 of the BAM. The justification for exclusion of species from the BAM is presented in Table 11.

1.6.1.1 Targeted surveys

Although the above species credit species were not included in the assessment, primarily due to lack of potential habitat, surveys throughout the Development Site were conducted as a conservative measure for species that were conspicuous, and/or met the survey timing requirements under the BAM (Table 12). Targeted surveys for threatened flora using the random meander technique, in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016), were undertaken within the two PCTs. The survey also involved searching for potential species known from database records identified within a 5 km radius of the Development Site.

Table 10: Habitat suitability for threatened species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to BC Act	EPBC Act	Credit type
<i>Acacia bynoeana</i>	Bynoe's Wattle	None		High	Endangered	Vulnerable Species
<i>Acacia clunies-rossiae</i>				High	Vulnerable	Not listed Species
<i>Acacia prominens</i> - endangered population	Gosford Wattle, Hurstville and Kogarah Local Government Areas			High	Endangered population	Not listed Species
<i>Acacia pubescens</i>	Downy Wattle			High	Vulnerable	Vulnerable Species
<i>Anthochaera phrygia</i>	Regent Honeyeater			High	Critically Endangered	Critically Endangered Ecosystem – foraging Species – breeding habitat
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow			Moderate Sensitivity to Potential Gain	Vulnerable	N/A Ecosystem
<i>Caladenia tessellata</i>	Spider Orchid		Yes	Moderate	Endangered	Vulnerable Species
<i>Calidris canutus</i>	Red Knot			High	Not listed	Endangered Species/Ecosystem
<i>Calidris ferruginea</i>	Curlew Sandpiper			High	Endangered	Critically Endangered Species/Ecosystem
<i>Calidris tenuirostris</i>	Great Knot			High	Vulnerable	Critically Endangered Species/Ecosystem
<i>Callistemon linearifolius</i>	Netted Bottle Brush			High	Vulnerable	Not listed Species
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Eucalypt tree species with hollows greater than 9 cm diameter		Moderate foraging High - breeding	Vulnerable	Not listed Ecosystem – foraging Species – breeding habitat

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to BC Act	EPBC Act	Credit type
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Uses hollows with diameter ≥ 10 cm and >9 m above the ground in eucalypts		High	Endangered population	Not listed Species
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	Hollow-bearing trees: Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Note that the species may need larger patches and more intact landscapes for breeding.		High	Vulnerable	Not listed Ecosystem – foraging Species – breeding habitat
<i>Camarophyllopsis kearneyi</i>			Yes	High	Endangered	Not listed Species
<i>Charadrius leschenaultii</i>	Greater Sand-plover			Moderate	Vulnerable	Vulnerable Species/Ecosystem
<i>Chthonicola sagittata</i>	Speckled Warbler			High Sensitivity to Potential Gain	Vulnerable	N/A Ecosystem
<i>Darwinia biflora</i>				High	Vulnerable	Vulnerable Species
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll			High Sensitivity to Potential Gain	Vulnerable	Endangered Ecosystem
<i>Dillwynia tenuifolia</i>				Moderate	Vulnerable	Not listed Species
<i>Epacris purpurascens</i> var. <i>purpurascens</i>				Moderate	Vulnerable	Not listed Species
<i>Epthianura albifrons</i>	White-fronted Chat			High	vulnerable	Not listed Ecosystem

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Credit type
<i>Epthianura albifrons</i>	White-fronted Chat	population in the Sydney Metropolitan Catchment Management Area		High	Endangered population	Not listed	Species
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark			High	Vulnerable	Vulnerable	Species
<i>Galium australe</i>	Tangled Bedstraw			High	Endangered	Not listed	Species
<i>Genoplesium baueri</i>	Bauer's Midge Orchid			Moderate	Endangered	Endangered	Species
<i>Glossopsitta pusilla</i>	Little Lorikeet			High Sensitivity to Potential Gain	Vulnerable	N/A	Ecosystem
<i>Grammitis stenophylla</i>	Finger Fern			Moderate	Endangered	Not listed	Species
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea			High	Vulnerable	Vulnerable	Species
<i>Grevillea parviflora</i> subsp. <i>supplicans</i>				High	Endangered	Not listed	Species
<i>Gyrostemon thesioides</i>			Yes	High	Endangered	Not listed	Species
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines		High	Vulnerable	Not listed	Ecosystem – foraging Species – breeding habitat
<i>Hibbertia puberula</i>				High	Endangered	Not listed	Species
<i>Hibbertia superans</i>				High	Endangered	Not listed	Species
<i>Hieraaetus morphnoides</i>	Little Eagle	Nest trees - live (occasionally dead) large old trees within vegetation.		Moderate	Vulnerable	Not listed	Ecosystem – foraging Species – breeding habitat

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Credit type
<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>			Yes	High	Vulnerable	Not listed	Species
<i>Hygrocybe aurantipes</i>			Yes	High	Vulnerable	Not listed	Species
<i>Hygrocybe austropratensis</i>			Yes	High	Endangered	Not listed	Species
<i>Hygrocybe collucera</i>			Yes	High	Endangered	Not listed	Species
<i>Hygrocybe griseoramosa</i>			Yes	High	Endangered	Not listed	Species
<i>Hygrocybe lanecovensensis</i>			Yes	High	Endangered	Not listed	Species
<i>Hygrocybe reesiaie</i>				High	Vulnerable	Not listed	Species
<i>Hygrocybe rubronivea</i>			Yes	High	Vulnerable	Not listed	Species
<i>Hibbertia spanantha</i>	Julian's Hibbertia			N/A	Critically endangered	Critically endangered	Species
<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>				High	Not listed	Extinct	Species
<i>Lathamus discolor</i>	Swift Parrot			Moderate	Endangered	Endangered	Ecosystem – foraging Species – breeding habitat
<i>Leptospermum deanei</i>				Moderate	Vulnerable	Vulnerable	Species
<i>Limicola falcinellus</i>	Broad-billed Sandpiper			High	Vulnerable	Migratory	Ecosystem – foraging Species – breeding habitat
<i>Limosa limosa</i>	Black-tailed Godwit			High	Vulnerable	Migratory	Ecosystem – foraging Species – breeding habitat

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to BC Act	EPBC Act	Credit type
<i>Litoria aurea</i>	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas, within 1km of wet areas/swamps, within 1 km of waterbody,		High	Endangered	Endangered Species
<i>Melaleuca biconvexa</i>	Biconvex Paperbark			High	Vulnerable	Vulnerable Species
<i>Melaleuca deanei</i>	Deane's Paperbark			High	Vulnerable	Vulnerable Species
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)			Moderate Sensitivity to Potential Gain	Endangered	Critically Endangered Ecosystem
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail			High	Endangered	Not Listed Species
<i>Miniopterus australis</i>	Little Bentwing-bat	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding		Very High	Vulnerable	Not Listed Ecosystem – foraging Species – breeding habitat
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding		Very High	Vulnerable	Not Listed Ecosystem – foraging Species – breeding habitat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat			High Sensitivity to Potential Gain	Vulnerable	N/A Ecosystem
<i>Myotis macropus</i>	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone Other Bridges, caves or artificial structures within 200 m of riparian zone		High	Vulnerable	Not Listed Species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to BC Act	EPBC Act	Credit type	
<i>Ninox connivens</i>	Barking Owl	Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.		High	Vulnerable	Not listed	Ecosystem – foraging Species – breeding habitat
<i>Ninox strenua</i>	Powerful Owl	Living or dead trees with hollow greater than 20cm diameter		High	Vulnerable	Not listed	Ecosystem – foraging Species – breeding habitat
<i>Numenius madagascariensis</i>	Eastern Curlew			High	Not listed	Critically endangered	Ecosystem – foraging Species – breeding habitat
<i>Pandion cristatus</i>	Eastern Osprey	Living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting .		Moderate	Vulnerable	Moderate	Ecosystem – foraging Species – breeding habitat
<i>Perameles nasuta</i>	Long-nosed Bandicoot population in inner western Sydney			High	Endangered population	Not listed	Species
<i>Persoonia hirsuta</i>	Hairy Geebung			High	Endangered	Endangered	Species
<i>Petaurus norfolcensis</i>	Squirrel Glider			High	Vulnerable	Not Listed	Species
<i>Petauroides volans</i>	Greater Glider			High	Not listed	Vulnerable	Species
<i>Petroica boodang</i>	Scarlet Robin			Moderate Sensitivity to Potential Gain	Vulnerable	N/A	Ecosystem
<i>Petroica phoenicea</i>	Flame Robin			Moderate Sensitivity to Potential Gain	Vulnerable	N/A	Ecosystem
<i>Phascolarctos cinereus</i>	Koala			High	Vulnerable	Vulnerable	Ecosystem – foraging

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to BC Act	BC Act	EPBC Act	Credit type
							Species – important habitat
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Pimelea curviflora var. curviflora				Vulnerable	Vulnerable	Species
<i>Pomaderris prunifolia</i>	<i>P. prunifolia</i> in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas			High	Endangered population	Not listed	Species
<i>Pommerhelix duralensis</i>	Woodland Snail	Leaf litter and shed bark or within 50m of litter of bark, Rocks or within 50m of rocks, Fallen/standing dead timber including logs, Including logs and bark or within 50m of logs or bark, Other		High	Endangered	Endangered	Species
<i>Prostanthera marifolia</i>	Seaforth Mintbush			High	Critically endangered	Critically endangered	Species
<i>Pseudophryne australis</i>	Red-crowned Toadlet			Moderate	Vulnerable	Not listed	Species
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox			High	Vulnerable	Vulnerable	Ecosystem – foraging Species – breeding habitat
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood			High	Endangered	Endangered	Species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Credit type
<i>Ptilinopus superbus</i>	Superb Fruit-dove			Moderate Sensitivity to Potential Gain	Vulnerable	N/A	Ecosystem
<i>Rhodamnia rubescens</i>	Scrub Turpentine			High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Species
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly			Moderate	Endangered	Vulnerable	Species
<i>Sternula albifrons</i>	Little Tern			High	Endangered	Migratory	Ecosystem – foraging Species – breeding habitat
<i>Tetradlea juncea</i>	Black-eyed Susan			High	Vulnerable	Vulnerable	Species
<i>Tetradlea glandulosa</i>				High	Vulnerable	Not listed	Species
<i>Tyto novaehollandiae</i>	Masked Owl	Living or dead trees with hollows greater than 20cm diameter.		High	Vulnerable	Not listed	Ecosystem – foraging Species – breeding habitat
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Land situated in damp, disturbed sites		High	Endangered population	Not listed	Species
<i>Wilsonia backhousei</i>	Narrow-leaved Wilsonia	Margins of salt marshes and lakes, both coastal and inland		High	Vulnerable	Not listed	Species
<i>Xenus cinereus</i>	Terek Sandpiper			High	Vulnerable	Not listed	Ecosystem – foraging

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to BC Act	EPBC Act	Credit type
						Species – breeding habitat
<i>Zannichellia palustris</i>		Land containing freshwater bodies		High	Endangered	Not listed Species

Table 11: Justification for exclusion of candidate species credit species

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Acacia clunies-rossiae</i>		Vulnerable	Not listed	This species was not recorded during the field survey. Furthermore, the record of this species is believed to be a planted specimen. Kanangra Wattle grows in the Kowmung and Coxs River areas entirely within Kanangra-Boyd and Blue Mountains National Parks.
<i>Acacia prominens</i> - endangered population	Gosford Wattle, Hurstville and Kogarah Local Government Areas	Endangered population	Not listed	This species was not recorded during the field survey. Furthermore, the Development Site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the subject land.
<i>Acacia pubescens</i>	Downy Wattle	Vulnerable	Vulnerable	This species was not recorded during the field survey. This species has known to tolerate disturbed environments. If this species occurred within the Development Site it is highly likely it would have been detected during the field survey.
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered	This species was recently recorded in Bennelong Park near Sydney Olympic Park where larger/ intact areas of bushland is present. The Development Site does not contain breeding habitat for this species and habitat is not located on an important area mapped by OEH. The Development Site is unlikely to provide good quality habitat that may be utilised by this species where habitat of higher quality is located in the locality.
<i>Caladenia tessellata</i>	Spider Orchid	Endangered	Vulnerable	The species was not identified, and it was determined that the habitat is substantially developed such that this species is unlikely to utilise the Development Site. The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
				Victoria from east of Melbourne to almost the NSW border. Therefore, it is unlikely that the Development Site would provide potential habitat for this species.
<i>Calidris canutus</i>	Red Knot	Not listed	Endangered	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Calidris ferruginea</i>	Curlew Sandpiper	Endangered	Critically Endangered	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Calidris tenuirostris</i>	Great Knot	Vulnerable	Critically Endangered	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Vulnerable	Not listed	This species was not recorded during the field survey. Database records within a 5km radius of the Development Site are outside of the Development Site.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Not listed	This species was not detected during the field survey. This species is known from two database records within a 5km radius of the Development from the late 1980s in Epping and Concord. The Development Site is unlikely to provide habitat for this species.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	Endangered population	Not listed	The Development Site is located outside of this endangered populations known distribution. In addition, the species was not detected during the field survey. This species is known from two database records within a 5km radius of the Development from the late 1980s in Epping and Concord. The Development Site is unlikely to provide habitat for this species.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	Vulnerable	Not listed	The Glossy Black-cockatoo is not known from any database records within a 5km radius of the Development Site. However, potential foraging habitat is present within the Development Site. The species has the potential to opportunistically utilise the site. Suitable sized hollow-bearing tree was detected during the field survey, however, this tree is occupied by <i>Cacatua galerita</i> (Sulphur-crested Cockatoo).
<i>Camarophyllopsis kearneyi</i>		Endangered	Not listed	<p>The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site.</p> <p>.</p> <p>Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region.</p>

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Charadrius leschenaultii</i>	Greater Sand-plover	Vulnerable	Vulnerable	Migratory species, key threats occurring overseas. Note that it does not breed in NSW or elsewhere in Australia but relies on successful feeding here to migrate >10,000km back to its breeding grounds.
<i>Darwinia biflora</i>		Vulnerable	Vulnerable	This species was not recorded during the field survey. This species occurs on the edges of weathered shale-capped ridges where these intergrade with Hawkesbury Sandstone. The Development Site does not contain suitable habitat for this species.
<i>Dillwynia tenuifolia</i>		Vulnerable	Not listed	This species was not recorded during the field survey. This species is known from two database records within a 5km radius of the Development Site from Ryde and Sydney Olympic Park. The Development Site does not contain suitable habitat for this species.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		Vulnerable	Not listed	The species was not identified, and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the Development Site.
<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable	Not listed	This species is usually found foraging on bare or grassy ground in wetland areas. The habitat within the Development Site is unlikely to provide suitable habitat for this species.
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	Endangered population	Not listed	The closest population is regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). The habitat within the Development Site is unlikely to provide suitable habitat for this species.
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	Vulnerable	Vulnerable	This species was not recorded during the field survey. Furthermore, this species has a restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park.
<i>Galium australe</i>	Tangled Bedstraw	Endangered	Not listed	Tangled Bedstraw has been recorded historically in the Nowra (Colymea) and Narooma areas and is extant in Nadgee Nature Reserve, south of Eden. Records in the Sydney area are yet to be confirmed. The species was not identified during the field survey, and it was determined that this species is unlikely to utilise the Development Site.

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	Endangered	Endangered	This species is known from eight database records from 1881 to 1887 and one record in 2011 near Putney. The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. This species grows in dry sclerophyll forest and moss gardens over sandstone. It was determined based on database records and habitat present within the Development Site that this species is unlikely to be present within the site.
<i>Grammitis stenophylla</i>	Finger Fern	Endangered	Not listed	The species was not identified, and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the Development Site Occurs in eastern Queensland and eastern NSW. In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri.
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	Vulnerable	Vulnerable	The species was not identified, and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the Development Site.
<i>Grevillea parviflora</i> subsp. <i>supplicans</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Has a very restricted known distribution (approximately 8 by 10 km) and is confined to the north-west of Sydney near Arcadia and the Maroota–Marramarra Creek area, in Hornsby and Baulkham Hills local government areas. It is known from only a few locations, one of which is in the southern portion of Marramarra National Park.
<i>Gyrostemon thesioides</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Within NSW, has only ever been recorded at three sites, to the west of Sydney, near the Colo, Georges and Nepean Rivers. The most recent sighting was of a single male plant near the Colo River within Wollemi National Park. The species has not been

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
				recorded from the Nepean and Georges Rivers for 90 and 30 years respectively, despite searches. Also occurs in Western Australia, South Australia, Victoria and Tasmania.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	Vulnerable	Not listed	The Development site does not provide suitable foraging habitat for this species and as such it is unlikely this species would utilise the site.
<i>Hibbertia puberula</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. This species extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath.
<i>Hibbertia spanantha</i>	Julian's Hibbertia	Critically endangered	Critically endangered	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site.
<i>Hibbertia superans</i>		Endangered	Not listed	This species occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey. No populations are known from a formal conservation reserve. The site is located outside of the species known range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site.
<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable	Not listed	The Development site does not provide suitable foraging habitat for this species and as such it is unlikely this species would utilise the site.
<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>		Vulnerable	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Type locality, Lane Cove Bushland Park, Lane Cove Local Government Area. Other records from Royal and Blue Mountains NPs.
<i>Hygrocybe aurantipes</i>		Vulnerable	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Type locality, Lane Cove Bushland Park, Lane Cove Local Government Area. Other records from Blue Mountains National Park (Mt Wilson) and Hazelbrook.

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Hygrocybe austropratensis</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area.
<i>Hygrocybe collucera</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area.
<i>Hygrocybe griseoramosa</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area.
<i>Hygrocybe lanecovens</i>		Endangered	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area.
<i>Hygrocybe reesia</i>		Vulnerable	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Type locality, Lane cove Bushland Park, Lane Cove Local Government Area. Also recorded from Blue Mountains National Park in the Hazelbrook area. Also found in Tasmania.
<i>Hygrocybe rubronivea</i>		Vulnerable	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the Development Site. Known in a few locations including in Lane Cove Bushland Park and the Blue Mountains in NSW and in areas of south-east Queensland. However little information exists for populations outside Lane Cove Bushland Park.
<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>		Not listed	Extinct	Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks.

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Endangered	The site contains potential foraging habitat. Only present in non-breeding season; present in northern NSW for a shorter period than southern NSW.
<i>Leptospermum deanei</i>		Vulnerable	Vulnerable	This species was not recorded during the field survey. It is unlikely that this species is present with the Development Site.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Vulnerable	Migratory	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Limosa limosa</i>	Black-tailed Godwit	Vulnerable	Migratory	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Endangered	The site does not contain any potential breeding habitat and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the Development Site.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Vulnerable	Vulnerable	This species was not recorded during the field survey. Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.
<i>Melaleuca deanei</i>	Deane's Paperbark	Vulnerable	Vulnerable	This species was not recorded during the field survey. It is unlikely that this species is present with the Development Site.
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Endangered	Not Listed	The Development Site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the site.
<i>Miniopterus australis</i>	Little Bentwing-bat	Vulnerable	Not listed	This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding cliffs are present in the Development Site. Although no breeding habitat is present within the Development Site the site provides potential foraging habitat for this species.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	Not listed	This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding cliffs are present in the Development Site. Although no breeding habitat is present within the Development Site the site provides potential foraging habitat for this species.

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not listed	This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The subject site does not contain any waterbodies or is within 200m of a riparian zone. No bridges, caves or artificial structures were recorded within the site. It is unlikely that the Development Site provides suitable habitat for this species.
<i>Ninox connivens</i>	Barking Owl	Vulnerable	Not listed	This species is known from two database records in Eastwood in the early 1990s. Barking Owls require very large permanent territories in most habitats due to sparse prey densities. Suitable sized hollow-bearing tree was detected during the field survey, however this tree is occupied by <i>Cacatua galerita</i> (Sulphur-crested Cockatoo). Based on historical records for this species and quality of habitat within the Development Site it was determined that this species is unlikely to utilise the site.
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not listed	The Development site provides potential foraging habitat for this species. Suitable sized hollow-bearing tree was detected during the field survey, however this tree is occupied by <i>Cacatua galerita</i> (Sulphur-crested Cockatoo).
<i>Numenius madagascariensis</i>	Eastern Curlew	Not listed	Critically endangered	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Pandion cristatus</i>	Eastern Osprey	Vulnerable	Moderate	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Perameles nasuta</i>	Long-nosed Bandicoot population in inner western Sydney	Endangered population	Not listed	The site is located outside of the endangered populations known range. The condition of the habitat is not suitable for this species such that this species is unlikely to utilise the site.
<i>Persoonia hirsuta</i>	Hairy Geebung	Endangered	Endangered	The species was not identified during the field survey. This species is only known from two database records located in Ryde within a 5km radius of the Development Site. Based on database records, that the species was not detected during the field survey and the quality of habitat within the Development Site it was determined that this species is unlikely to utilise the site.
<i>Petauroides volans</i>	Greater Glider	Not listed	Vulnerable	The Greater Glider is only known from 1 record within a 5 km radius of the Development Site near Lane Cove National Park. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Based on database records and the highly development nature of the Development Site and urbanised area it is unlikely that this species would utilise the site.

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable	Not listed	This species has not been recorded within a 5 km radius of the site and habitat is substantially degraded such that this species is unlikely to utilise the Development Site.
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Vulnerable	This species was not detected during the field survey and in addition the Development Site is located in a highly urban area where connectivity to suitable habitat is low and highly unlikely that this species would occur within the Development Area. Furthermore the Development Site does not contain feed trees that would support this species.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Pimelea curviflora var. curviflora	Vulnerable	Vulnerable	The species was not identified, and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the site.
<i>Pomaderris prunifolia</i>	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	Endangered population	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the site.
<i>Pommerhelix duralensis</i>	Woodland Snail	Endangered	Endangered	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the site.
<i>Prostanthera marifolia</i>	Seaforth Mintbush	Critically endangered	Critically endangered	<i>P. marifolia</i> was not recorded during the field survey and this species is only known from three database records within a 5km radius of the Development Site in Hunters Hill and Lane Cove in early 1900s and one more recent record in Ryde in 2011. The species is currently only known from the northern Sydney suburb of Seaforth and has a very highly restricted distribution within the Sydney Basin Bioregion. The single population is fragmented by urbanisation into three small sites. All known sites are within an area of 2x2 km. Two of the sites are within the local government area of Manly and one site is in the LGA of Warringah. Due to the developed nature of the site and surrounding landscape it is unlikely that this species would occur within the Development Site.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	Vulnerable	Not listed	The Red-crowned Toadlet inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. The Development site does not contain any ephemeral creek or potential breeding habitat or is located adjacent suitable habitat. Therefore, this species is unlikely to utilise the site.

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Suitable breeding habitat (camps) was not available within the Development Site. Potential foraging habitat is available within the Development Site.
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Endangered	Endangered	<i>P. saxicola</i> is known from one database record within a 5km radius of the Development Site in 2011 near Putney. This species is restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Only one population occurs within a conservation reserve (Georges River National Park). The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Rhodamnia rubescens</i>	Scrub Turpentine	Vulnerable	Vulnerable	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Sternula albifrons</i>	Little Tern	Endangered	Migratory	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Endangered	Vulnerable	This species is commonly planted / cultivated for garden landscapes across Sydney. The specimen observed within the Development Site represented planted / cultivated individuals, and therefore does not represent the species listed under the BC / EPBC Acts.
<i>Tetratheca glandulosa</i>		Vulnerable	Not listed	The species was not identified, and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the site.
<i>Tetratheca juncea</i>	Black-eyed Susan	Vulnerable	Vulnerable	This species was not identified during the survey. Furthermore, this species is only known from two database records within a 5km radius of the Development Site which were recorded in 1884 in two locations in Five Dock. This species is confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.
<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	Not listed	The Masked Owl is known from one database record within a 5km radius of the Development Site from 1976 in Macquarie University. The Masked Owl roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves

Species	Common Name	NSW listing status	EPBC Listing status	Justification for exclusion of species
				for nesting. The Development Site is unlikely to provide suitable habitat for this species and therefore the species is unlikely to utilise the site.
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Endangered population	Not listed	The site is located outside of the species range and condition of the habitat is not suitable for this species such that this species is unlikely to utilise the site.
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	Vulnerable	Not listed	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Xenus cinereus</i>	Terek Sandpiper	Vulnerable	Not listed	The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.
<i>Zannichellia palustris</i>		Endangered	Not listed	This species is an aquatic plant. The Development Site does not contain suitable habitat for this species and therefore this species is unlikely to utilise the site.

Table 12: Targeted surveys

Date	Surveyors	Target species
28/05/2018	Danielle Adams-Bennett	<i>Acacia bynoeana</i> , <i>Acacia pubescens</i> , <i>Callistemon linearifolius</i> , <i>Darwinia biflora</i> , <i>Dillwynia tenuifolia</i> , <i>Epacris purpurascens</i> var. <i>purpurascens</i> , <i>Grevillea parviflora</i> subsp. <i>parviflora</i> , <i>Leptospermum deanei</i> , <i>Melaleuca biconvexa</i> , <i>Melaleuca deanei</i> , <i>Persoonia hirsuta</i> , <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Prostanthera marifolia</i> , <i>Tetratheca glandulosa</i> , <i>Tetratheca juncea</i> .

Weather conditions during the targeted survey are outlined in Table 13.

Table 13: Weather conditions

Date	Rainfall (mm)	Minimum temperature 0C	Maximum temperature 0C
12/07/2018	0	4.8	19.3

Survey effort undertaken at the Development Site is outlined in Table 14.

Table 14: Survey effort

Method	Habitat (ha)	Total effort	Target species
Area search	0.33	120 minutes search	<i>Acacia bynoeana</i> , <i>Acacia pubescens</i> , <i>Callistemon linearifolius</i> , <i>Darwinia biflora</i> , <i>Dillwynia tenuifolia</i> , <i>Epacris purpurascens</i> var. <i>purpurascens</i> , <i>Grevillea parviflora</i> subsp. <i>parviflora</i> , <i>Leptospermum deanei</i> , <i>Melaleuca biconvexa</i> , <i>Melaleuca deanei</i> , <i>Persoonia hirsuta</i> , <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Prostanthera marifolia</i> , <i>Tetratheca glandulosa</i> and <i>Tetratheca juncea</i> .

1.6.1.2 Targeted Survey results

During the field survey two threatened flora species *Eucalyptus nicholii* (Narrow-leaved Peppermint) and *Syzygium paniculatum* (Magenta Lilly Pilly) which are listed under the BC Act and EPBC Act were found within and in close proximity to the Development Site (Figure 5). *Eucalyptus nicholii* is listed as Vulnerable under the BC and EPBC Acts and occurs naturally on the New England Tablelands from Nundle to north of Tenterfield northern NSW and is not indigenous to Sydney. The specimen observed is outside of the known range for this species, is a commonly planted species in Sydney and is likely a cultivated individual. Therefore, the individual observed is not considered to represent the species as listed under the BC and EPBC Acts.

Syzygium paniculatum is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. The species occurs naturally in the Jervis, Sydney Cataract, Pittwater and Wyong subregions of the Sydney Basin Bioregion, and in the Karuah-Manning and Macleay-Hastings subregions of the NSW North Coast Bioregion. Based on historical land use and records for this species in the Ryde LGA it is likely that this occurrence of this species is cultivated / planted. This species is readily available as horticultural varieties from nurseries as it is a commonly planted species in Sydney gardens. Therefore, the individual observed is not considered to represent the species as listed under the BC and EPBC Acts.

No other threatened flora or fauna species were recorded during targeted surveys on the Development Site.

1.6.2 Use of local data

The use of local data is not proposed.

1.6.3 Expert reports

Expert reports have not been prepared as part of this BDAR.

2. Stage 2: Impact Assessment

2.1 Avoiding impacts

The Development Site contains small and fragmented patches of degraded native vegetation. The development footprint has been located to avoid and minimises impacts on native vegetation as outlined in Table 15 and Table 16.

2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

Table 15: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
locating the project in areas where there are no biodiversity values	Areas of cleared land, exotic vegetation and existing infrastructure containing no biodiversity values have been utilised. The development site has been designed to avoid impacts to remnant vegetation and as many large remnant trees as possible. Approximately 0.53 ha of low condition PCT 1237 (comprising 0.19 ha of non CEEC PCT 1237), 0.03 ha of moderate condition PCT 1237 and 0.03 ha of good condition PCT 1281 will be removed. Additional impacts also include trimming outer branches covering an area of 0.02 ha of PCT 1281 therefore avoiding complete removal of remnant trees and/or vegetation.	The Development Site is predominantly located in areas containing little biodiversity values. The area of native vegetation to be impacted is in various degrees of condition and consists of a combination of remnant, regrowth and planted native trees.
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The Development Site has been designed to avoid impacts to remnant vegetation and large remnant trees. Approximately 0.53 ha of low condition PCT 1237 (comprising 0.19 ha of non CEEC PCT 1237), 0.03 ha of moderate condition PCT 1237 and 0.03 ha of good condition PCT 1281 will be removed. Additional impacts also include trimming outer branches covering an area of 0.02 ha of PCT 1281 therefore avoiding complete removal of remnant trees and/or vegetation.	Native vegetation within the Development Site is predominantly comprised of planted native trees in low condition, with some vegetation comprising remnants of the BGHF and STIF CEEC. However, vegetated that will be impacted as part of the works are in a degraded condition. Vegetation integrity scores for the PCTs range between 10.8 and 32.5 for PCT 1237 and 43.2 for PCT 1281 vegetation zones (see Section 2.2.2 below). Adjacent areas of native vegetation outside of the Development Site to the west and south appeared to be in better condition and has been avoided as far as possible.
locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The Development Site has been located to avoid impacting on an area of remnant TECs where possible. The project has avoided most of the hollow-bearing trees which contain habitat for fauna species with the exception of one hollow-bearing tree. The development cannot avoid impacts to all areas of BGHF and STIF, however	Native vegetation within the Development Site is predominantly comprised of planted native trees in low condition, and areas of low to moderate condition BGHF and one area of STIF in good condition. However, the development has been placed in areas of lowest condition and the majority of BGHF in moderate

Approach	How addressed	Justification
	these impacts have been minimised and avoided as much as possible. A total area of 0.37 ha of BGHF and 0.03 ha of STIF will be cleared and 0.02 ha of STIF will be indirectly impacted.	condition and all of the STIF in good condition identified within the Development Site will remain.
locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The Development Site footprint does not impact on connectivity values surrounding the Development Site.	The Development Site is located within a fragmented landscape. Land directly to the north, east and south has been highly developed. Vegetation along the western boundary of the Meadowbank TAFE site provides a small corridor of vegetation that has the potential to link with vegetation to the north. However, the vegetation in this site is also modified containing a mixture of native and planted native trees. Due to the highly urbanised surrounding environment there is limited habitat connectivity. Given the proposed development will utilise an area of already highly developed land and fragmented native vegetation, the movement of species and genetic material between areas of adjacent or nearby habitat will be maintained.

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

Table 16: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
reducing the clearing footprint of the project	The clearing footprint has primarily utilised areas of already developed land and areas of disturbed or planted vegetation. The impact area has been redesigned to reduce impacts on PCT 1237 and PCT 1281 as much as possible and is contained in an area with the lowest vegetation condition.	The Development Site is primarily located within an existing developed site containing buildings, carparks and landscaped area. A small area of disturbed native vegetation will be impacted including a small area that is not consistent with a PCT.
locating ancillary facilities in areas where there are no biodiversity values	Ancillary features are located in areas where there are minimal biodiversity values.	The Development site utilises areas containing predominantly exotic and areas of PCT 1237 of low conservation value (Non CEEC vegetation zone 3 - 0.19 ha with a vegetation integrity score of 10.8), avoiding as much of the remnant vegetation and large remnant trees within the site. Therefore, avoiding the requirement to offset. There will be a small impact (0.37 ha) to areas consisting of CEEC PCT 1237 and 0.03 ha of PCT 1281 and an indirect impact to 0.02 ha of PCT 1281 which will consist of trimming outer branches of trees.

Approach	How addressed	Justification
locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	All vegetation within the Development site has a relatively low vegetation integrity score (see Section 2.2.2).	The Development site utilises areas containing predominantly exotic and areas of PCT 1237 of low conservation value (Non CEEC vegetation zone 3 - 0.19 ha with a vegetation integrity score of 10.8 – below offset threshold), avoiding the majority of remnant vegetation and large remnant trees within the site. There will be a small impact (0.34 ha) to areas containing low condition CEEC PCT 1237, 0.03 ha of moderate condition CEEC PCT 1237 and 0.03 ha of good condition PCT 1281.
locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	Ancillary features are not located in areas containing habitat for species in high threat status categories but will impact a CEEC in poor and moderate condition and minor trimming to outer branches of a EEC in good condition.	Ancillary features will be located in areas that impact vegetation with high threat status (i.e., CEEC), however the condition of this vegetation community is poor, and following avoidance where practical, only a small amount will be impacted (0.37 ha of BGHF and 0.03 ha of STIF with an additional 0.02 ha indirect impacts to STIF).
providing structures to enable species and genetic material to move across barriers or hostile gaps	Not deemed necessary as connectivity is limited to within the Development site and only applies to those highly mobile avian species, microbats or GHFF.	The mapped local occurrence of PCT 1237 and PCT 1281 is confined to the TAFE grounds. There is no habitat connectivity values within the Development Site to large areas of habitat, except for highly mobile species.
making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the Development Site.	Proponent to protect all remaining vegetation outside of the Development Site footprint.	The proponent will demarcate all areas outside the Development Site boundary to be retained as no go areas to avoid impacts occurring to intact good quality native vegetation within the north western portion of the Lot.

2.1.3 Prescribed biodiversity impacts

The list of potential prescribed biodiversity impacts as per the BAM is provided below:

- Occurrences of karst, caves, crevices and cliffs - none occur within the Development Site
- Occurrences of rock - no rock outcrops or scattered rocks occur within the Development Site
- Occurrences of human made structures and non-native vegetation - as the Development Site is located in a heavily urbanised area and contains human made structures. Consideration was given during literature review to buildings or structures that could potentially be utilised as a roosting resource by microchiropteran bats (microbats). Non-native vegetation was identified and assessed for the potential to provide habitat for threatened flora and fauna species
- Hydrological processes that sustain and interact with the rivers, streams and wetlands - none occur within the Development Site.
- Proposed development for a wind farm and use by species as a flyway or migration route - the project does not involve any wind farm development.

The Development Site has the prescribed biodiversity impacts outlined in Table 17.

Table 17: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the Development Site	Threatened species or ecological communities affected.
Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation	The potential removal of planted native and non-native vegetation may be required within the Development Site.	<i>Pteropus poliocephalus</i> (Grey-headed Flying Fox)

2.1.3.1 Locating a project to avoid and minimise prescribed biodiversity impacts

The development has been located to avoid and minimises prescribed biodiversity impacts as outlined in Table 18.

Table 18: Locating a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating the envelope of surface works to avoid direct impacts on the habitat features	Surface works are to occur primarily within existing infrastructure and road corridors.	Areas of non-native vegetation with lowest biodiversity values will be removed, and PCTs with high integrity has been avoided.

2.1.3.2 Designing a project to avoid and minimise prescribed biodiversity impacts

The development has been designed to avoid and minimise prescribed biodiversity impacts as outlined in Table 19.

Table 19: Designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Design of the project to maintain environmental processes critical to the formation and persistence of habitat features not associated with native vegetation	The Development Site is designed to avoid trees where possible to maintain habitat features	The Development Site has utilised areas not associated with native vegetation where possible.

2.2 Assessment of impacts

2.2.1 Direct impacts

The direct impacts on native vegetation and TECs are outlined in Table 20 and Table 21. The proposed development will result in the removal of all structural layers for vegetation in PCT 1237 with the exception of one small area in the north east corner. In this area decking is proposed and will be placed around the native trees resulting in the trees being retained. Vegetation removal will consist of planted native and exotic shrubs. Impacts to PCT 1281 include the trimming of outer branches of trees along the eastern edge of this patch. The different vegetation clearing treatments are shown in Figure 7 and is summarised in Table 20 and Table 21.

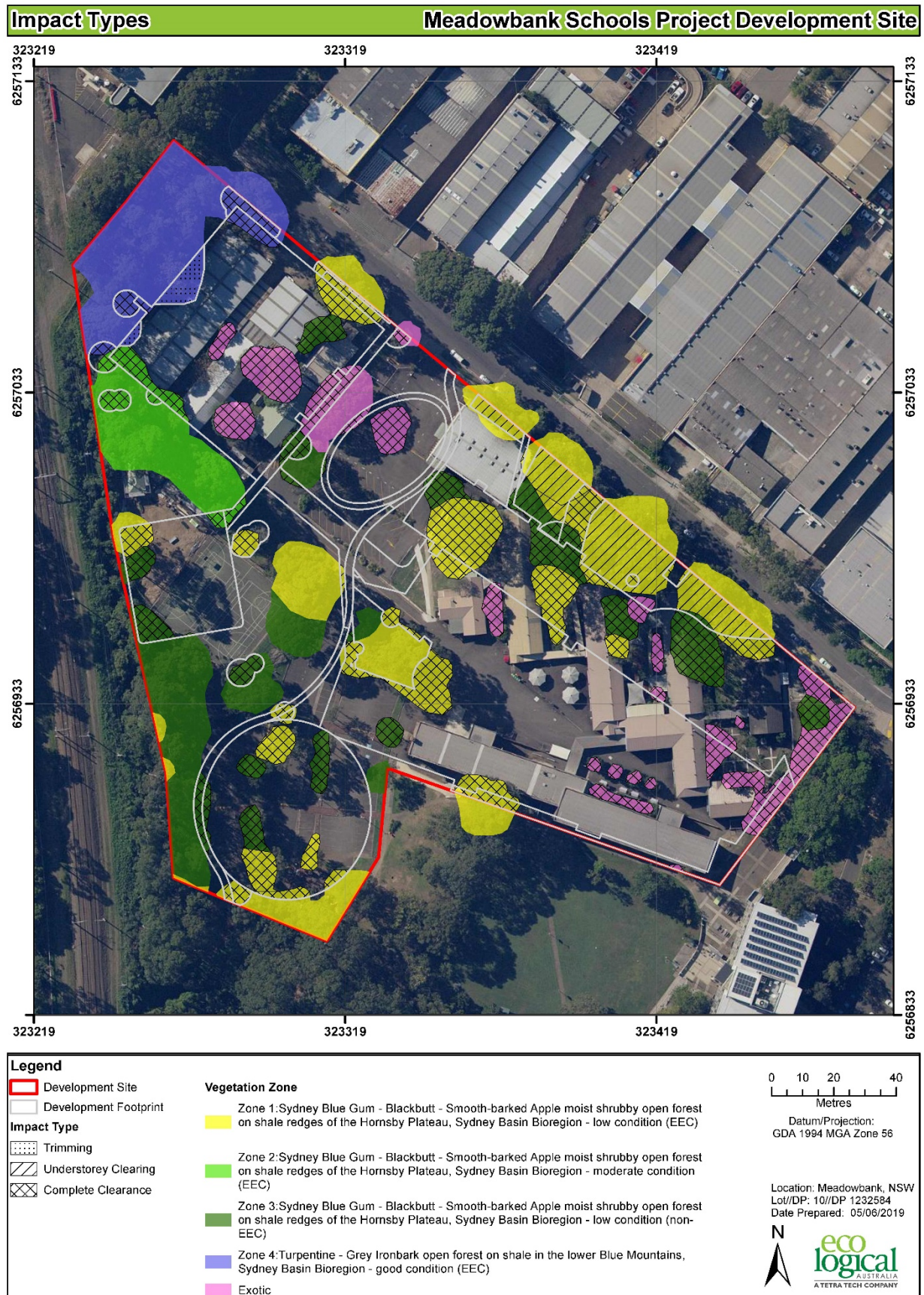


Figure 7: Type of vegetation clearing impacts

Table 20: Direct impacts to native vegetation

PCT ID	Veg zone	PCT Name	Vegetation Class	Vegetation Formation	Direct impact
1237	1	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion – low condition (BGHF)</i>	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.34 ha
1237	2	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion – moderate condition (BGHF)</i>	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.03 ha
1237	3	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion – degraded (not a TEC)</i>	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.19 ha
1281	4	<i>Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (STIF)</i>	Northern Hinterland Sclerophyll Forests	Wet Sclerophyll Forests (Grassy sub-formation)	0.03 ha 0.02 ha**

** Vegetation clearance will be confined to trimming of outer branches and will not change the composition of this PCT

Table 21: Direct impacts on threatened ecological communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
1237	CEEC	Blue Gum High Forest	0.37	CEEC	Blue Gum High Forest in the Sydney Basin Bioregion	N/A
1281	EEC	Sydney Turpentine-Ironbark Forest	0.03 0.02**	CEEC	Sydney Turpentine-Ironbark Forest	N/A

** Vegetation clearance will be confined to trimming of outer branches and will not change the composition of this PCT

2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 22. The future vegetation integrity score of 0 for the 0.59 ha portion of the Development Site reflects the clearing of the native vegetation identified within the Development Site.

Table 22: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Impact (ha)	Area	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	1237	Low	0.34	32.5	0	-32.5	
2	1237	Moderate	0.03	26.9	0	-26.9	
3	1237	Low (non CEEC)	0.19	10.8	0	-10.8	
4	1281	Good	0.03	43.2	0	-43.2	

2.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 23.

Table 23: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during construction works	Downhill (south) from Development Site.	During heavy rainfall or storm events	During rainfall events	Short-term impacts
inadvertent impacts on adjacent habitat or vegetation	Construction	Damage to adjacent habitat or vegetation	Approximately 5-10m from Development Site boundary	Daily, during construction works	Throughout construction period	Short-term impacts
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Short-term impacts
trampling of threatened flora species	Construction / operation	No threatened flora present	N/A	N/A	N/A	N/A
bush rock removal and disturbance	Construction / operation	No bush rock present	N/A	N/A	N/A	N/A
increase in predatory species populations	Construction / operation	Negligible likelihood of impact occurring because only a small degraded area of native vegetation will be removed	N/A	N/A	N/A	N/A
increase in pest animal populations	Construction / operation	Negligible likelihood of impact occurring because only a small degraded area of native vegetation will be removed	N/A	N/A	N/A	N/A

2.2.4 Prescribed biodiversity impacts

The development does not have any prescribed biodiversity impacts.

2.2.5 Mitigating and managing impacts

Measures proposed to minimise impacts at the Development Site before, during and after construction are outlined in Table 24.

Table 24: Measures proposed to minimise impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	Minor	Negligible	One hollow-bearing tree within the study area will be removed. As such, trees should be removed in accordance with best practise methods and a qualified ecologist should be present to supervise the removal of the hollow-bearing tree. In the event that fauna are injured during tree removal works a qualified ecologist/licensed wildlife handler should be contacted.	Relocation of fauna in a sensitive manner	Prior to and during clearing works	Project Manager
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Minor	Minor	All trees within the site to be retained shall be protected prior to and during construction from all activities that may result in detrimental impact by erecting a suitable protective fence beneath the canopy to the full extent of the Tree Protection Zone, excluding the footprint of the proposed works and areas within adjoining properties, as indicated on the Tree Protection Plan.	Habitat trees recorded in trees that will be retained will be clearly marked therefore any fauna utilising habitat within the Development Site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	Prior to and during clearing works	Project Manager
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Negligible	Negligible	If no hollows/hollow trunks/fissures are present and will be removed in the Development Site replacement is not required.	Replacement of habitat features not required	N/A	N/A
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance	Moderate	Minor	All trees within the site to be retained shall be protected prior to and during construction from all activities that may result in detrimental impact by erecting a suitable protective fence beneath the canopy to the full extent of the Tree Protection Zone, excluding the footprint of the proposed works and areas	Vegetation to be retained outside of the Development Site boundary (northern portion of Lot) and	Fencing to be set up prior to any works occurring on site and to remain throughout duration	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			<p>within adjoining properties, as indicated on the Tree Protection Plan.</p> <p>Install No Go fencing prior to construction works on the edge of the Sydney Turpentine-Ironbark Forest in the north west corner of the site to prevent impacts to this vegetation.</p> <p>Fencing and signage will be placed around those areas of vegetation to be maintained to prevent any accidental construction damage and provide a permanent barrier between the Development Site and retained areas</p> <p>The type of fencing during construction may be of a temporary nature and scale that is robust enough to withstand damage during this phase of work</p>	<p>retained vegetation within the Development</p> <p>Site will not be disturbed/impacted</p>	of construction works	
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	<p>Appropriate controls will be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways</p> <p>Ensure all works within proximity to the drainage lines have adequate sediment and erosion controls</p>	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	<p>Timing of construction works should be planned to occur outside of the spring breeding season for microbat species and nesting birds.</p> <p>Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009)</p> <p>Monday to Friday 7.00am to 6.00pm</p> <p>Saturday 8.00am to 1.00pm</p> <p>No work on Sunday or public holidays</p>	Noise impacts associated with the development will be managed in accordance with guidelines	For the duration of construction works	Project Manager
adaptive dust monitoring programs to control air quality	Minor	Negligible	<p>Dust suppression measures will be implemented during construction works to limit dust on site</p> <p>Commence revegetation as soon as practicable to minimise areas likely to create dust</p>	Mitigate dust created during construction activities	For the duration of construction works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	<p>Weeds present within the Development Site listed under the NSW <i>Biosecurity Act 2015</i> and Greater Sydney Regional Strategic Weed Management Plan should be managed. Weeds present include</p> <ol style="list-style-type: none"> 1. <i>Ageratina adenophora</i> (Crofton Weed) 2. <i>Anredera cordifolia</i> (Madeira Vine) 3. <i>Asparagus asparagoides</i> (Bridal Creeper) 4. <i>Cardiospermum grandiflorum</i> (Balloon Vine) 5. <i>Cinnamomum camphora</i> (Camphor Laurel) 6. <i>Ehrharta erecta</i> (Panic Veldtgrass) 7. <i>Eragrostis curvula</i> (African Love Grass) 8. <i>Ligustrum lucidum</i> (Large-leaved Privet) 9. <i>Ochna serrulata</i> (Mickey Mouse Plant) 10. <i>Olea europaea</i> subsp. <i>cuspidata</i> (African Olive) 11. <i>Pennisetum clandestinum</i> (Kikuyu) 12. <i>Phoenix canariensis</i> (Canary Island Date Palm) 13. <i>Rubus</i> sp. (Blackberry) 14. <i>Stenotaphrum secundatum</i> (Buffalo Grass) 15. <i>Tradescantia fluminensis</i> (Wandering Jew) 	Prevent spread of weeds or pathogens	For the duration of construction works	Project Manager
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	<p>All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as:</p> <ol style="list-style-type: none"> 1. Importance of No Go zones 2. Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) 3. What to do in case of environmental emergency (chemical spills, fire, injured fauna) 	All staff entering the Development Site are fully aware of the presence of native vegetation adjacent to the site what to do in case of any environmental emergencies	To occur for all staff entering/working at the Development Site. Site briefings should be updated based on phase of the work and when environmental issues become apparent.	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
4. Key contacts in case of environmental emergency						
development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Minor	Negligible	Temporary fencing to be placed around the perimeter of the Development Site to prevent impacts to adjacent vegetation.	Protect vegetation and habitat adjacent to Development Site.	During operational phase	Client
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Development Site	Minor	Negligible	Landscaping in the Development Site is to use locality derived native species and those found within the PCTs present Retained area in the north west portion of the Lot is to be left untouched.	Areas within the Development Site will be landscaped using appropriate species	Throughout construction and following completion of construction activities	Project Manager

2.2.6 Serious and Irreversible Impacts (SII)

The Development Site contains one Serious and Irreversible Impact (SII) candidate entity identified in Table 25. Detailed consideration of whether impacts on candidate TECs are serious and irreversible is included in Table 26.

Table 25: Candidate Serious and Irreversible Impacts

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)	Threshold
Blue Gum High Forest in the Sydney Basin Bioregion	Blue Gum High Forest in the Sydney Basin Bioregion	Principle 1, 2 and 3	Removal of 0.37 ha	Not yet published
Sydney Turpentine-Ironbark Forest	Sydney Turpentine-Ironbark Forest	Principle 1, 2 and 3	Removal of 0.03 ha and trimming of 0.02 ha	Not yet published

Table 26: Evaluation of an impact on a TEC

Impact Assessment Provisions	Assessment
1. the area and condition of the TEC to be impacted directly and indirectly by the proposed development	The development will remove 0.034 ha of BGHF in a degraded condition with a vegetation integrity score of 26.9, removal of 0.03 ha of BGHF in a moderate condition with a vegetation integrity score of 32.5 and 0.03 ha of STIF in a good condition with a vegetation integrity score of 43.2 in the BAMC. Additionally, approximately 0.02 ha of good condition STIF will be trimmed, however, this is expected to be minimal.
2. the extent and overall condition of the TEC within an area of 1500 metres, and then 5000 metres, surrounding the proposed development footprint. In the case of strategic biodiversity certification projects, the extent and overall condition of the TEC may be assessed across the IBRA sub region	Within the development site 0.34 ha of BGHF and 0.19 ha of STIF will be retained. In addition to what has been mapped within the Development Site, within the Assessment Area there is an estimated 22.15 ha of BGHF and 0.34 ha of STIF (SMCMA, 2016). Within 5,000 metres of the Development Site there is an estimated 92.61 ha of BGHF and 124.21 ha of STIF (SMCMA, 2016). Vegetation that has been mapped as part of this assessment had not previously been mapped and will contribute to the overall amount of this vegetation in the Assessment Area. The condition of vegetation that will remain is in higher condition than the condition of vegetation that will be impacted. Mitigation measures such as measures to reduce the spread of weeds have been recommended.
3. an estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration	Within the Development Site the proposal will reduce the extant area of BGHF by 0.37 ha and 0.03 ha of STIF. Considering the very small area and poor quality of BGHF to be removed, it is considered that the development will have a negligible impact on the extant area and overall condition of the TEC on a broad scale with a loss of 0.76% within 1,500

Impact Assessment Provisions	Assessment
	m of the development site and 0.16% within 5,000 m of the development site.
4. the development proposal's impact on:	
a. abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	The development will not impact abiotic factors critical to the long-term survival of the TECs.
b. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants	The development will not impact characteristic and functionally important species outside of the proposed impact area.
c. the quality and integrity of an occurrence of the 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 TEC	The development has the potential to assist the spread of invasive flora in BGHF and STIF that will be retained within the site and adjacent to the study area. This potential impact will be controlled during the construction phase. The development will not have additional impacts to the quality and integrity of the occurrence of BGHF and/or STIF outside of the proposed impact area.
5. direct or indirect fragmentation and isolation of an area of the TEC	The development will not cause direct or indirect fragmentation or isolation of any area of BGHF or STIF.
6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	In its current form, the proposed development does not contribute to the recovery of these TECs in the IBRA subregion

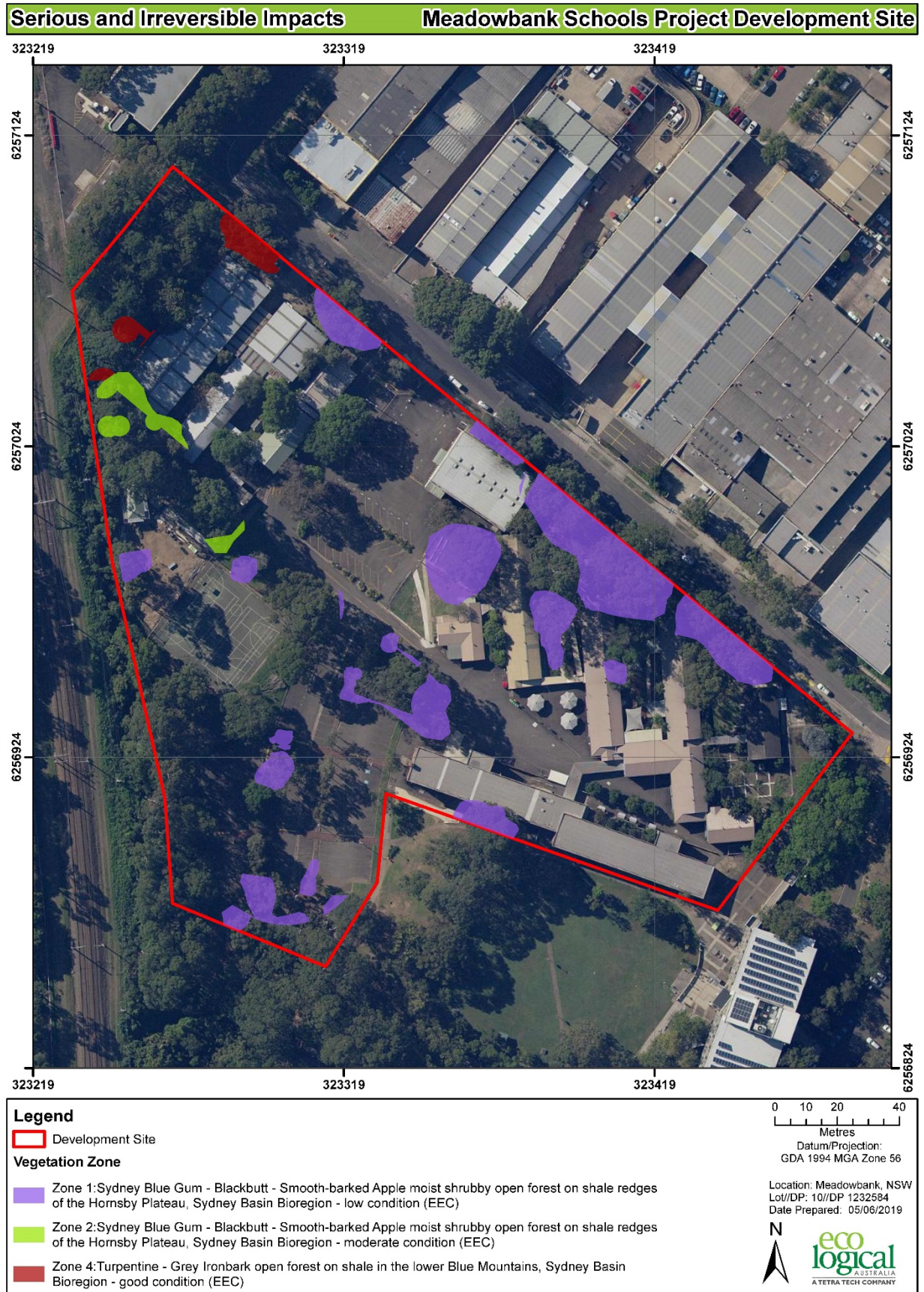


Figure 8: Potential Serious and Irreversible Impacts

2.3 Risk Assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures (Section 2.2.5, Table 24) have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 27, Table 28 and Table 29, respectively, and the risk assessment outcome is presented in Table 30.

Table 27: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 28: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 29: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 30: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
sedimentation and contaminated and/or nutrient rich run-off	Construction	Medium	Low
inadvertent impacts on adjacent habitat or vegetation	Construction	Medium	Low
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Medium	Low
trampling of threatened flora species	Construction	Medium	Low
bush rock removal and disturbance	N/A	N/A	N/A
increase in predatory species populations	Construction and operational	Low	Very Low
increase in pest animal populations	Construction and operational	Low	Very Low

2.4 Adaptive management strategy

This section is required for those impacts that are infrequent, cumulative or difficult to predict. Impacts associated with the proposed development have been considered and addressed in Section 2.2.5 and no further impacts are required to be addressed.

2.5 Impact Summary

2.5.1 Serious and Irreversible Impacts (SAIL)

As discussed in Section 2.2.6, as the thresholds for a SAIL on BGHF and STIF have not yet been published by the OEH, it cannot be determined with certainty if the proposed development will have a SAIL on BGHF or STIF. Considering the degraded nature of BGHF in the Development Site and small area to be removed (0.37 ha) and small area of STIF (0.03 ha), it is unlikely that the development would result in a SAIL. Furthermore, the extent of the impact to STIF will be restricted to the trimming of outer branches of the trees in PCT 1237 and 1281 identified within the Development Site and it is unlikely that it will result in a SAIL.

2.5.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 31 and shown on Figure 9.

Table 31: Impacts to native vegetation that require offset.

PCT ID	Veg Zone	PCT Name	Vegetation Class		Vegetation formation	Direct impact (ha)	Vegetation integrity score
1237	1	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion</i>	North	Coast	Wet Sclerophyll Forests (Shrubby sub-formation)	0.34	32.5
1237	2	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (Moderate condition)</i>	North	Coast	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.03	26.9
1237	3	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (non-CEEC)</i>	North	Coast	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.19	10.8
1281	4	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (Good condition)	Northern	Hinterland	Wet Sclerophyll Forests (Grassy sub-formation)	0.03	43.2

2.5.3 Impacts not requiring offset

Impacts to PCT 1237 in vegetation zone 3 are not required to be offset as the vegetation integrity score is below the offset threshold. The BAM requires an offset to be determined for PCTs where a vegetation zone has a vegetation integrity score ≥ 20 where a PCT is not representative of a TEC (Section 10.3.1 of the BAM). As vegetation zone 3 is not representative of a TEC and has a vegetation integrity score < 20 (Table 31), impacts are not required to be offset, as per Section 10.3.1 of the BAM. The Development Site did not contain any other impacts requiring offset for such as threatened species and threatened species habitat.

It should be noted that with the change in the credit calculator Zone 3 has been assessed as an Critically Endangered Ecological Community (CEEC) where this vegetation is not aligned with the CEEC but was assessed as a EEC in the calculator.

2.5.4 Areas not requiring assessment

Areas that do not require further assessment with the BAM in the Development Site are shown on Figure 11 and include the native vegetation that will be retained within the site, cleared/exotic vegetation and buildings that will be demolished as part of the proposal (Plate 1).

2.5.4.1 Planted vegetation

Vegetation within the Development Site contained planted native trees covering an area of 0.38 ha, which included native species such as *Eucalyptus citriodora*, *Melaleuca armillaris*, *Callitris rhomboidea*,

Callistemon viminalis, *Eucalyptus botryoides*, *Melaleuca quinquenervia*, *Lophostemon confertus*, *Eucalyptus cinerea*, *Eucalyptus nicholii*, *Podocarpus elatus* (Brown Pine) and *Melaleuca styphelioides*. A total of 0.19 ha of will be cleared for the development.

The understorey varied in condition and contained native planted shrubs, mulched garden beds and/or lawn.

Although this vegetation is not consistent with any listed PCT, recent advice provided by the NSW Office of Environment and Heritage (OEH), now requires that planted native vegetation be assigned and assessed against the best-fit PCT (J. Seidel 2018, pers. comm. May). Due to this requirement, plot data was collected and the vegetation was assigned a best-fit PCT based on native/ remnant vegetation identified within the Development Site.

The results of this vegetation assessment were below the vegetation integrity score offset threshold for the assigned best-fit PCT, and therefore a credit offset is not required to be determined. Additionally, the site also contains planted threatened species such as *Eucalyptus nicholii* (Narrow-leaved Peppermint) trees and *Syzygium paniculatum* (Magenta Lilly Pilly) and OEH are yet to release their position on requirements to assess planted threatened species (Kerr 2018, pers comm., 23 April). However, it has been assumed that these species are cultivated individuals, and therefore do not represent a threatened entity.

2.5.4.2 Exotics/Cleared/Built environment

The Development Site contains buildings that will be demolished as part of the works for the construction of open active and passive recreation areas. The Development site also contains cleared areas such as footpaths, carparks and mown/managed areas. Planted exotic vegetation was also identified within the Development Site (3.3 ha) which contained planted non-native species such as *Jacaranda mimosifolia* (Jacaranda), *Fraxinus* sp., *Prunus cerasifera* (Cherry Plum), *Morus* sp. and *Ulmus parvifolia* (Chinese Elm). Dominant groundcover species present include *Eragrostis curvula* (African Love Grass), *Pennisetum clandestinum* (Kikuyu), *Conyza bonariensis* (Fleabane) and *Asparagus asparagoides* (Bridal Creeper). This vegetation is exotic and is not consistent with any listed PCT.



Plate 1: Planted exotic vegetation within the Development Site.

2.5.5 Credit summary

A summary of the credit report generated by the BAMC is outlined in Table 32. No candidate species credit species or likely habitat was recorded within the Development Site; hence no species credits are required to offset the development. The full biodiversity credit report exported from the BAMC is included in Appendix D.

Table 32: Ecosystem credits required

PCT ID	Veg Zone	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
1237	1	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (Low condition)</i>	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.34	7
1237	2	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (Moderate condition)</i>	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.03	1
1237	3	<i>Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion (non-EEC)</i>	Wet Sclerophyll Forests (Shrubby Sub-formation)	0.19	0
1281	4	<i>Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (Good condition)</i>	Wet Sclerophyll Forests (Grassy sub-formation)	0.03	1

2.6 Offset options

There are a number of options that can be utilised to offset the required ecosystem credits. These include retiring matching biodiversity credits either through establishing a Biodiversity Stewardship Agreement (offset) on land owned by The Department of Education, through purchasing matching credits on the open market, making a payment to the Biodiversity Conservation Trust or funding biodiversity actions for individual species or communities. However, this last option has some limitations. Due to the small scale of the project, and lack of suitable offset land owned by the proponent, it is likely that making a payment to the Biodiversity Conservation Trust will be the easiest option to retire credits for this redevelopment.

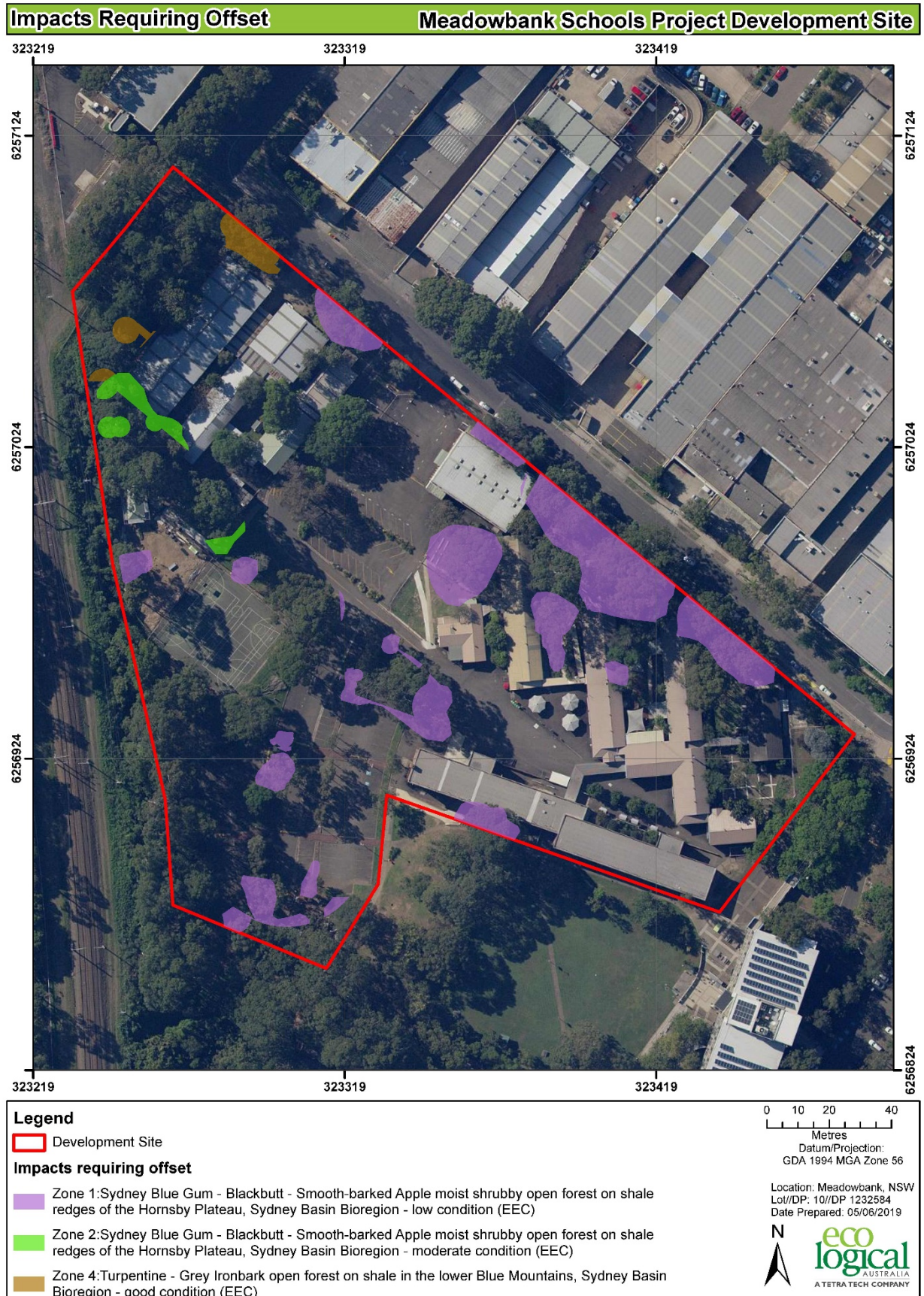


Figure 9: Impacts requiring offset



Figure 10: Impacts not requiring offsets

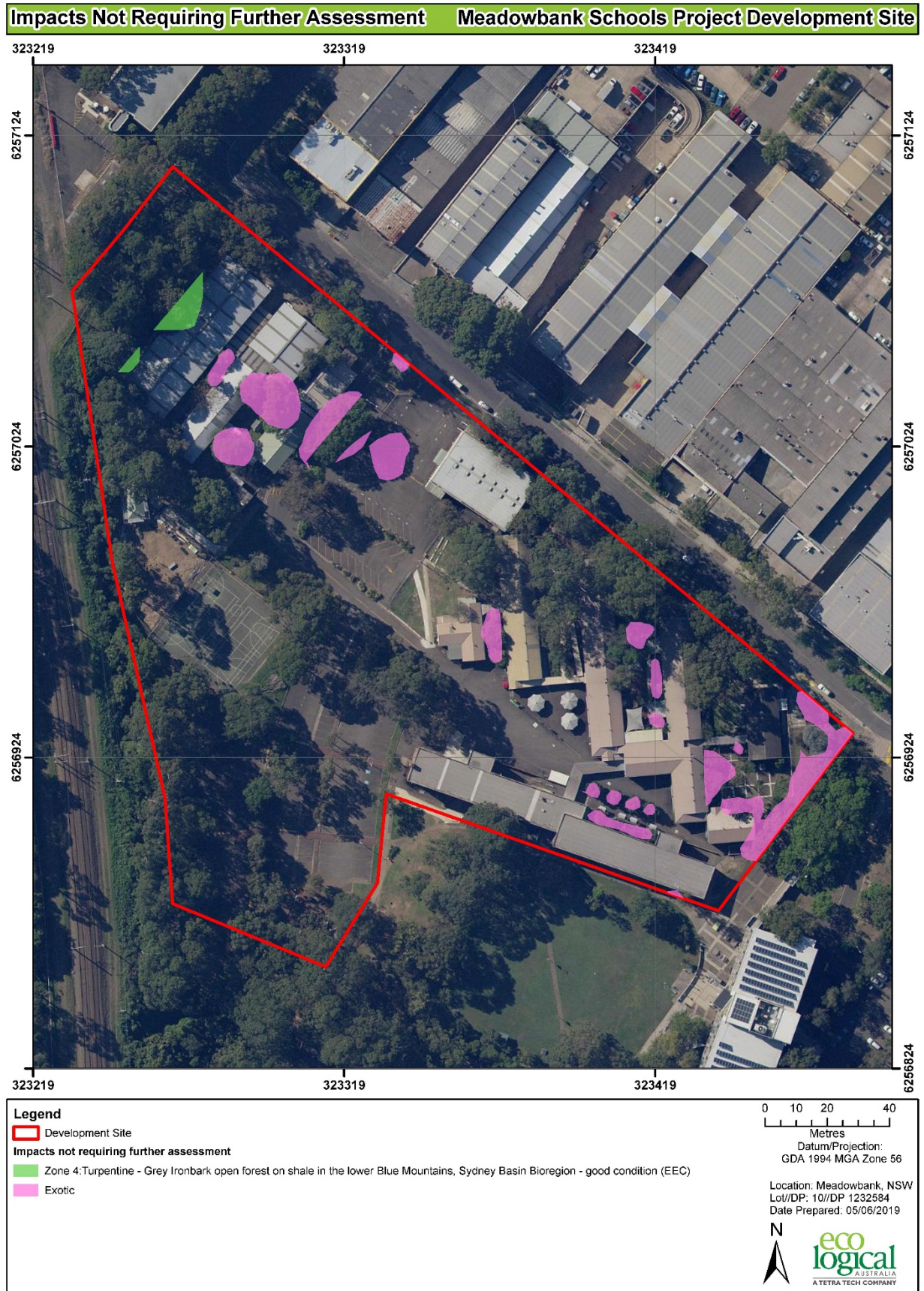


Figure 11: Areas not requiring assessment

3. References

Bureau of Meteorology 2018. Sydney Olympic Park, New South Wales July 2018 Daily Weather Observations. Available: <http://www.bom.gov.au/climate/dwo/IDCJDW2061.latest.shtml>

Chapman, G. A. and Murphy, C. L. 1989. Soil Landscapes of the Sydney 1:100 000 Sheet. Soil Conservation Service of NSW, Sydney.

Cropper, S.C. 1993. Management of Endangered Plants. CSIRO Australia, Melbourne.

Department of Environment and Climate Change. 2002, 'Descriptions for NSW (Mitchell) Landscapes Version 2'. Sourced 17 July 2018 from:

<http://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf>

Department of Environment and Conservation, 2004, Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW.

Department of Environment, Climate Change and Water NSW (DECCW) 2009. Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus*. Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney.

Department of the Environment and Energy (DoEE) 2018. National Flying-fox monitoring viewer. Australian Government. Available: <http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf> (Accessed: 24 July 2018)

Department of the Environment and Energy (DoEE) 2018a. Protected Matters Search Tool [online]. Available: <http://www.environment.gov.au/epbc/protect/index.html> (Accessed: July 2018).

Department of the Environment and Energy (DoEE) 2018b. Species Profile and Threats Database. Available <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>.

Naylor, S.D., Chapman, G.A., Atkinson, G., Murphy, C.L., Tulau, M.J., Flewin, T.C., Milford, H.B., Morand, D.Y. 1998. Guidelines for the Use of Acid Sulfate Soil Risk Maps, 2nd ed., Department of Land and Water Conservation, Sydney 1998

Land and Property Information. 2015, 'SIX maps aerial imagery'.

NSW Department of Finance, Services & Innovation 2017. Public NSW Imagery.

Office of Environment and Heritage, 2011. 'Blue Gum High Forest in the Sydney Basin Bioregion - critically endangered ecological community listing'. Sourced 14 July 2018 from: <http://www.environment.nsw.gov.au/determinations/BlueGumHighForestEndSpListing.htm>

Office of Environment and Heritage 2016. NSW Guide of Surveying Threatened Plants. Available: <http://www.environment.nsw.gov.au/resources/threatenedspecies/160129-threatened-plants-survey-guide.pdf>

Office of Environment and Heritage 2016. The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0. NSW Office of Environment and Heritage, Sydney.

Office of Environment and Heritage (OEH) 2018b. Threatened Species Profiles. Available: <http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?>

Office of Environment and Heritage (OEH). 2018. Threatened Species Database (5 km radius search). OEH Sydney, NSW. (Data viewed July 2018).

PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney. <http://plantnet.rbgsyd.nsw.gov.au> [Date accessed: 12 July 2018]

Appendix A: Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
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.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
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.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
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 minimum 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.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
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).
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
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 development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next

Terminology	Definition
	area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
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.
Remaining 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 purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
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
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.
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 development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
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.
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.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
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
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B: Vegetation plot data

Table 33: Species matrix (species recorded by plot)

Stratum	Form	Species name	Common name	Exotic	High Threat Weed	Plot 1		Plot2		Plot 3		Plot 4	
						Cover (%)	Abundance	Cover (%)	Abundance	Cover (%)	Abundance	Cover (%)	Abundance
Mid		<i>Agapanthus</i> sp.		Y								0.1	2
Mid		<i>Ageratina adenophora</i>	Crofton Weed	Y	Y							0.1	1
Upper	TG	<i>Angophora bakeri</i>	Narrow-leaved Ironbark					3	3				
Upper	TG	<i>Angophora costata</i>	Sydney Red Gum									10	3
Ground		<i>Anredera cordifolia</i>	Madeira Vine	Y	Y	1	10						
Ground		<i>Asparagus aethiopicus</i>	Ground Asparagus	Y	Y	0.2	5	1	40			1	25
		<i>Bidens pilosa</i>	Cobbler Pegs	Y								0.5	20
Mid	SG	<i>Breynia oblongifolia</i>	Coffee Bush									0.2	12
Mid	SG	<i>Bursaria spinosa</i>	Native Blackthorn									2	10
Upper	TG	<i>Callitris rhomboidea</i>	Port Jackson Pine					2	1				
Upper	TG	<i>Callistemon viminalis</i>	Weeping Bottlebrush			3	3						
Ground		<i>Cardiospermum grandiflorum</i>	Balloon Vine	Y	Y	0.1	5						
Mid	TG	<i>Casuarina glauca</i>	Swamp Oak			3	2	4	20				
Mid	OG	<i>Cayratia clematidea</i>	Native Grape									0.2	4
Mid	TG	<i>Ceratopetalum gummiferum</i>	Christmas Bush					2	1				
Mid		<i>Cinnamomum camphora</i>	Camphor Laurel	Y	Y	2	8					0.1	1
Ground	FG	<i>Commelina cyanea</i>										0.1	10

Stratum	Form	Species name	Common name	Exotic	High Threat Weed	Plot 1	Plot2	Plot 3	Plot 4
Ground		<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Y		0.1	3		
Ground	FG	<i>Cotula australis</i>	Common Cotula					2	100
Ground	GG	<i>Cynodon dactylon</i>	Couch			0.1	5	0.1	5
Ground	GG	<i>Cyperus gracilis</i>	Slender Flat-sedge					2	100
Ground	FG	<i>Dianella</i> sp.					0.2	5	0.1
Ground	FG	<i>Dichondra repens</i>	Kidney Weed			0.1	20	1	20
Ground		<i>Ehrharta erecta</i>	Panic Veldtgrass	Y	Y	2	100	2	50
Ground	GG	<i>Entolasia</i> sp.							1
Ground		<i>Eragrostis curvula</i>	African Lovegrass	Y	Y		0.5	10	
Upper	TG	<i>Eucalyptus acmenoides</i>	White Mahogany						1
Upper	TG	<i>Eucalyptus botryoides</i>	Bangalay					20	1
Upper	TG	<i>Eucalyptus paniculata</i>	Grey Ironbark				3	1	
Upper	TG	<i>Eucalyptus pilularis</i>	Blackbutt				30	3	
Upper	TG	<i>Eucalyptus saligna</i>	Blue Gum			40	8	2	1
Mid	TG	<i>Ficus rubiginosa</i>	Port Jackson Fig			1	1		
Ground	OG	<i>Glycine tabacina</i>							0.5
Ground		<i>Hypochaeris radicata</i>	Catsear	Y		0.1	5	0.2	20
Ground	GG	<i>Imperata cylindrica</i>	Blady Grass						2
Mid		<i>Ipomoea purpurea</i>	Common Morning Glory			0.5	5		
Ground		<i>Lantana camara</i>	Lantana			0.2	4		0.2
Ground	GG	<i>Lepidosperma laterale</i>							0.2
Mid	SG	<i>Leucopogon juniperinus</i>	Prickly Beard-heath						2
Mid		<i>Ligustrum lucidum</i>	Large-leaved Privet	Y	Y	1	1		0.2

Stratum	Form	Species name	Common name	Exotic	High Threat Weed	Plot 1	Plot2	Plot 3	Plot 4
Ground	GG	<i>Lomandra longifolia</i>	Spiny-headed mat-rush						2 20
Mid	TG	<i>Melaleuca armillaris</i>	Bracelet Honey-myrtle					3 1	
Ground	GG	<i>Microlaena stipoides</i>	Weeping Grass			0.5 10		5 20	10 100
Mid		<i>Nerium oleander</i>	Oleander	Y			1 1		
Mid		<i>Ochna serrulata</i>	Mickey Mouse Plant	Y	Y				0.1 1
Mid		<i>Olea europaea subsp. cuspidata</i>	African Olive	Y	Y				0.1 2
Ground		<i>Oxalis pes-copre</i>		Y					0.2 20
Mid	SG	<i>Pittosporum undulatum</i>	Sweet Pittosporum			3 2			5 2
Mid		<i>Phoenix canariensis</i>	Canary Island Date Palm	Y	Y	1 1	0.1 1		
Ground		<i>Plantago lanceolata</i>	Plantain	Y					0.1 10
Ground		<i>Poa annua</i>	Winter Grass	Y		1 1		30 100	
Mid	FG	<i>Pteridium esculentum</i>	Common Bracken						0.2 10
Ground		<i>Rubus</i> sp.		Y	Y				0.1 1
Ground		<i>Setaria</i> sp.		Y					0.1 5
Ground		<i>Sida rhombifolia</i>		Y				10 100	0.1 4
Mid		<i>Solanum</i> sp.		Y		0.1 3			
Ground		<i>Stellaria media</i>	Common Chickweed	Y				0.1 10	
Ground		<i>Stenotaphrum secundatum</i>	Buffalo Grass	Y	Y	0.1 1	2 50		0.3 10
Upper	TG	<i>Syncarpia glomulifera</i>	Turpentine						15 11
Mid	SG	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly			6 6			
Mid	SG	<i>Syzygium</i> sp.					2 15		
Ground		<i>Tradescantia fluminensis</i>	Wandering Jew	Y	Y	1 10			
Ground		<i>Trifolium repens</i>	White Clover	Y				0.1 10	

Tree (TG), Shrub (SG), Grass & Grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Table 34: Vegetation integrity data (Composition, Structure and function)

Plot location data					
Plot no.	PCT	Condition	Eastings	Northings	Bearing
1	1237	Moderate	323242	6257025	120° SE
2	1237	Low	323423	6256979	300° NW
3	1237	Low	323288	6256937	20° NNE
4	1281	Good	323273	6257098	220° SW

Composition (number of species)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	4	2	2	1	0	0
2	7	1	0	1	0	0
3	1	1	3	2	0	0
4	4	4	6	2	1	2

Structure (Total cover)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	47	9	0.6	0.1	0	0
2	46	2	0	0.2	0	0
3	20	3	7.1	3	0	0
4	41	9.2	17.2	0.2	0.2	0.7

Function												
Plot no.	Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree Stem 5- 9	Tree Stem 10-1 9	Tree Stem 20-2 9	Tree Stem 30-49	Tree Stem 50-79	Tree Stem 80+	Tree Regen	High Threat Weed Cover
1	0	0	51.2	0	1	1	1	1	7	0	0	9.1
2	4	0	60.6	0	1	1	1	1	0	4	0	5.6
3	0	0	6.6	2	0	0	0	1	1	0	0	5
4	0	0	84	14	1	1	1	1	2	0	1	2.6

Appendix C: Plot photos



Plate 2: Plot 1 transect start



Plate 3: Plot 1 transect end



Plate 4: Plot 2 transect start



Plate 5: Plot 2 transect end



Plate 6: Plot 3 transect start



Plate 7: Plot 3 transect end



Plate 8: Plot 4 transect start



Plate 9: Plot 4 transect end

Appendix D: Biodiversity credit report



BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00011603/BAAS18077/19/00011604	10784 - Meadowbank Education Precinct Schools	03/06/2019
Assessor Name	Report Created	BAM Data version *
Nicole McVicar	07/06/2019	9
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS18077		
Revision No		
3		

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion								
1	1237_Low_EEC	32.5	0.3	0.25	High Sensitivity to Potential Gain	2.50	TRUE	7



BAM Credit Summary Report

2	1237_Moderate_E EC	26.9	0.0	0.25	High Sensitivity to Potential Gain	2.50	TRUE	1
3	1237_Low	10.8	0.2	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0
							Subtotal	8
Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion								
4	1281_Good	43.2	0.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
							Subtotal	1
							Total	9

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAIL	Species credits
----------------------	------------------------	-----------------------------	----------	-----------------------------	----------------	-----------------

