Biodiversity Development Assessment Report

Proposed Ancillary Works at Narrabeen North Public School in a Mapped Coastal Wetland Area

6 Namona Street, North Narrabeen

NSW 2101

2 February 2023

Disclaimer

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Document Control

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Draft 1.0	Biodiversity Development Assessment Report Upgrade of School Facilities 6 Namona Street, Narrabeen NSW 2101	12/12/2022	Internal review
Draft 1.1	Biodiversity Development Assessment Report Upgrade of School Facilities 6 Namona Street, Narrabeen NSW 2101	24/01/2023	First draft to client
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Final 1.0	Biodiversity Development Assessment Report Upgrade of School Facilities 6 Namona Street, Narrabeen NSW 2101	02/02/2023	Final version to client

Executive Summary

Land Eco Consulting (Land Eco) was commissioned by ADE Consulting Group on behalf of the School Infrastructure NSW ('the proponent') to prepare this Biodiversity Development Assessment Report (BDAR) for the proposed ancillary works within the Coastal Wetland Area at Narrabeen North Public School (6 Namona Street, North Narrabeen; Lot 3/-/DP1018621) (the 'Subject Property'). The extent of the development is referred to as 'The Subject Land'.

The Subject Property is a public school that occurs in the Northern Beaches local government area of Sydney approximately 1km from the coast. The landholding is dominated by existing school infrastructures including buildings, playgrounds and sports ovals, as well as a mixture of mature native and exotic vegetation. The development assessed under this designated Development Application (DA) involves:

- Removal of eight (8) trees;
- New accessible pedestrian pathways;
- New substation on Namona Street frontage along with associated conduit connections;
- New fire hydrant booster and associated conduit connections; and
- New hard and soft landscaping including planting of twelve (12) new trees.

The proposed development is a designated development application and is subject to approval by the Northern Beaches Council (Council) under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The proposed development is declared to be a designated development pursuant to Section2.7 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) as it comprises a development on land identified as 'Coastal Wetlands'. The proponent has commissioned this Biodiversity Development Assessment Report (BDAR) to accompany the proposal and address the requirements of the NSW Biodiversity Offset Scheme (BOS) and requires submission of a streamlined 'Small Areas' BDAR as stipulated under the *Biodiversity Conservation Act 2016* and in accordance with the Biodiversity Assessment Method (BAM). The BDAR is required to be undertaken by an accredited assessor to assess the impacts of the proposal.

The proposed development has been designed to avoid and minimise impacts on biodiversity values in keeping with the purposeful use of the Subject Land. This has been accomplished by limiting the removal of trees to the minimum required for the proposed development, utilising sensitive excavation methods under the supervision of an AQF Level 5 Arborist and avoiding the removal of hollow-bearing trees.

One plant community type (PCT) occurs within the Subject Land and will be impacted by the proposed development:

- PCT 1793 - Coastal Sand Bangalay Forest. Note the associated Threatened Ecological Community is *Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (Bangalay Sand Forest) Endangered Ecological Community* listed under Schedule 2 of the *Biodiversity Conservation Act 2016*)

5 Ecosystem Credits are required to be retired to offset the biodiversity impacts of the proposed development.

No threatened species were recorded on the Subject Property by Land Eco.

16 Species Credits are required to be retired to offset the biodiversity impacts of the proposal:

- 8 credits for the Large-eared Pied Bat (*Chalinolobus dwyeri*)
- 8 credits for the Eastern Cave Bat (*Vespadelus troughtoni*)

Impacts will be limited to the removal of 0.17 ha of native vegetation including up to eight (8) trees (Independent Arboricultural Services 2022). No hollow-bearing trees are proposed for removal. Minor indirect impacts to vegetation being retained are unlikely to increase baseline conditions. There will be no Serious and Irreversible Impacts as a result of the proposed development.

In addition to offsetting, the *Biodiversity Conservation Act 2016* and its regulations requires that an applicant takes all reasonable effort to avoid and minimise potential impacts of the proposal on local biodiversity values. A series of mitigation and management measures have been identified, which are to be implemented as part of any construction environmental management plan produced for the site. These include measures to:

- Ensure all contractors employed to work within the Subject Land are suitably qualified, experienced and informed of the sensitive ecological features and potentially occurring threatened species;

- Assign a Project Ecologist to conduct and oversee all ecological compliance requirements associated with conducting a proposed development in line with all relevant state and commonwealth legislation and guidelines;
- Have an ecologist present during the clearing of threatened species habitat required for the proposed activity;
- Incorporate locally indigenous flora species in soft landscaping associated with the development;
- Implement vertebrate pest control during construction and operation of the development;
- Implement all relevant biological hygiene protocols and requirements as per NSW Government guidelines;
- Implement ongoing management of priority weeds according to statutory requirements; and
- Implement appropriate sound barriers, vegetation protection fencing, stockpiling and sediment control during construction.

The proponent is required to retire biodiversity offset credits in order to meet their obligations to offset the residual impacts of the proposed designated DA. The proponent may purchase and retire the appropriate biodiversity offset credits from Biodiversity Stewardship Sites that comply with the trading rules of the BOS in accordance with the 'like for like' report generated by the Biodiversity Assessment Method Calculator.

Table 1. Impacts that require an offset - ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area	Number of ecosystem credits required
Mature Canopy	PCT 1793 - Coastal Sand Bangalay Forest	Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (Bangalay Sand Forest) Endangered Ecological Community (EEC) listed under Schedule 2 of the Biodiversity Conservation Act 2016	0.17 ha	5

Table 2. Impacts that require an offset - species credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
Large-eared Pied Bat	*Chalinolobus dwyeri*	0.17 ha	8
Eastern Cave Bat	*Vespadelus troughtoni*	0.17 ha	8

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Acronym/ Term	Definition
BAM	New South Wales Biodiversity Assessment Method 2020 as published by the NSW Department of Planning, Industry and Environment and has been in effect since 22 October 2020.
BOS	New South Wales Biodiversity Offset Scheme
BOSET	New South Wales Biodiversity Offset Scheme Entry Tool
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
Council	Northern Beaches Council
DA	Development Application pursuant to section 4 of the NSW Environmental Planning and Assessment Act 1979
DCP	Development Control Plan
Development	The use of land, and the subdivision of land, and the carrying out of a work, and the demolition of a building or work, and the erection of a building, and any other act, matter or thing referred to in section 26 that is controlled by an environmental planning instrument but does not include any development of a class or description prescribed by the regulations for the purposes of this definition (Environmental Planning and Assessment Act 1979).
DPIE	Department of Planning Industry and Environment
EEC	Endangered Ecological Community
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EP&A Act	NSW Environmental Planning and Assessment Act 1979
ha	Hectares
km	Kilometre
KTP	Key Threatening Process (as listed in the BC Act)
LEP	Local Environment Plan
LGA	Local Government Area
Locality	The area within a 10km radius of the Subject Land. The same meaning when describing a local population of a species or local occurrence of an ecological community.
M	Metres
mm	Millimetres
NPWS	NSW National Parks and Wildlife Services
NSW	New South Wales
OEH	Office of Environment and Heritage (now the Department of Planning Industry and Environment)
Proposal	The development, activity or action proposed.
ROTAP	Rare or Threatened Australian Plants
R&H SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP	State Environmental Planning Policy
SSD	State Significant Development
Subject Land	Development footprint along the frontage at 6 Nomona St, North Narrabeen, NSW 2101
Subject Property	Narrabeen North Public School (6 Namona Street, North Narrabeen; Lot 3/-/DP1018621)
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 and *threatened species, population or ecological community* means a species, population or ecological community specified in any of those Schedules.

Declarations

i. Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the Biodiversity Conservation Act 2016 (BC Act).

Signature: 

Date: 02/02/2023

BAM Assessor Accreditation no: #BAAS18059

This BDAR has been prepared to meet the requirements of BAM 2020.

ii. Details and experience of author/s and contributors

Land Eco Authors and Contributors

Name	BAM Assessor Accreditation no.	Position/Company	Tasks Performed	Relevant Qualifications
Kurtis Lindsay	#BAAS18059	Principal Ecologist/Land Eco Consulting	Document Review Flora Identification	*BSc (Hons)*
Semonn Oleksyn		Project Manager Ecologist/ Land Eco Consulting	Site Assessment Report Preparation BAM-C Data entry and analysis Figure Preparation	*BAdvSci* *MRes*
Serene White		Junior Ecologist/ Land Eco Consulting	Site Assessment	*BSc* *BNatSc* *MRes*
Isaac Mammott		Botanist/ Sclerophyll Flora Surveys and Research Pty Ltd	Flora survey BAM VIS Plots	*BSc BA*

Stage 1: Biodiversity Assessment

1. Introduction

1.1 Proposed Development

1.1.1 Development Overview

Land Eco Consulting (Land Eco) was commissioned by ADE Consulting Group on behalf of the School Infrastructure NSW ('the proponent') to prepare this Biodiversity Development Assessment Report (BDAR) for the proposed upgrade of school facilities in the mapped Coastal Wetlands area at Narrabeen North Public School (6 Namona Street, North Narrabeen; Lot 3//DP1018621) (the 'Subject Property'). The extent of the proposed development is referred to as 'The Subject Land'.

The Subject Property is a public school that occurs in the Northern Beaches local government area of Sydney approximately 1km from the coast. The landholding is dominated by existing school infrastructures including buildings, playgrounds and sports ovals, as well as a mixture of mature native and exotic vegetation. The development assessed under this esignated Development Application (DA) involves:

- Removal of eight (8) trees;
- New accessible pedestrian pathways;
- New substation on Namona Street frontage along with associated conduit connections;
- New fire hydrant booster and associated conduit connections; and
- New hard and soft landscaping including planting of twelve (12) new trees.

The proposed development is a designated development application and is subject to approval by the Northern Beaches Council (Council) under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The proposed development is declared to be a designated development pursuant to Section2.7 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) as it comprises a development on land identified as 'Coastal Wetlands'. The proponent has commissioned this Biodiversity Development Assessment Report (BDAR) to accompany the proposal and address the requirements of the NSW Biodiversity Offset Scheme (BOS) and requires submission of a streamlined 'Small Areas' BDAR as stipulated under the *Biodiversity Conservation Act 2016* and in accordance with the Biodiversity Assessment Method (BAM). The BDAR is required to be undertaken by an accredited assessor to assess the impacts of the proposal.

Land Eco have produced this report to assess any potential impacts associated with the proposed development and recommend appropriate measures to mitigate any potential ecological impacts in line with the requirements of the Consent Authority, Northern Beaches Council.

1.1.2 Location

The Subject Property is a public school that occurs in the Northern Beaches local government area of Sydney approximately 1km from the coast. This BDAR relates solely to the development footprint within the mapped Coastal Wetlands area, hereafter referred to as the 'Subject Land'. The Subject Land occupies all of the Subject Property along the frontage at 6 Namona Street, North Narrabeen (**Figure 2**).

1.1.3 Proposed Development and the Subject Land

The proposed development application is deemed a Designated Development as a result of proposed impacts to the Coastal Wetland mapped within the Subject Land under R&H SEPP (**Figure 4**).

The extent of the Designated Development ('the Subject Land') is 4202m^2 (0.42 ha) (**Figure 3**). This includes 688m^2 (0.07 ha) of existing schooling infrastructure and 3514m^2 (0.35 ha) of native vegetation.

The area of native vegetation proposed for clearing is 1721m^2 (0.17 ha) including 245m^2 (0.02 ha) of overhanging tree canopy (**Figure 3**). It is important to note that native vegetation clearing will only occur over part (33%) of the Subject Land.

The Designated Development (DD) seeks consent for the following works at NNPS:

- Removal of eight (8) trees;
- New accessible pedestrian pathways;
- New substation on Namona Street frontage along with associated conduit connections;
- New fire hydrant booster and associated conduit connections; and
- New hard and soft landscaping including planting of twelve (12) new trees.

1.1.4 Other documentation

Other documentation relevant to biodiversity to be submitted with the proposed development include:

- Proposed ancillary works at Narrabeen North Public School in a mapped Coastal Wetlands Area – Ecological Assessment (ADE Consulting Group 2022)
- BAM Field Survey Forms (Isaac Mammott 2022)
- Arboricultural Impact Assessment (Independent Arboricultural Services 2022).
- Landscape Plan (Design Inc 2022)
- Narrabeen North Public School Aquatic Ecology Assessment (ADE Consulting Group 2023)

1.2 Biodiversity Offset Scheme Entry

The proposed development is a designated development application and is subject to approval by Council under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proponent has commissioned this Biodiversity Development Assessment Report (BDAR) to accompany the proposal and address the requirements of the NSW Biodiversity Offset Scheme (BOS) and requires submission of a streamlined 'Small Areas' BDAR as stipulated under the *Biodiversity Conservation Act 2016* (BC Act) and in accordance with the Biodiversity Assessment Method (BAM). The BDAR is required to be undertaken by an accredited assessor to assess the impacts of the proposal.

1.2.1 Area Clearing Threshold

The BC Act and its regulations stipulate the native vegetation clearing 'area threshold' values that determine whether a development is required to be assessed in accordance with the 'Biodiversity Offset Scheme' (BOS). Minimum entry thresholds for native vegetation clearing depend on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan [LEP]), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP). The term 'vegetation clearing' includes all lopping, felling, slashing, or mowing of native trees, shrubs, or groundcover for the purpose of construction, landscaping, excavation or bushfire Asset Protection Zone (APZ) works.

Developments that trigger the BOS will require a BDAR (this report) that addresses the BAM and the retiring of Biodiversity Offset Credits.

There is no minimum lot size prescribed by the Pittwater Local Environmental Plan 2014 to the Subject Property. The actual lot size is approximately 2.378 ha. This means the 'native vegetation clearing threshold' trigger for this BOS is 0.5 ha (**Table 3**). As 0.17 ha of native vegetation is proposed for removal, this is not a trigger for the BOS.

Table 3. Biodiversity Offset Scheme Entry Thresholds

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	**0.25 ha or more**
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

1.2.2 Biodiversity Value Mapping

At the time of preparing this report, the proposed development will require the removal of native vegetation from land mapped purple under the Biodiversity Values Map associated with a mapped Coastal Wetland under the R&H SEPP (**Figure 1**) (DPIE 2022a). Therefore, this is a trigger for the BOS.

Figure 1. Biodiversity Values Mapping (DPIE 2022a) in relation to the Subject Land

1.3 Excluded Impacts

1.3.1 Native Vegetation Regulatory Map

The entirety of the Subject Property is mapped as 'Land excluded from the LLS Act' by the Native Vegetation Regulatory Map (NSW DPIE 2022f). Therefore, *Chapter 2 Vegetation in non-rural areas of the State Environmental Planning Policy (Biodiversity and Conservation) 2021* applies to this development.

1.4 Matters of National Environmental Significance

One Matter of National Significance was assumed present within the Subject Land:

- *Chalinolobus dwyeri* Large-eared Pied Bat – EPBC listed: Vulnerable

An EPBC Assessment of Significance was undertaken for this species. It is considered unlikely that the proposed development will significantly impact this species (**Appendix C**). A referral to the Commonwealth is not recommended for the proposed development to proceed.

1.5 Information Sources

A detailed list of all sources utilised in the preparation of this BDAR is presented in the 'References' (**Section 13**) of this report.

Figure 2. The location of the Subject Property and BAM Plot sampled by Isaac Mammott in June 2022

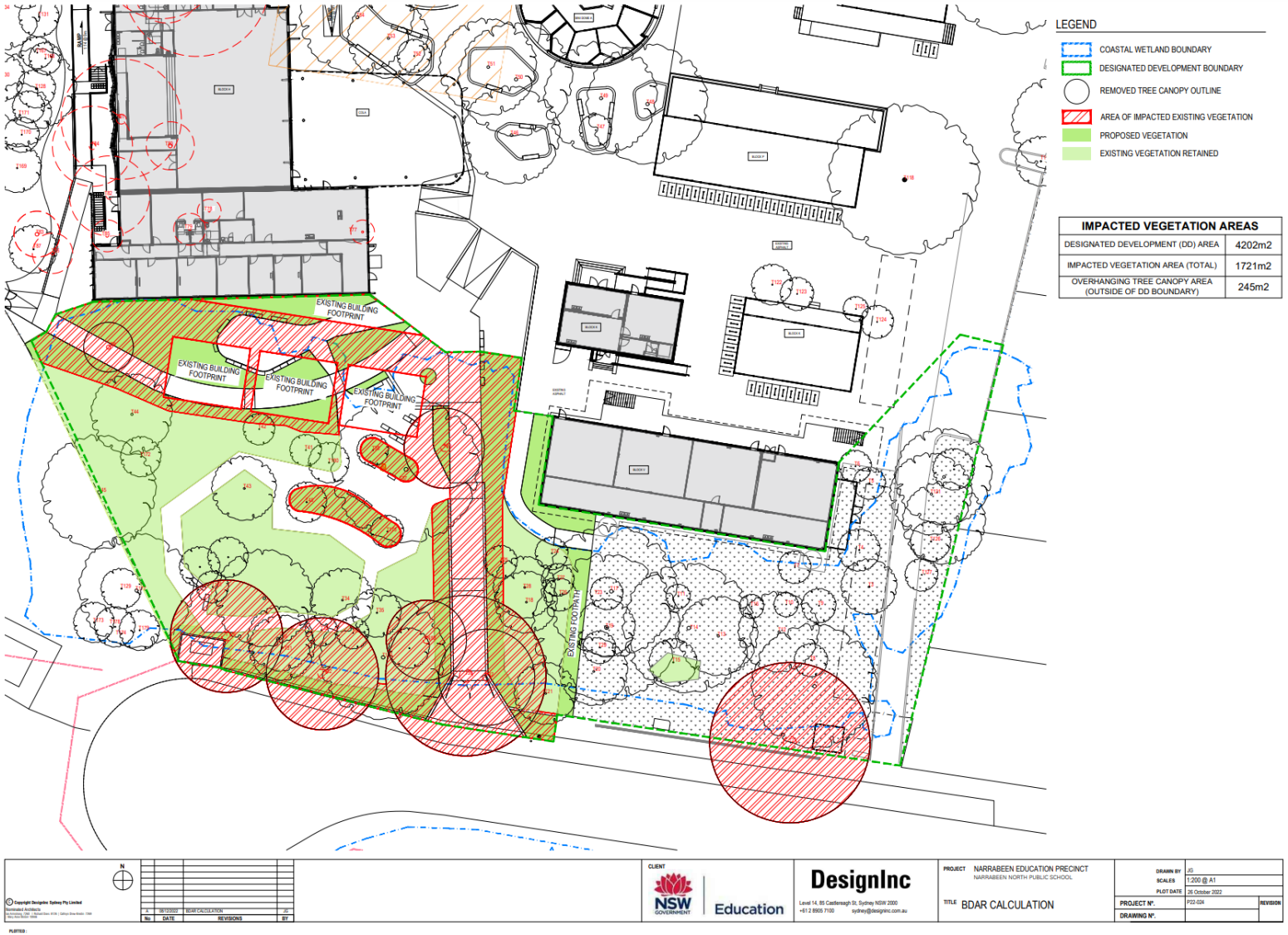

Figure 3. Proposed development plan (ADE Consulting Group 2022)

2. Method

2.1 Site Context Methods

2.1.1 Landscape Features

The Subject Property is a public school that is dominated by existing school infrastructures including buildings, playgrounds and sports ovals, as well as a mixture of mature native and exotic vegetation. The Subject Land contains highly productive habitat with mature Banksias, Eucalypts and other fruiting vegetation over a weed-infested native understorey providing habitat to a high density of locally common birds. This vegetation also contains hollow-bearing trees and stags. Nearby buildings are well-maintained and do not contain large open crevices or other habitat highly suitable for roosting microbats.

This section details the landscape features and associated habitat values in and around the Subject Land. A table is provided which details the Landscape Features as required by the BAM (**Table 5**).

2.2 Native vegetation, threatened ecological communities and vegetation integrity methods

2.2.1 Existing Information

Broad mapping of vegetation communities (**Figure 10**) have been undertaken as follows:

- NSW State Vegetation Type Map (NSW DPE 2022h)

This resource mapped the vegetation in the Subject Land as:

- PCT 4028: Estuarine Swamp Oak Twig-rush Forest

The Ecologist Assessment Report (ADE Consulting Group 2022) identified the vegetation within the Subject Land as *PCT 3638: South Coast Sands Bangalay Forest* which "appears consistent with the "*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*" TEC" listed under Schedule 2 of the BC Act 2016.

With this as a guide, Land Eco confirmed that only PCT that can form part of this TEC are candidates for the Subject Land. PCT 4028 is not a candidate for this TEC.

2.2.2 Mapping Native Vegetation Extent

Land Eco mapped the native vegetation extent within the Subject Land by:

- Viewing recent aerial imagery (Nearmap 2022) for differences in texture that would suggest different vegetation zones; followed by

- conducting a ground-based meandering transect, identifying native vegetation and marking the extent using a Garmin 65S hand-held GPS.

Plant Community Type (PCT) selection was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2020e).

2.2.3 Plot-based Vegetation Survey

One representative BAM VIS plot was allocated to the single vegetation zone identified within the Subject Land by Isaac Mammott in June 2022.

Isaac Mammott then visited the Subject Land and sampled a 20m x 20m floristic plot in the mapped BAM VIS plot. The full species name, percentage cover, and estimate of abundance of all native and exotic vascular plant species was recorded.

Plant Community Type (PCT) selection was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2020e).

2.2.4 Vegetation Integrity Survey

One vegetation integrity plot was conducted across the Subject Land. This was located to provide a representative assessment of vegetation integrity throughout the Subject Lands. These survey plots were established around a central 50 m midline as follows:

- one 400 m^2 plot (standard 20 m × 20 m), to assess all the composition and structure attributes;
- one 1000 m^2 (standard 20 m × 50 m) plot, to assess the function attributes (number of large trees, stem size classes, tree regeneration and length of logs);
- five 1 m^2 subplots, to assess average litter cover (and other optional ground cover components) for the plot.

The presence of hollow-bearing trees, the composition, the vegetation structure and vegetation function were all assessed according to the protocol outlined in Section 4.3.4 of the BAM (NSW DPIE 2020a).

Land Eco used the GPS co-ordinates provided by Isaac Mammott to identify the location of the vegetation integrity plot on a georeferenced field map. Two Land Eco Ecologists then attended the site in December 2022 to validate the findings of the vegetation survey and assess whether the data required updating. No updates to vegetation data were deemed necessary.

2.3 Threatened Flora Survey Methods

2.3.1 Review of Existing Information

Land Eco reviewed any existing information on native vegetation relevant to the Subject Land and land within the 1500 m buffer area. This includes:

- individual species records that are held in the NSW Wildlife Atlas BioNet (NSW DPIE 2022d);
- existing maps of native vegetation in the area such as those held by the Department, or a local government authority;
- information from publicly accessible ecological reports, soil surveys or previous native vegetation surveys that is relevant to the Subject Land (where available).

2.3.2 Habitat Constraints Assessment

Land Eco compiled a detailed summary of potential microhabitats for threatened fauna species as well as habitat constraints present on the Subject Land. Where relevant habitats were mapped and photographed.

2.3.3 Field Surveys

A suite of Flora Species Credit species were identified within the BAMC (DPIE 2022c) and NSW Wildlife Atlas (DPIE 2022d) as having the potential to occur within the Subject Land (**Table 15**). No targeted fauna surveys were undertaken for this BDAR.

2.4 Threatened Fauna Survey Methods

2.4.1 Review of Existing Information

Land Eco reviewed any existing information on threatened fauna relevant to the Subject Land and land within the 1500 m buffer area. This includes:

- survey data or individual species records that are held in NSW Wildlife Atlas BioNet (NSW DPIE 2022d);
- information in ecological reports, soil surveys or previous fauna surveys that is relevant to the Subject Land (where available).

2.4.2 Habitat Constraints Assessment

The Land Eco Consulting Ecologists compiled a detailed summary of potential microhabitats for threatened fauna species as well as habitat constraints present on the Subject Land, including both Species Credit and Ecosystem Credit threatened fauna species.

2.4.3 Field Surveys

A suite of Fauna Species Credit species were identified within the BAMC (DPIE 2022c) and NSW Wildlife Atlas (DPIE 2022d) as having the potential to occur within the Subject Land (**Table 16**). As this is a streamlined assessment, owing to the proponent's requirement for an expedited assessment, no targeted fauna surveys were undertaken.

2.5 Weather Conditions

The weather during the vegetation integrity survey was cool with a moderate wind. The weather leading up to the vegetation survey was similarly cool and dry in June 2022, however May 2022 was relatively warm and wet, with over 125mm of rainfall (BOM 2022). The rainfall and temperatures in the leadup to the vegetation survey were conducive to a representative flora survey.

The weather during the December 2022 site assessment was warm and sunny with a light breeze.

The weather conditions in the lead up to and during all surveys were suitable for the surveys undertaken.

Table 4. Environmental conditions during threatened species surveys (BOM 2022)

Survey undertaken (e.g. method / targeted species)	Date	Time	Temperature (°C) (min. & max.)	Wind (light, mod…)	Rainfall (mm)
Vegetation Integrity Survey	10/6/22	-	4.7 – 16.7	Moderate	0
Site Assessment	2/12/22	15:00 – 16:30	14.4 – 19.6	Light	0

2.6 Limitations

Land Eco did not conduct the vegetation integrity survey plot validation or complete this report until 6 months after the sampling of the BAM plots by Botanist, Isaac Mammott (Sclerophyll Flora Surveys and Research Pty Ltd) in June 2022.

3. Site Context

3.1 Assessment Area

The Assessment Area includes a 1500m buffer zone surrounding the Subject Land (**Figure 2**).

3.2 Landscape Features

Landscape features identified within the Subject Land and assessment are presented in **Figure 2-11**. A discussion of relevant landscape features is provided below.

3.2.1 IBRA Bioregions and Subregions

In accordance with BAM Subsection 3.1.3(2) the Subject Land has been mapped to IBRA Bioregion and Subregion. The Subject Land occurs within the 'Sydney Basin' Interim Biogeographic Regionalisation for Australia ver. 7 (IBRA) bioregion, and 'Pittwater' IBRA subregion (DEE 2016; **Figure 5** and **Figure 8**).

3.2.2 Rivers, Streams, Estuaries and Wetlands

This subsection details wetlands, rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E).

There are no mapped watercourses within the Subject Property. Mullet Creek, a third order tributary of South Creek, occurs approximately 200m west of the Subject Land (**Figure 6**).

The Subject Land has been mapped as a 'Coastal Wetland' under the R&H SEPP (**Figure 4**).

3.2.3 Habitat Connectivity

In accordance with connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6)) the assessor must identify the connectivity of different areas of habitat that may facilitate the movement of threatened species across their range and identify these on the Location Map (**Figure 7**).

Significant biodiversity links are those that connect different areas of habitat, facilitating movement of threatened species across their distribution. The presence of significant biodiversity links on a site contributes to the biodiversity value of that subject land at the landscape scale. Connectivity can be identified at different scales depending on the target species and can include recognised biodiversity corridors in a plan approved by DPIE (e.g. priority investment areas), a local corridor identified by a local council, flyways for migratory species or a riparian buffer of a stream, wetland or estuary.

Land Eco has identified routes of habitat connectivity within the Assessment Area and has classified them into two categories:

- Minor Habitat Corridor – a local-scale habitat connection consisting of a narrow or disturbed vegetation corridor (i.e. canopy connectivity); and
- Major Habitat Corridor – a locally significant habitat connection consisting of remnant vegetation, reserves, densely vegetated riparian corridors or wetlands.

The Subject Property occurs at the eastern edge of a 'minor habitat corridor' which connects with major habitat corridors including Mullet Creek, South Creek and Heydon Reserve, Ingleside Park and the Warriewood Wetlands (**Figure 7**). The Subject Land contains highly productive habitat with mature *Banksia spp., Eucalyptus spp.* and other fruiting vegetation over a weed-infested native understorey providing habitat to a high density of locally common, mobile bird and mammal species. This habitat acts as a stepping-stone for fauna moving across the landscape.

Figure 4. Mapping of Coastal Wetlands and Coastal Environment Area on the Subject Land (NSW DPIE 2022e)

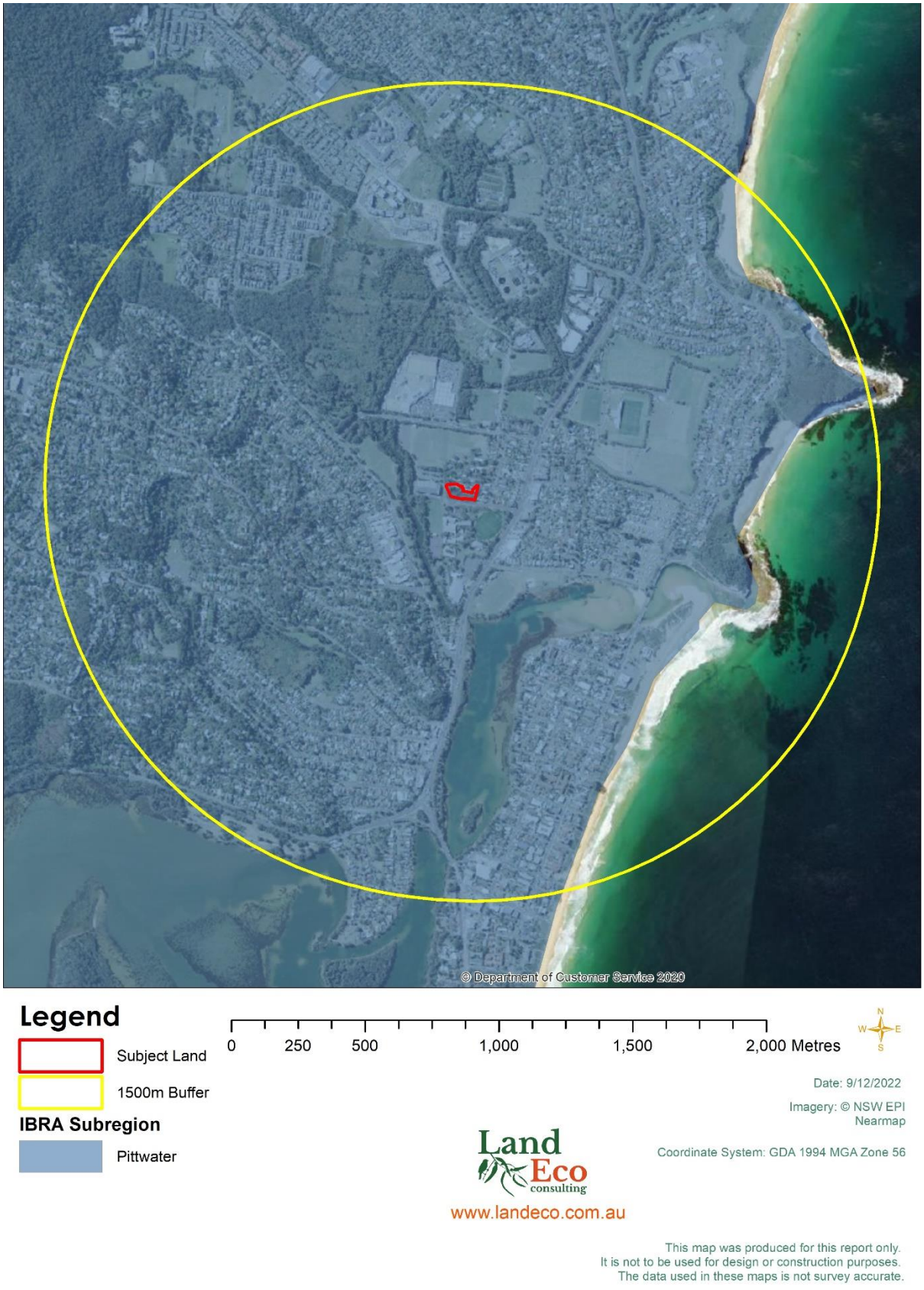

Figure 5. The assessment buffer surrounding the Subject Land lies entirely within the Pittwater IBRA 7 Subregion of the Sydney Basin IBRA7 Bioregion.

3.2.4 Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance

In accordance with BAM Subsections 3.1.3(7.) and 3.1.3(12.) the assessor must detail karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features.

None of these features were identified within the Subject Land, though cliffs, caves and rocks are considered likely to occur within the Assessment Area including Irrawong Reserve.

3.2.5 Areas of Outstanding Biodiversity Value

No areas of Outstanding Biodiversity Value occur within the Subject Land or Assessment Area.

Figure 6. Watercourses (streams and waterbodies) within the vicinity of the Subject Land.

Figure 7. Terrestrial and wetland habitat connectivity links within the Subject Land and surrounding area.

3.2.6 Mitchell Landscapes

NSW Landscapes Mapping: Background and Methodology (Mitchell 2002; OEH 2016a) groups ecosystems into meso-ecosystems representing larger natural entities based on topography and geology. The naming of ecosystems and meso-ecosystems was standardised so that each name provided location information and a meaningful descriptive landscape term.

The Subject Land occurs over the 'Sydney – Newcastle Barriers and Beaches' Mitchell Landscape (**Figure 8**).

3.2.6.1 Landscape Ecosystem – Sydney – Newcastle Barriers and Beaches

Quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. Includes areas of more extensive high dunes often located on top of the headlands. General elevation 0 to 30m, local relief 10m. Cliff top dunes may be found as high as 90m above sea level. Distinct zonation of vegetation and increasing soil development from the beach to the inland dunes. Coast banksia (*Banksia integrifolia*) and old man banksia (*Banksia serrata*) are found on the second dunes and these merge with more complex forest containing blackbutt (*Eucalyptus pilularis*), red bloodwood (*Corymbia gummifera*), grass trees (*Xanthorrhoea sp.*) and numerous understorey shrubs on deep sands that have an organic rich A horizon, a bleached A2 horizon and the initial development of weak iron or organic pans in the sandy subsoil. Well-developed, deep podsol profiles are present in cliff top dunes with swampy swales indicating that these forms are probably older than the coastal dunes. Vegetation of *Banksia aemula* heathland and open scrub of coast banksia (*Banksia integrifolia*), coast rosemary (*Westringea fruticosa*), coast tea-tree and grass tree, with dwarfed smooth-barked apple (*Angophora costata*) and red bloodwood. Freshwater sedge swamps in larger areas of sand. In the lagoons salinity varies depending on tidal flushing and they are often surrounded by broad-leaved tea-tree (*Melaleuca quinquenervia*) and swamp oak (*Casuarina glauca*). Water margins are occupied by Juncus sp. and common reed (*Phragmites australis*) in fresh water areas. Grey mangrove (*Avicennia marina*) may occur in some tidal inlets (Mitchell 2002; OEH 2016a).

Table 5. Summary of Landscape features identified within the Subject Land and surrounding 1500m buffer.

Landscape Feature	Identification of Landscape Feature on Site
Rivers and Streams (classified according to stream order)	There are no mapped watercourses within the Subject Property. Mullet Creek, a third order tributary of South Creek, occurs approximately 200m west of the Subject Land (**Figure 6**).
Wetlands (within, adjacent to and downstream of site)	The Subject Land has been mapped as a Coastal Wetland and within the Coastal Environment Area under the R&H SEPP.
Connectivity features	See **section 3.2.3** (**Figure 7**).
Areas of geological significance and soil hazard features	No areas of geological significance (karsts, caves, crevices or cliffs) were identified within the Subject Land. This was determined as a result of a comprehensive site-based assessment. However, cliffs, caves and rocks are considered likely to occur within the Assessment Area including Irrawong Reserve.

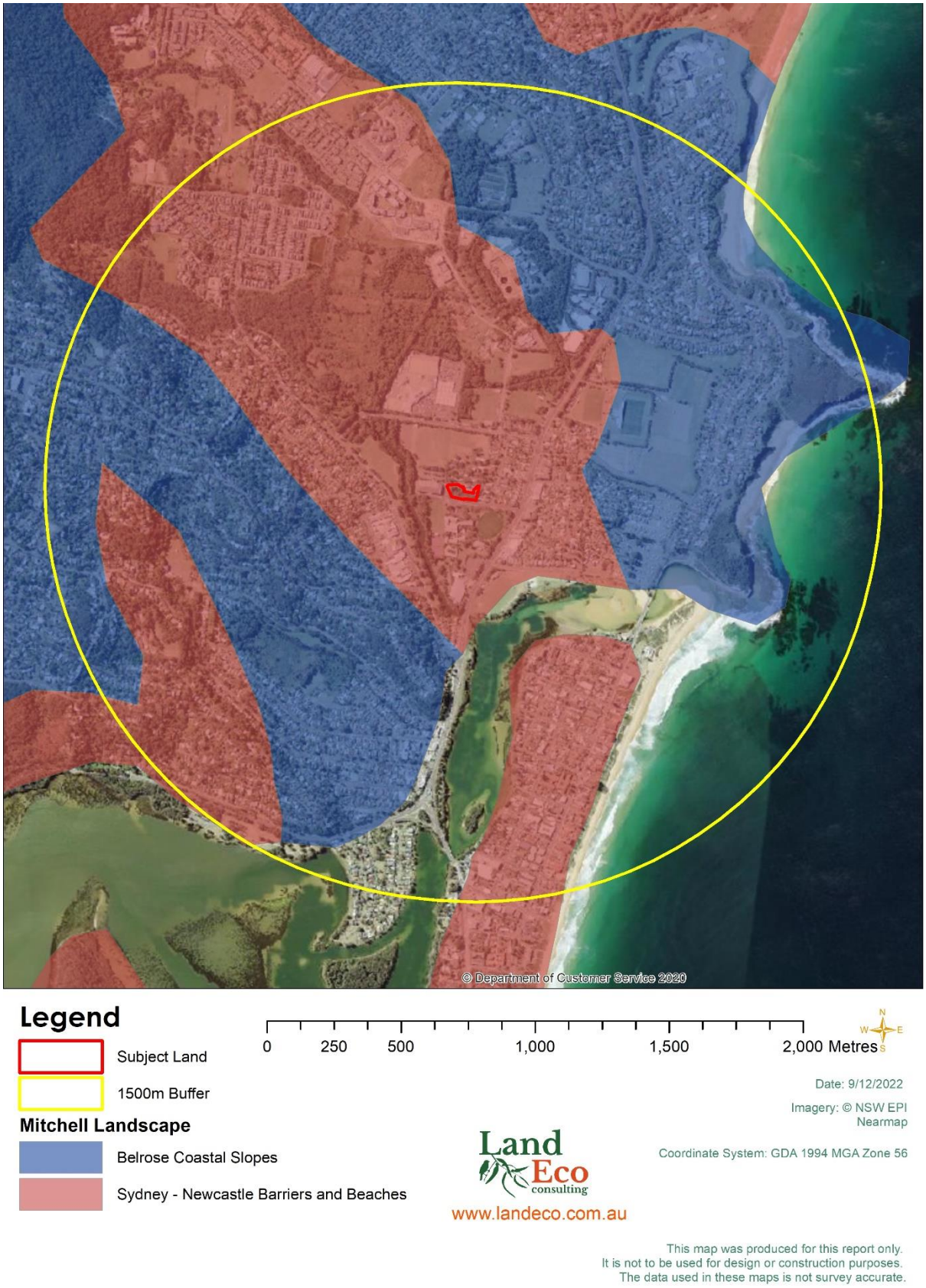

Figure 8. The Mitchell Landscapes that comprise the Subject Land and the surrounding assessment area.

3.2.7 Additional Landscape Features Identified

No additional landscape features are identified in the Subject Land for the proposed development.

3.2.8 Soil Hazard Features

The proposed development does not require approval from the Native Vegetation Panel under Part 5A of the LLS Act or the Vegetation SEPP as the Subject Land is mapped 'Category 1 – Exempt Land', therefore the soil hazard features are not relevant to this development.

3.3 Native Vegetation Cover

A 1500m buffer or 'assessment circle' surrounding the outside boundary of the Subject Land was prepared in order to determine the extent of native vegetation within the surrounding locality of the Subject Land. Native vegetation was determined from aerial imagery (Google 2022) and local knowledge of the locality. The 'Native Vegetation of The Sydney Metropolitan Area' mapping (NSW OEH 2016c) was used to assess general vegetation coverage and was refined utilising up to date aerial imagery. The results are presented in **Table 6**.

Table 6. Native vegetation cover in the Assessment Area

Assessment area	753.79 ha
Total area of native vegetation cover	199.10 ha
Percentage of native vegetation cover	26.41%
Class (0-10, >10-30, >30-70 or >70%)	>10 – 30 %

Figure 9. Native vegetation patches within the area surrounding the Subject Land (1500m buffer)

4. Native Vegetation, Threatened Ecological Communities and Vegetation Integrity

4.1 Native Vegetation Extent

Land Eco mapped the native vegetation extent within the Subject Land (as described in BAM Section 4.1(1–3.) and BAM Subsection 4.1.1). Impacts to vegetation required to facilitate the proposed development are presented in **Table 7**.

Table 7. Impacts to vegetation to facilitate development

Vegetation type	Area to be removed (ha) for Development
PCT 1793: Mature Canopy - Mature	0.148 ha
PCT 1793: Mature Canopy - Overhang	0.025 ha
Total Native Vegetation	0.173 ha
Total Assessable Under BAM	0.17 ha

4.1.1 Changes to the Mapped Native Vegetation Extent

The actual native vegetation extent matches that shown on the aerial imagery used in the figures of this report (**Figure 2**).

4.1.2 Non-native Vegetation

Despite being weed-infested, all parts of the Subject Land supported native vegetation (**Figure 11**).

4.2 Plant Community Types

4.2.1 Overview

Vegetation within the Subject Land has been assessed as aligning with the BioNet Vegetation Classification PCTs identified within **Table 8** and their extent is shown in **Figure 11**. Detailed descriptions of each PCT are provided in the following subsections.

The botanist who conducted the BAM Plot survey, Isaac Mammott, identified the Subject Land as '*PCT 661: Coastal Sand Littoral Forest*'. However, after undertaking the site assessment and reviewing the vegetation structure and composition, Land Eco identified the Subject Land as PCT 1793: Coastal Sand Bangalay Forest which qualifies as "*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*" EEC listed under Schedule 2 of the BC Act 2016. This PCT will be decommissioned with the revision of eastern NSW PCTs, hence the identification of the Subject Land as PCT 3638 in the Ecological Assessment Report (ADE Consulting Group 2022). However, at the time of writing this report, the BAMC was still using the former NSW PCTs and as such, the Subject Land has been entered as PCT 1793.

Table 8. PCTs identified within the Subject Land

PCT ID	PCT name	Zone	Management Zone	Subject Land Area	Total area assessable under BAM
1793	Coastal Sand Bangalay Forest	Mature Canopy	Mature	0.42 ha	0.148 ha
1793	Coastal Sand Bangalay Forest	Mature Canopy	Overhang	0.02 ha	0.025 ha
				Total	0.17 ha

4.2.2 PCT 1793: Coastal Sand Bangalay Forest within the Subject Land

This vegetation covered the Subject Land in its entirety. The indigenous canopy is dominated by *Eucalyptus botryoides, E. robusta* and *Angophora costata* with *Banksia integrifolia and Livistona australis*. The indigenous shrub layer is mixed mesophyllous and sclerophyllous with species such as *Elaeocarpus reticulatus, Pittosporum undulatum* and *Glochidion ferdinandi*. The native groundlayer is dominated by *Pteridium esculentum, Commelina cyanea, Viola hederacea* and *Lomandra longifolia*. All strata are infill planted with non-native ornamental plants, and are weed-infested.

Table 9. PCT 1793 - Coastal Sand Bangalay Forest within the Subject Land

PCT ID	1793
PCT name	Coastal Sand Bangalay Forest
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	South Coast Sands Dry Sclerophyll Forests
Per cent cleared value	40 %
Extent within Subject Land	0.42 ha (**Table 8**)
Condition State	• Mature Canopy
Justification of PCT Selection	• Moderately tall open forest • Occurs on low-lying coastal marine sand deposits of the coastal zones • Canopy dominated by *Eucalyptus botryoides* and *Angophora costata* with tall banksias (*Banksia integrifolia*) • Mixture of mesophyllous and sclerophyllous shrub layer including *Pittosporum undulatum, Glochidion ferdinandi, Breynia oblongifolia* and *Monotoca elliptica*. • Native groundlayer dominated by *Pteridium esculentum, Commelina cyanea* and *Lomandra longifolia*
Alignment with TECs	The vegetation within the Subject Land qualifies as "*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*" EEC listed under Schedule 2 of the BC Act 2016.
Photo	**Plate 1**

4.3 Threatened Ecological Communities

The Subject Land qualifies as a Threatened Ecological Community (TEC) (**Table 11**).

All of the PCT 1793 within the Subject Land qualifies as "*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*" (Bangalay Sand Forest) listed as endangered under Schedule 2 of the BC Act 2016 (**Table 10**).

Table 10. Identification of Bangalay Sand Forest

Key Diagnostic Characteristic (NSW TSSC 2011)	Subject Land
Associated with coastal sand plains of marine or aeolian origin. Occurs on deep, freely draining to damp sandy soils on flat to moderate slopes	Alluvium and coastal sand plain. Soils are deep, sandy, free-draining and the terrain is flat.
Occurs within a few kilometres of the sea and at altitudes below 100 m	Less than 1km west of the coast, approximately 10 m above sea level.
Typically has a dense to open tree canopy, approximately 5 – 20 m tall, depending on exposure and disturbance history. The most common tree species include *Eucalyptus botryoides* (Bangalay) and *Banksia integrifolia* subsp. *integrifolia* (Coast Banksia), while *Eucalyptus pilularis* (Blackbutt) and *Acmena smithii* (Lilly Pilly) may occur in more sheltered situations, and *Casuarina glauca* (Swamp Oak).	Open tree canopy dominated by *Eucalyptus botryoides* and *Banksia integrifolia subsp. integrifolia*. *Casuarina glauca* occurred but outside of the plot.
The open shrub stratum may be dominated by sclerophyllous species, such as *Banksia serrata* (Old Man Banksia), *Leptospermum laevigatum* (Coast Teatree) and *Monotoca elliptica*, or mesophyllous, species, such as *Breynia oblongifolia* (Coffee Bush) and *Pittosporum undulatum* (Sweet Pittosporum), or a combination of both.	Open shrub stratum including *Monotoca elliptica, Breynia oblongifolia* and *Pittosporum undulatum*.
The groundcover varies from open to dense, and may be sparse where the tree canopy is dense or where there is a thick litter of leaves and branches. Dominant species include *Dianella* spp. (Blue Flax Lilies), *Lepidosperma concavum, Lomandra longifolia* (Spiny-headed Matrush), *Pteridium esculentum* (Bracken), and the grasses *Imperata cylindrica* var. *major* (Blady Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass) and *Themeda australis* (Kangaroo Grass), while herbs, such as *Desmodium gunnii*, *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (Whiteroot) and *Viola hederacea* (Ivy-leaved Violet), are scattered amongst the larger plants.	Varied groundcover density including *Lomandra longifolia, Pteridium esculentum, Dichondra repens* and *Viola hederacea*.

Table 11. TECs within the Subject Land

TEC name	Profile ID (from TBDC)	BC Act status	Associated vegetation zones within the Subject Land	Area within Subject Land
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	20035	Endangered Ecological Community	PCT 1793	0.42 ha

4.4 Vegetation Zones and Patch Size

One vegetation zone was identified within the Subject Land:

- PCT 1330: Mature Canopy

This vegetation zone was characterised by a mature native canopy over a mixed, native dominant assemblage of understorey vegetation arranged in garden beds and lawns.

Patch size is defined by the BAM as an area of native vegetation that:

- occurs on the development site or biodiversity stewardship site, and
- includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).

Patch size may extend onto adjoining land that is not part of the development site (OEH 2020a). Patch size was calculated according to the above guidelines. Land Eco confirmed the Subject Land must be assessed under the >100 ha patch size category as the vegetation within the Subject Land connected with remnant native vegetation at the Warriewood Wetlands and Irrawong Reserve, which extends to Ku-ring-gai Chase National Park (**Figure 9**).

Table 12. Vegetation Zones and Patch Sizes

Vegetation zone ID	PCT ID number and name	Condition / other defining feature	Area	Patch size class (select multiple if areas of native vegetation are discontinuous)	Number of vegetation integrity plots required	Number of vegetation integrity plots completed	Number of vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
Mature Canopy	PCT 1793 - Coastal Sand Bangalay Forest	Mature Native Canopy, mixed native/exotic garden beds and lawns	0.42 ha	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	Plot 1

Plate 1. Representative photograph of the PCT 1793 within the Subject Land. Photo taken from 0m (beginning) of BAM VIS Plot 1 by Semonn Oleksyn approximately 6 months after the plot was sampled by Isaac Mammott.

4.5 Vegetation Integrity (Vegetation Condition)

4.5.1 Vegetation Integrity Survey Plots

A total of one (1) BAM Vegetation Integrity Score (VIS) Plot was sampled within the Subject Land (**Figure 11**), in accordance with the minimum number of plots as outlined in BAM Table 3. Plot data gathered for each attribute used to assess the function of the Subject Land vegetation is detailed in **Appendix B.** Vegetation Integrity Survey Scores, represented by existing vegetation within each vegetation zone, are detailed in **Table 13.**

The future VIS post-development of the PCT 1793 Mature Canopy 'Mature' management zone has been assigned 0. This equates to total clearing.

As it was not practical to conduct a BAM Plot within the PCT 1793 Mature Canopy 'Overhang' management zone, the data from BAM Plot 1 conducted in the PCT 1793 Mature Canopy 'Mature' management zone was used. While the 'Mature' management zone will be cleared in its entirety, the impacts of clearing in the 'Overhang' management zone will be limited to canopy removal. To accurately assess this partial reduction in VIS, the 'Overhang' management zone has been assigned (in the BAMC) a future VIS of 26.2, due to the removal of all canopy cover within this zone and no impacts to any understorey vegetation. This was considered suitable because the overhang zone has no native groundcover or shrub layer vegetation, just concrete footpath/road.

In accordance with section 9.2. of the BAM (DPIE 2020a) if, during the assessment of biodiversity values for any type of development, clearing or biodiversity certification proposal, the assessor determines that:

(a) an area of land does not contain native vegetation, or

(b) a vegetation zone has a vegetation integrity score <15 where the PCT is representative of an endangered or critically endangered ecological community, or

(c) a vegetation zone has a vegetation integrity score <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

(d) a vegetation zone has a vegetation integrity score <20 where the PCT is not representative of a TEC or associated with threatened species habitat then for that vegetation zone:

(e) assessment of native vegetation is not required beyond Section 5.4.

An offset is not needed for impacts on native vegetation if the vegetation integrity score is below those listed in subsection 9.2.1(1.) of the BAM (see above); however, if the entity is at risk of an SAII the assessor will need to address the relevant criteria in Section 9.1 of the BAM and include this in the BDAR.

4.5.2 Scores

Table 13. Vegetation Integrity Scores

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
PCT 1793: Mature Canopy	68.3	55.1	64.6	62.4	Yes

4.5.3 Use of Benchmark Data

The benchmark data was sourced from the BAMC (DPIE 2022c).

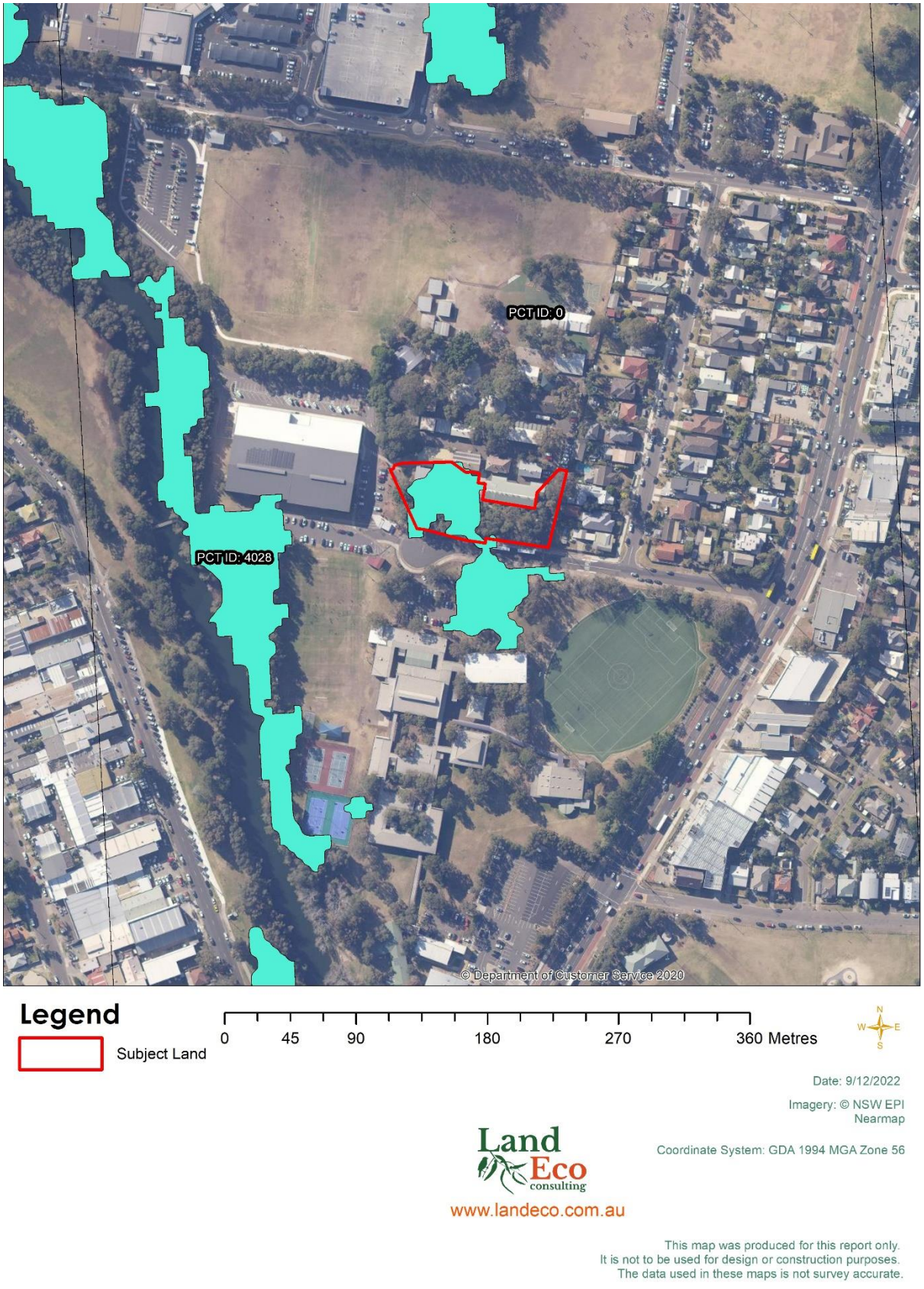

Figure 10. Historically Mapped Vegetation in the vicinity of the Subject Land (NSW DPE 2022f)

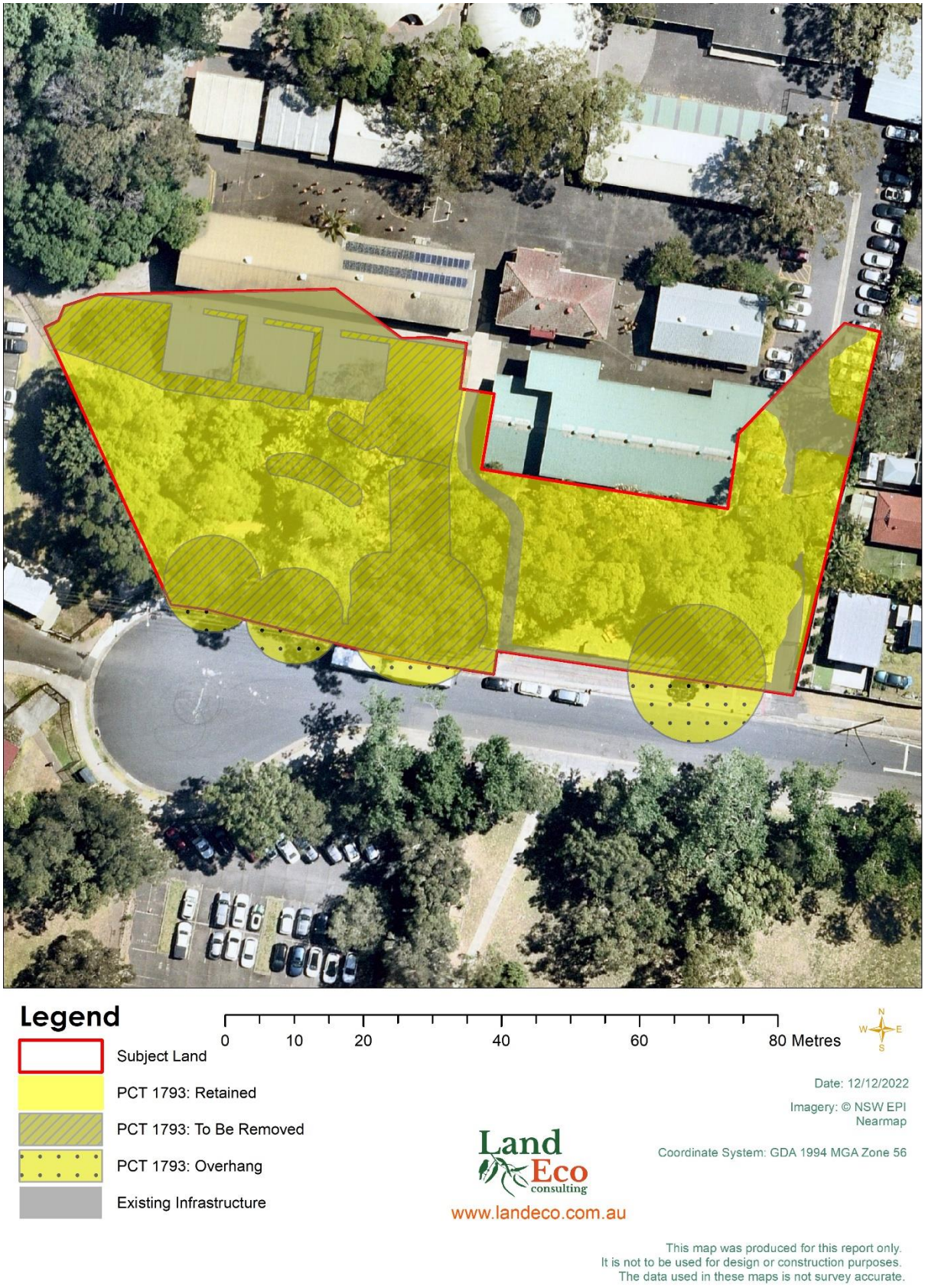

Figure 11. Field validated vegetation mapping within the Subject Land.

5. Habitat Suitability for Threatened Species

5.1 Identification Of Threatened Species for Assessment

5.1.1 Ecosystem Credit Species

This section provides a summary of the candidate Ecosystem Credit Species for the Subject Land derived from BAMC (OEH 2022c) and a 10km BioNet Atlas Search (DPIE 2022d). Ecosystem credit species associated with the Subject Land are listed below in **Table 14.**

Table 14. Predicted ecosystem credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Regent Honeyeater (Foraging)	*Anthochaera phrygia*	Critically Endangered	Critically Endangered	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Vulnerable	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Australasian Bittern	*Botaurus poiciloptilus*	Endangered	Endangered	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	The Subject Land has been mapped as a coastal wetland however has no waterbodies or active brackish or freshwater wetlands.	N/A
Sanderling (Foraging)	*Calidris alba*	Vulnerable	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Red Knot (Foraging)	*Calidris canutus*	-	Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A
Curlew Sandpiper (Foraging)	*Calidris ferruginea*	Endangered	Critically Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A
Great Knot (Foraging)	*Calidris tenuirostris*	Vulnerable	Critically Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A
Gang-gang Cockatoo (Foraging)	*Callocephalon fimbriatum*	Vulnerable	Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Glossy Black-Cockatoo (Foraging)	*Calyptorhynchus lathami*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Greater Sand-plover (Foraging)	*Charadrius leschenaultii*	Vulnerable	Vulnerable	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A
Less Sand-plover (Foraging)	*Charadrius mongolus*	Vulnerable	Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Varied Sitella	*Daphoenositta chrysoptera*	Vulnerable	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable	Endangered	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Beach Stone-curlew (Foraging)	*Esacus magnirostris*	Critically Endangered	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A
Eastern False Pipistrell	*Falsistrellus tasmaniensis*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Little Lorikeet	*Glossopsitta pusilla*	Vulnerable	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
White-bellied Sea-Eagle (Foraging)	*Haliaeetus leucogaster*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Little Eagle (Foraging)	*Hieraaetus morphnoides*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
White-throated Needletail	*Hirundapus caudacutus*	-	Vulnerable	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Black Bittern	*Ixobrychus flavicollis*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	The Subject Land has been mapped as a coastal wetland however has no waterbodies or land within 40m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation.	N/A
Swift Parrot (Foraging)	*Lathamus discolor*	Endangered	Critically Endangered	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Square-tailed Kite (Foraging)	*Lophoictinia isura*	Vulnerable	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Black-chinned honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Little Bent-winged Bat (Foraging)	*Miniopterus australis*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Large Bent-winged Bat (Foraging)	*Miniopterus orianae oceanensis*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Turquoise Parrot	*Neophema pulchella*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Barking Owl (Foraging)	*Ninox connivens*	Vulnerable	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Powerful Owl (Foraging)	*Ninox strenua*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Eastern Curlew (Foraging)	*Numenius madagascariensis*	-	Critically Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A
Eastern Osprey (Foraging)	*Pandion cristatus*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Scarlet Robin	*Petroica boodang*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
New Holland Mouse	Pseudmys novaehollandiae	-	Vulnerable	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Grey-headed Flying-fox (Foraging)	*Pteropus poliocephalus*	Vulnerable	Vulnerable	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Wompoo Fruit-Dove	*Ptilinopus magnificus*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Rose-crowned Fruit-Dove	*Ptilinopus regina*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Australian Painted Snipe	*Rostratula australis*	Endangered	Endangered	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable swamps, dams or marshes within the Subject Land.	• PCT 1793: Mature Canopy
Yellow-bellied Shethtail-bat	*Saccolaimus flaviventris*	Vulnerable	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Greater Broad-nosed Bat	*Scoteanax rieppellii*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Little Tern (Foraging)	*Sternulea albifrons*	Endangered	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	• PCT 1793: Mature Canopy
Masked Owl (Forgaing)	*Tyto novaehollandiae*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Rosenberg's Goanna	*Varanus rosenbergi*	Vulnerable	-	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Terek Sandpiper (Foraging)	*Xenus cinereus*	Vulnerable	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable coastal foraging habitat for this species.	N/A

5.1.2 Species Credit Species

This section provides a summary of the candidate Species Credit flora (**Table 15**) and fauna species (**Table 16**) for the Subject Land derived from BAMC (OEH 2021c) and a 10km BioNet Atlas Search (DPIE 2021d). A summary of the targeted survey effort applied to each species is provided along with the results of the survey effort, specifically whether or not the Species Credit needs to be offset through retiring of Biodiversity Offset Credits (**Table 15;Table 16**). Where a species is assumed to be present on the Subject Land, the species polygon must encompass the entire vegetation zone/s within which the candidate species is predicted to use/occur.

The assessor must determine an offset for the impacts of proposals on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥17. The assessor must determine an offset for the impacts of proposals on threatened species that require species credits, identified in accordance with Chapter 5 of the BAM (DPIE 202a).

Table 15. Predicted flora species credit species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Wallangarra White Gum	*Eucalyptus scoparia*	Endangered	Vulnerable	☐ BAM-C ☐ TBDC ☒ Previous survey ☐ Current survey	No	Recorded present as planted specimens within the Subject Property. Does not naturally occur in Sydney, not viable in this location. Native range begins in the Northern NSW.	N/A
Bauer's Midge Orchid	*Genoplesium baueri*	Endangered	Endangered	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Sandy soils within the Subject Land not suitable for this species. Only occurs on shale-sandstone soils and laterites.	N/A
Caley's Grevillea	*Grevillea caleyi*	Critically Endangered	Critically Endangered	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No laterite soils located on ridgetops on or within 100m of the Subject Land.	N/A
Angus's Onion Orchid	*Microtis angusii*	Endangered	Endangered	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Sandy soils within the Subject Land not suitable for this species. Only occurs on laterites of the Hornsby Plateau.	N/A

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Hairy Geebung	*Persoonia hirsuta*	Endangered	Endangered	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Sandy soils within the Subject Land not suitable for this species. Only occurs on shale-sandstone soils and laterites.	N/A
Scrub Turpentine	*Rhodamnia rubescens*	Critically Endangered	Critically Endangered	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy

Table 16. Predicted fauna species credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Regent Honeyeater (Breeding)	*Anthochaera phrygia*	Critically Endangered	Critically Endangered	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Not in an important habitat mapped area.	-
Curlew Sandpiper (Breeding)	*Calidris ferruginea*	Endangered	Critically Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Not in an important habitat mapped area.	-
Great Knot (Breeding)	*Calidris tenuirostris*	Vulnerable	Critically Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Not in an important habitat mapped area.	-

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Loggerhead Turtle	*Caretta caretta*	Endangered	Endangered	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No suitable dunes within the Subject Land.	-
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy
Swift Parrot (Breeding)	*Lathamus discolor*	Endangered	Critically Endangered	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Not in an important habitat mapped area.	-
Little Bent-winged Bat (Breeding)	*Miniopterus australis*	Vulnerable	-	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	No caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave', observation type code 'E nest-roost', with numbers of individuals >500.	-
Large Bent-winged Bat (Breeding)	*Miniopterus orianae oceanensis*	Vulnerable	-	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	No caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave', observation type code 'E nest-roost', with numbers of individuals >500. One record with type code 'E nest-roost in 10km locality at Cromer Heights in 2013, approximately 5km south-west of the Subject Land.	-

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Eastern Cave Bat	*Vespadelus troughtoni*	Vulnerable	-	No	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A	• PCT 1793: Mature Canopy

5.2 Presence of Candidate Species Credit Species

The presence or absence of candidate species credit species are presented below (**Table 17;Table 18).**

Table 17. Determine the presence of candidate flora species credit species on the Subject Land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Scrub Turpentine	*Rhodamnia rubescens*	Critically Endangered	Critically Endangered	Targeted threatened species survey	No	No

Table 18. Determine the presence of candidate fauna species credit species on the Subject Land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	Assumed present	Assumed present	No
Eastern Cave Bat	*Vespadelus troughtoni*	Vulnerable	-	Assumed present	Assumed present	No

5.3 Candidate Species Credit Species

The survey methods for the candidate flora and fauna species credit species is presented below (**Table 19;Table 20**).

Table 19. Threatened species surveys for candidate flora species credit species on the Subject Land

Common name	Scientific name	Threatened flora species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (transects or grids)	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. people)		
Scrub Turpentine	*Rhodamnia rubescens*	Meandering transect	☒ Yes 30/11/22	☐ No	4 people hours, 2 people	No	No

Table 20. Threatened species surveys for candidate fauna species credit species on the Subject Land

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	**Timing of survey – within recommended period?** (BAM-C / TBDC)		**Effort** (hours & no. people)		
N/A	N/A	N/A	☐ Yes	☐ No	N/A	N/A	N/A

5.4 Expert Reports

No expert reports informed this BDAR.

5.5 More Appropriate Local Data

No additional local data has been used to assess habitat suitability.

5.6 Area or Count, and Location of Suitable Habitat for a Species Credit Species (A Species Polygon)

Where a Species credit species is confirmed present or assumed to be present within the Subject Land, the assessor must assign species polygon that encompasses the entire vegetation zone(s) within which the candidate species is predicted to occur based on the correct application of the BAM (DPIE 2020a). The species polygons for the Subject Land are presented (**Appendix D**).

No Species Credit Species were recorded present within the Subject Land however, both *Chalinolobus dwyeri* and *Vespadelus troughtoni* have been assumed present (**Table 21;Table 22**).

Table 21. Results for present species (recorded within the Subject Land)

Common name	**Scientific name**	**Biodiversity risk weighting** (BAM-C & TBDC*)	**SAII entity**** (BAM-C & TBDC)	**Habitat constraints / microhabitats present on the subject land / vegetation zone**	**Abundance – Number of individual plants present on subject land** (flora with unit of measure of count)	**Extent (ha) of suitable habitat present on site** (flora or fauna with unit of measure of area)	**TBDC species specific recommendations e.g. buffers, general comments** (where relevant)	**Habitat condition** (vegetation integrity score for each vegetation zone in the polygon – area species only)
Large-eared Pied Bat	*Chalinolobus dwyeri*	Very High (3)	Yes	Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels. Suitable foraging habitat surrounding canopies of native vegetation within the Subject Land. Potential to temporarily roost underneath and amongst existing school infrastructure.	N/A	0.17	Any impacts on breeding habitat used by this species could be considered potentially serious and irreversible. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. All habitat on the Subject Land should also be mapped if present. Use high resolution aerial imagery and topographic maps to identify potential roost habitat features on the subject land within 2km caves, scarps, cliffs etc. Species polygon boundary should align with PCTs on the subject land to which the species is associated that are within 2km of identified potential roost habitat features.	62.4
Eastern Cave Bat	*Vespadelus troughtoni*	Very High (3)	Yes	Within 2 km of rocky areas containing caves,	N/A	0.17	Any impacts on breeding habitat used by this species could be	62.4

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC*)	SAII entity** (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – Number of individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of suitable habitat present on site (flora or fauna with unit of measure of area)	TBDC species specific recommendations e.g. buffers, general comments (where relevant)	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
				overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels. Suitable foraging habitat surrounding canopies of native vegetation within the Subject Land. Potential to temporarily roost underneath and amongst existing school infrastructure.			considered potentially serious and irreversible. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas, caves, overhangs crevices, cliffs and escarpments, or old mines or tunnels, old buildings and sheds within the potential habitat. When the species is present on the subject land and the proposed impact is not a potential SAII, standard species credits will be generated. All habitat on the subject land where the subject land is within 2km of caves, scarps, cliffs, rock overhangs and disused mines must be mapped. Use high resolution aerial imagery and topographic maps to identify potential roost habitat features on the subject land within 2km caves, scarps, cliffs etc. Species polygon boundary should align with PCTs on the subject land to which the species is associated that are within 2km of identified potential roost habitat features.	

Table 22. Results for EPBC Act listed species present (recorded within the Subject Land)

Common name	**Scientific name**	**Abundance – Number of individual plants present on subject land** (flora with unit of measure as count)	**Extent (ha) of suitable habitat present on site** (flora or fauna with unit of measure as area)
N/A	N/A	N/A	N/A

6. Identifying Prescribed Impacts

This chapter of the report details the type and extent of impacts to biodiversity that will occur as a result of the proposed development (**Table 23**). Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the BOS, as per clause 6.1 of the BC Regulation. Such prescribed impacts (including direct and indirect impacts) are impacts:

a. on the habitat of threatened entities including:

i. karst, caves, crevices, cliffs, rocks and other geological features of significance, or

ii. human-made structures, or

iii. non-native vegetation

b. on areas connecting threatened species habitat, such as movement corridors

c. that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)

d. on threatened and protected animals from turbine strikes from a wind farm

e. on threatened species or fauna that are part of a TEC from vehicle strikes.

If relevant, these features must be identified on a map.

Table 23. Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.	Describe how these features provide habitat for, or are used by, each threatened entity
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒No	None within the Subject Land though considered highly likely to occur within Irrawong Reserve.	*Chalinolobus dwyeri* *Vespadelus troughtoni*	These species have the potential to breed within Irrawong Reserve and utilise the Subject Land as foraging habitat and/or for temporary roosting.
Human-made structures	☒Yes / ☐No	The Subject Land contains a concrete pathway, constructed garden beds and fencing. Existing school buildings occur adjacent.	*Chalinolobus dwyeri* *Vespadelus troughtoni*	These species may occasionally utilise cavities underneath and around the adjacent buildings for temporary roosting.
Non-native vegetation	☐Yes / ☒No	While the Subject Land has several weed infestations, it is still dominated by native vegetation. There is no non-native vegetation of outstanding habitat value within the Subject Land.	N/A	N/A

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.	Describe how these features provide habitat for, or are used by, each threatened entity
Habitat connectivity	☒Yes / ☐No	The Subject Property forms a minor habitat corridor which connects to major habitat corridors including Mullet Creek, South Creek and Heydon Reserve, Ingleside Park and the Warriewood Wetlands. The Subject Land contains highly productive habitat with mature Banksias, Eucalypts and other fruiting vegetation over a weed-infested native understorey providing habitat to a high density of locally common birds and acts as a stepping-stone for fauna moving across the landscape (**Figure 7**).	Bangalay Sand Forest All Ecosystem Credit Species *Chalinolobus dwyeri* *Vespadelus troughtoni*	*Chalinolobus dwyeri*, *Vespadelus troughtoni* and most Ecosystem Credit Species are mobile, generalist fauna that benefit from increased foraging resources accessible through adequate habitat connectivity.
Waterbodies, water quality and hydrological processes	☐Yes / ☒No	There are no mapped watercourses within the Subject Property. Mullet Creek, a third order tributary of South Creek, occurs approximately 200m west of the Subject Land (**Figure 6**). The Subject Land has been mapped as a Coastal Wetland and within the Coastal Environment Area under the R&H SEPP. The proposed development will not substantially impact any waterbodies, water quality or hydrological process.	N/A	N/A
Wind turbine strikes (wind farm development only)	☐Yes / ☒No	N/A	N/A	N/A
Vehicle strikes	☐Yes / ☒No	The Subject Land occurs within an existing school with adjacent roads. The proposed development will not increase the risk of vehicle strikes.	N/A	N/A

Stage 2: Impact Assessment (Biodiversity Values and Prescribed Impacts)

7. Avoid and Minimise Impacts

7.1 Avoid and Minimise Direct and Indirect Impacts

7.1.1 Project Location

The Subject Land occurs in an existing school in the Northern Beaches local government area of Sydney. The proposed development has been located within a historically modified, edge-effected patch of native vegetation.

7.1.2 Project Design

The proposed development has been designed to retain as much native vegetation as possible and proposes additional native plantings and weed management to minimise ongoing indirect impacts to native vegetation that is being retained.

7.2 Avoid and Minimise Prescribed Impacts

7.2.1 Project Location

Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas as detailed (**Table 24**). When selecting a proposal's location, all of the following should be analysed. Justification for the decisions in determining the final location must be based on consideration of the items listed in **Table 24**.

The proposed development has the potential to impact the use of human-made structures as well as the habitat connectivity across the Subject Property. The proposed development involves the upgrade of infrastructure within an existing school and is unlikely to exacerbate impacts beyond the status quo.

Table 24. Measures to locate the proposal to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat

How has the proposal has been located in areas lacking biodiversity values?	The Subject Land occurs in an existing school with historically modified, infill planted and weed-infested native vegetation. The proposed development will maintain the biodiversity values of the Subject Land similar to the current condition.
How has the proposal has been located in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score)?	The vegetation within the Subject Property is of moderate condition (VI score 62.4), owing to a mature canopy over a mixed native exotic understorey including garden beds and lawn. The select removal of trees, avoidance of hollow-bearing trees and minimised area of disturbance will limit the impacts of the proposed development.
How does the proposal avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.	No important habitat will be impacted by the proposed development. While two threatened species with a high biodiversity risk rating (*Chalinolobus dwyeri, Vespadelus troughtoni*) and one TEC (Bangalay Sand Forest EEC) will be impacted, the impacts have been minimised to the select removal of trees and a small area of modified understorey vegetation. The impacts will not be significant for these entities and offsetting in accordance with the Biodiversity Offset Scheme is an appropriate mitigation method.
Has the proposal been located outside of the buffer area around breeding habitat features such as nest trees or caves?	The proposed development will avoid the removal of all hollow-bearing trees. No caves occur within the Subject Land. Threatened microbats may occasionally utilise cavities underneath and around the adjacent buildings for temporary roosting. The proposed development will not permanently impact their use of these structures. No threated fauna were observed breeding, or considered likely to breed within the Subject Land.
Has the proposal sought alternative:	
• **modes or technologies that would avoid or minimise impacts on biodiversity values**	Landscaping including weed management and regenerative plantings prioritising native indigenous species will be undertaken according to the Landscape Plan (Design Inc 2022).
• **routes that would avoid or minimise impacts on biodiversity values**	The proposed development has prioritised the upgrade of existing infrastructure to avoid the unnecessary removal of additional vegetation. The site is accessible from Namona Street, adjacent to the Subject Land, limiting additional disturbance.
• **locations that would avoid or minimise impacts on biodiversity values**	The Subject Land occurs in an existing school with historically modified, infill planted and weed-infested native vegetation.
• **sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.**	The Subject Land occurs in an existing school with historically modified, infill planted and weed-infested native vegetation. The proposed development has prioritised the upgrade of existing infrastructure to avoid the unnecessary removal of additional native vegetation.
Detail the site constraints that have contributed to selecting this location	
• **bushfire protection requirements, including clearing for asset protection zones**	There is no requirement to clear native vegetation for bushfire management.
• **flood planning levels**	The Subject Land occurs as a Coastal Wetland that may have historically been periodically inundated. Modern infrastructure has reduced the propensity of this occurring.
• **servicing constraints.**	The proposed development has been located close to the Namona Street frontage and the associated services. The proposed development will involve the upgrade of these services.

7.2.2 Project Design

This BDAR documents the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities (**Table 25**).

Table 25. Design the proposal to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat

Efforts to reduce the proposal's clearing footprint by minimising the number and type of facilities	The proposed development has prioritised the upgrade of existing infrastructure to avoid the unnecessary removal of additional native vegetation.
Efforts to locate ancillary facilities in areas that have no biodiversity values	The proposed development has prioritised the upgrade of existing infrastructure to avoid the unnecessary removal of additional native vegetation. The new substation and fire hydrant booster have been located close to the edge of the Subject Property along the fenceline for this reason.
Efforts to locate ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores)	The proposed development has prioritised the upgrade of existing infrastructure to avoid the unnecessary removal of additional native vegetation. The new substation and fire hydrant booster have been located close to the edge of the Subject Property along the fenceline where the vegetation is already disturbed.
Efforts to locate ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII)	The Subject Land is covered in its entirety by Bangalay Sand Forest EEC and potential habitat for threatened species. The proposed development has been designed to minimise vegetation removal to the select removal of trees, avoidance of hollow-bearing trees and disturbance to a historically modified understorey. The ancillary facilities have been located largely within the footprint of existing infrastructure, avoiding the need to broad-scale vegetation removal.
Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.	Landscaping including weed management and regenerative plantings prioritising native indigenous species will be undertaken according to the Landscape Plan (Design Inc 2022).

8. Impact Assessment

8.1 Direct Impacts

In accordance with section 8 of the BAM the assessor must determine the direct impacts on threatened entities and their habitat. The BDAR or BCAR must include an assessment of the impacts of the proposal on threatened entities and their habitat, and describe the direct impacts of the proposal on native vegetation, TECs and threatened species habitat.

8.1.1 Residual Direct Impacts

Table 26. Summary of residual direct impacts

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	**BC Act status**	**EPBC Act status**	**SAII entity**	**Project phase/timing of impact** (e.g. construction, operation, rehabilitation)	**Extent** (ha, number of individuals)
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	Endangered Ecological Community	-	No	Construction, Operation	0.17 ha

8.1.2 Change in Vegetation Integrity Scores

Table 27. Impacts to vegetation integrity

Vegetation zone	**PCT ID**	**Management zone**	**Area**	**Before development**				**After development**				**Change**
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
Mature Canopy	1793	Mature	0.15 ha	68.3	55.1	64.6	62.4	0	0	0	0	-62.4
Mature Canopy	1793	Overhang	0.02 ha	68.3	55.1	64.6	62.4	54.2	22.7	14.6	26.2	-36.2

8.2 Indirect Impacts

A detailed summary of residual indirect impacts to threatened entities is provided in **Table 28.**

Table 28. Summary of residual indirect impacts

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
(a) inadvertent impacts on adjacent habitat or vegetation	Bangalay Sand Forest EEC All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	During Construction and Ongoing	Long-term	Construction, Operation	In the unlikely event adjacent vegetation is cleared it is unlikely that this would cause significant impacts to threatened ecological communities or threatened species. The vegetation adjacent to the Subject Land occurs within an existing school and is historically modified. The proposed development is unlikely to exacerbate inadvertent impacts beyond the status quo. Mitigation measures including the management of soil erosion and sedimentation in compliance with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004) will adequately mitigate any inadvertent impacts.
(b) reduced viability of adjacent habitat due to edge effects	Bangalay Sand Forest EEC All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	During Construction and Ongoing	Long-term	Construction, Operation	The Subject Land and adjacent habitat is already impacted due to edge effects from existing surrounding land uses including wind shear, weed infestation, gross pollutants and litter. The proposed development is unlikely to exacerbate edge effects beyond the status quo.

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
(c) reduced viability of adjacent habitat due to noise, dust or light spill	Bangalay Sand Forest EEC All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	During Construction and Ongoing	Long-term	Construction, Operation	The proposed development may result in the increase of noise, dust or light spill associated with the construction activities. These impacts will not persist post-construction. The Subject Land's position within an existing school means that it is already subject to regular noise and light pollution. The proposed development is unlikely to exacerbate this reality beyond the current condition.
(d) transport of weeds and pathogens from the site to adjacent vegetation	Bangalay Sand Forest EEC All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	During Construction	Short-term	Construction	The proposed development will result in soil disturbance on the Subject Land which may result in the propagation and spread of weed propagules from the soil bank to the adjacent vegetation. The Subject Land and adjacent vegetation are already weed-infested with high threat exotic weeds including *Asaparagus aethiopicus, Ehrharta erecta* and *Lantana camara*. There is the potential for the construction vehicles to transport novel weeds onto the Subject Land and surrounds however this is unlikely to exacerbate this reality beyond the current condition.
(e) increased risk of starvation, exposure and loss of shade or shelter	Bangalay Sand Forest EEC All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	During Construction and Operation	Short-term, Possible long-term	Construction, Operation	The proposed development will not remove any hollowing-bearing trees. Substantial vegetation will remain on the Subject Land and surrounds. The removal of select trees and small areas of modified

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
						understorey will not significantly impact any threatened entities.
(f) loss of breeding habitats	All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	During Construction and Operation	Long term	Construction	The proposed development will not remove any hollow bearing trees or natural cave/crevice habitat. The select removal of trees from the Subject Land does not represent important breeding habitat for any threatened species. The vegetation being removed represents foraging habitat for *Chalinolobus dwyeri* and *Vespadelus troughtoni* with 2km of potential breeding habitat, and the buildings adjacent the Subject Land have the potential to be utilised as temporary roosting habitat by these species. The loss of this habitat is unlikely to be a significant impact at a species level for any threatened species.
(g) trampling of threatened flora species	N/A	N/A	N/A	N/A	N/A	No sensitive threatened flora considered likely to occur within the Subject Land.
(h) inhibition of nitrogen fixation and increased soil salinity	N/A	N/A	N/A	N/A	N/A	Unlikely to be exacerbated beyond status quo.
(i) fertiliser drift	N/A	N/A	N/A	N/A	N/A	Unlikely to be exacerbated beyond status quo.
(j) rubbish dumping	N/A	N/A	N/A	N/A	N/A	Unlikely to be exacerbated beyond status quo.
(k) wood collection	N/A	N/A	N/A	N/A	N/A	N/A
(l) bush rock removal and disturbance	N/A	N/A	N/A	N/A	N/A	N/A

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	Impacted entities (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	Extent (ha or zone reference)	Frequency	Duration (long-term/ short-term/ medium-term)	Project phase/ timing of impact (e.g. construction, operation, rehabilitation)	Likelihood and consequences
(m) increase in predatory species populations	All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	Ongoing	Long-term	Construction, Operation	It is likely that predatory animals occur in high densities already as the locality is disturbed and situated in an urban environment. The proposed development is unlikely to exacerbate this reality beyond the current condition.
(n) increase in pest animal populations	All ecosystem credit species *Chalinolobus dwyeri* *Vespadelus troughtoni*	0.17 ha	Ongoing	Long-term	Construction, Operation	It is likely that pest animals occur in high densities already as the locality is disturbed and situated in an urban environment. The proposed development is unlikely to exacerbate this reality beyond the current condition.
(o) increased risk of fire	N/A	N/A	N/A	N/A	N/A	Unlikely to be exacerbated beyond status quo.
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	N/A	N/A	N/A	N/A	N/A	While the Subject Land is mapped as a Coastal Wetland, it does not contain suitable specialist breeding or foraging habitat.

8.3 Prescribed Impacts

This section of the report addresses impact mitigation measures for prescribed impacts.

8.3.1 Karst, caves, crevices, cliffs, rocks or other geological features of significance

None of these features were identified within the Subject Land, though cliffs, caves and rocks are considered likely to occur within the Assessment Area including Irrawong Reserve. None of these will be impacted by the proposed development.

8.3.2 Human-made structures

The Subject Land contains some human-made structures detailed in **Table 29.**

Table 29. Residual prescribed impacts – impacts to human-made structures

Nature	Threatened fauna or flora protected fauna that are at risk	SAII entities at risk	Likelihood	Extent	Duration	Consequences
The Subject Land contains a concrete pathway, constructed garden beds and fencing. Existing school buildings occur adjacent.	*Chalinolobus dwyeri* *Vespadelus troughtoni*	*Chalinolobus dwyeri* *Vespadelus troughtoni*	High	Several existing buildings will be demolished.	This impact will be permanent.	These species will lose potential temporary roosting habitat. This is unlikely to be a serious and irreversible impact.

8.3.3 Non-native vegetation

Not applicable.

8.3.4 Habitat connectivity

The Subject Land contains habitat connectivity that will be impacted by the proposed development as detailed in **Table 30.**

Table 30. Residual prescribed impacts – impacts to habitat connectivity

Nature	Threatened fauna or flora protected fauna that are at risk	SAII entities at risk	Likelihood	Extent	Duration	Consequences
The Subject Property forms a minor habitat corridor that connects with major habitat corridors including Mullet Creek, South Creek and Heydon Reserve, Ingleside Park and the Warriewood Wetlands. The Subject Land contains highly productive habitat with mature	Bangalay Sand Forest EEC All Ecosystem Credit Species *Chalinolobus dwyeri* *Vespadelus troughtoni*	*Chalinolobus dwyeri* *Vespadelus troughtoni*	High	0.17 ha of Bangalay Sand Forest EEC	The existingvegetation will be removed, however proposed replacement plantings will uphold habitat connectivity across the Subject Land.	The removal of habitat from the Subject Land will minimally disrupt connectivity within the Subject Property. Vegetation being retained will ensure that impacts to habitat connectivity are negligible.

Nature	Threatened fauna or flora protected fauna that are at risk	SAll entities at risk	Likeliho od	Extent	Duration	Consequences
Banksias, Eucalypts and other fruiting vegetation over a weed-infested native understorey providing habitat to a high density of locally common birds and acts as a stepping-stone for fauna moving across the landscape.						

8.3.5 Waterbodies, water quality and hydrological processes

There are no mapped watercourses within the Subject Property. Mullet Creek, a third order tributary of South Creek, occurs approximately 200m west of the Subject Land. The Subject Land has been mapped as a Coastal Wetland and within the Coastal Environment Area under the R&H SEPP, however this area does not function like a wetland owing to historical disturbances and engineered changes to the hydrological regime. The proposed development will not substantially impact any waterbodies, water quality or hydrological process.

8.3.6 Wind turbine strikes

Not applicable.

8.3.7 Vehicle strikes

The Subject Land occurs within an existing school with adjacent roads. The proposed development will not increase the risk of vehicle strikes.

8.4 Mitigating residual impacts – management measures and implementation

The implementation of the recommended mitigation measures outlined in **Table 31** in accordance with the protocol outlined in **Table 32** will minimise the residual impacts of the proposed development.

Table 31. Summary of proposed mitigation and management measures for residual impacts (direct, indirect and prescribed)

Requirement	Mitigation measure
Assigning a Project Ecologist	Prior to construction, a qualified and experienced ecologist (>3 years of experience) with a minimum tertiary degree in science, conservation, biology, ecology, natural resource management, environmental science or environmental management will be engaged. The ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist must be a member of the NSW Ecological Consultants Association.
Tree Protection Zones	All trees to be retained must be protected in accordance with *Australian Standard - Protection of Trees on Development Sites (AS-4970-2009)*, which outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on development sites. It is an area isolated from construction disturbance so that the tree remains viable.

Requirement	Mitigation measure
	Works will be avoided within the TPZ of any trees that are proposed for retention.
Clearing of Vegetation and Fauna Habitat	Project Ecologist to undertake a pre-clearing survey of the Subject Land, identifying active hollows and/or nest. All felling of native trees should be supervised by an Ecologist who will be available on site to capture, treat/relocate any displaced fauna. Several nest boxes occur on the Subject Land. The Project Ecologist must supervise works in close proximity to these nest boxes, assessing whether they are active and propose a suitable protocol for works to proceed.
Salvage and Relocation of Woody Debris	No tree hollows are proposed for removal. Any tree hollows that are identified during the pre-clearing survey and removed should be carefully handled and salvaged for installation in a nearby tree with permission from neighbouring landholders, or relocated to a council reserve with permission from Northern Beaches Council. Coarse woody debris from tree felling should also be salvaged and relocated in the same manner.
Erosion and Sedimentation	Appropriate erosion and sediment control will be erected and maintained during construction. At minimum such measures will comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).
Storage and Stockpiling	Locate the construction site compound as well as all construction storage, stockpile and laydown areas within the project disturbance area i.e. away from any native vegetation that is planned to be retained. Ensure any soil imported from outside the site, if required, is free of weeds.
Management of Light, Noise and Dust from Construction	Appropriate light, noise and dust suppression methods must be implemented to reduce their impact on surrounding flora and fauna. Construction works should be limited to daylight hours.

Table 32. Implementation of the mitigation and management measures

Measure/action	**Monitoring and evaluation strategy** (Data, frequency, timing and reporting)	**Performance criteria** (linked to monitoring and evaluation strategy)	**Adaptive management threshold** (trigger for adaptive management plan/actions)	**Adaptive management response** (when triggered)
Assigning a Project Ecologist	Project Ecologist to be engaged by proponent. Ecologist to conduct a pre-clearing survey for any sensitive fauna, breeding fauna, or threatened species in the Subject Property. No less than 48 hours prior to clearing commencing.	Assigned Project Ecologist to prepare an '*Ecologist Pre-clearing Report*' to detail findings of the pre-clearing survey.	If a tree hollow, or nesting, sensitive, or threatened fauna or flora is found, the Ecologist will prepare a strategy to maximise likelihood of safe relocation.	Relocate sensitive fauna, or threatened entity. If tree hollow found, instruct an Arborist to carefully remove the hollow sections of the tree and prepare excised hollows for re-install within the Subject Land or Property.
Tree Protection Zones	Project Arborist (Qualified Consulting Arborist) to be engaged by proponent. Tree Protection Zone (TPZ) fencing to be installed around any trees on adjacent landholdings which may be impacted by the	Project Abrorist to supervise the installation of TPZ fencing. Arborist to provide letter with photographic evidence to confirm appropriate controls have been installed.	If any excavation works that occur within the 'drip zones' or structural root zones of trees that are to be retained on the Subject Property or neighbours property.	Stop works immediately. Qualified Consulting Arborist must be present to supervise any excavation works and provide advice to ensure such works do not harm trees on adjacent properties.

Measure/action	Monitoring and evaluation strategy (Data, frequency, timing and reporting)	Performance criteria (linked to monitoring and evaluation strategy)	Adaptive management threshold (trigger for adaptive management plan/actions)	Adaptive management response (when triggered)
	proposed excavation or construction.			
Clearing of Vegetation and Fauna Habitat	Project Ecologist to supervise all vegetation clearing and works in close proximity to the nest boxes within the Subject Land.	Assigned Project Ecologist to prepare an '*Ecologist Post-clearing Report*' to detail findings clearing works.	N/A	N/A
Salvage and Relocation of Woody Debris	To be documented and confirmed by Project Ecologist.	At least 20 metres of course woody debris (felled tree trunks, not branches or root balls) to be salvaged and relocated to a suitable position within the Subject Property or public reserve as identified by Council, under the supervision of the Project Ecologist.	If Council cannot identify a suitable location to donate coarse woody debris too, contact Local Land Services or NSW Fisheries and see if they have a restoration project that may use the debris.	Find a suitable recipient site for receipt of the 20 metres of coarse woody debris and felled tree trunks. Contact Council, NSW Fisheries or Local Land Services to determine a suitable recipient of the logs so they can continue to provide habitat for fauna.
Erosion and Sedimentation	Appropriate Erosion and Sedimentation Controls informed by the Blue Book (Landcom 2004) to be included in a Construction Environmental Management Plan (CEMP) commissioned by the proponent.	Minimum industry standards enforced prior to and during earthworks, clearing and construction.	If controls are not properly installed, or fail.	Engage Earthworks Contractor, Civil or Environmental Engineer to install appropriate controls within 24 hours of the breach.
Storage and Stockpiling	All storage and stockpiling of construction resources must be in appropriate laydown areas away from the dripline of trees that will be retained.	No inadvertent impacts to habitat or vegetation.	Inadvertent impacts occur to adjacent vegetation as a result of improper management of construction materials.	Review controls and implement new measures. Remediate the vegetation impacted by the inadvertent impact under the guidance of the Project Ecologist.
Management of Light, Noise and Dust from Construction	Restrict construction to daylight hours. Manage dust, erosion and runoff in accordance with the provisions of 'The Blue Book' (Landcom 2004). Limit the unnecessary use of flood lighting.	Control measures implemented.	Control measures ineffective, resulting in disturbance to protected flora or fauna, or disturbance to nearby landholders.	Review controls and implement new measures under guidance of Construction Contractor to adequately mitigate impacts.

8.5 Adaptive management strategy for uncertain impacts

There are no anticipated uncertain impacts.

9. Serious and Irreversible Impacts

9.1 Assessment for serious and irreversible impacts on biodiversity values

There are two entities at risk of a serious and irreversible impact (SAII) from the proposed development (**Table 33**):

- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Eastern Cave Bat (*Vespadelus troughtoni*)

Due to the potential sensitivity of these species to any impact on habitat as a result of the proposed development, a determination of whether or not the proposed impacts are serious and irreversible is to be undertaken in accordance with section 9.1 of the BAM (OEH 2020a) and section 3.2 of the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (OEH 2017b) (**Table 34**).

The TBDC profiles for both of these species states the following:

"Any impacts on breeding habitat used by this species could be considered potentially serious and irreversible… Species polygon boundary should align with PCTs on the subject land to which the species is associated that are within 2km of identified potential roost habitat features."

Owing to the proponent's request for an expedited BDAR, no targeted surveys were carried out for these species. Pursuant of the precautionary principle and owing to recent proximal records of both of these SAII species, both species were assumed present within the Subject Land. While no known breeding habitat occurs within the Subject Land, potential breeding habitat is considered likely to occur within Irrawong Reserve within 2km of the Subject Land. Potential roost habitat features including existing buildings with open cavities underneath as well as potential foraging habitat surrounding these potential roosting features occur within the Subject Land and will be removed for the proposed development.

It is considered unlikely that the proposed development will cause a serious and irreversible impact (SAII) to the Large-eared Pied Bat or the Eastern Cave Bat, however the final determination of whether an impact is serious and irreversible lies with the consent authority, Northern Beaches Council.

Table 33. Entities at risk of SAII

Common name	Scientific name	Reason for inclusion in assessment
Large-eared Pied Bat	*Chalinolobus dwyeri*	Potential breeding habitat is considered likely to occur within Irrawong Reserve within 2km of the Subject Land. Potential roost habitat features including existing school buildings with open cavities underneath (that may provide temporary roosting habitat for these bats) as well as potential foraging habitat (native vegetation) surrounding these potential roosting features occur within the Subject Land and will be removed for the proposed development.
Eastern Cave Bat	*Vespadelus troughtoni*	Potential breeding habitat is considered likely to occur within Irrawong Reserve within 2km of the Subject Land. Potential roost habitat features including existing school buildings with open cavities underneath (that may provide temporary roosting habitat for these bats) as well as potential foraging habitat (native vegetation) surrounding these potential roosting features occur within the Subject Land and will be removed for the proposed development.

Table 34. Serious and Irreversible Impact Assessment for the Large-eared Pied Bat and Eastern Cave Bat

Serious and Irreversible Impact (SAII) **Impact assessment provisions for threatened species or populations:** Large-eared Pied Bat (*Chalinolobus dwyeri*) Eastern Cave Bat (*Vespadelus troughtoni*)		
BC Act Status: Vulnerable		
a) The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII.	The proposed development will not remove any known breeding habitat for these species. Direct impacts are limited to the removal of existing buildings that are in good condition though have an open cavity underneath the flooring which these bats may occasionally utilise for temporary roosting, and the select removal of trees from the Subject Land which represents potential foraging habitat for these species that may forage for insects around the tree canopies. The development has been designed to minimise tree removal, and will not remove any known breeding, roosting or foraging habitat considered to be important to the survival of these species in the locality.	
b) The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification.	The local populations of these species is largely unknown however NSW BioNet records represent an indication of the prevalence of these species in the locality. There are 14 occurrence records of Large-eared Pied Bat in the 10km locality and one record of the Eastern Cave Bat has in the 10km locality. Each record represents a minimum of one individual of each species.	
c) The extent to which the impact exceeds any threshold for the potential entity	Thresholds for these species have not yet been determined by the DPIE. A total area of 0.17 ha of potential foraging habitat and approximately three small school buildings (containing crevices which may be used for temporary roosting) representing an area of approximately 300m^2 will be removed for the proposed development.	
d) The likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to:	**i. an estimate of the change in habitat available to the local population as a result of the proposed development**	A total area of 0.17 ha of potential foraging habitat and approximately three small school buildings representing an area of approximately 300m^2 will be removed for the proposed development. Substantial existing foraging habitat will be retained within and adjacent to the Subject Land. The habitat within the Subject Land will be supplemented with the planting of predominantly locally indigenous plants.
	ii. the proposed loss, modification, destruction or isolation of the available habitat used by the local population	A total area of 0.17 ha of potential foraging habitat and approximately three small school buildings representing an area of approximately 300m^2 will be removed for the proposed development. Owing to the retention of vegetation within the Subject Land, habitat connectivity will be upheld across the Subject Land in a similar condition as present and will avoid the isolation of this habitat for the local populations of these species.
	iii. modification of habitat required for the maintenance of processes	The Subject Land requires minor modification of habitat that may be used for the maintenance of processes

Serious and Irreversible Impact (SAII) **Impact assessment provisions for threatened species or populations:** Large-eared Pied Bat (*Chalinolobus dwyeri*) Eastern Cave Bat (*Vespadelus troughtoni*)		
	important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development.	important to the species' life cycle, however it is not believed the habitat is 'important'. The habitat occurs in a highly modified and managed condition. While some natural regeneration occurs within some of the garden beds within the Subject Land, most of the flora and fauna within the Subject Land requires supplementary habitat outside of the Subject Land. The proposed development will not alter this reality.
e) The likely impact on the ecology of the local population. At a minimum, address the following: i. for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways ii. for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available: – pollination cycle – seedbanks – recruitment, and – interactions with other species (e.g. pollinators, host species, mycorrhizal associations).	The likely impacts on the ecology of the local populations of these species include: • Breeding: No known or potential breeding habitat will be removed from the Subject Land as a result of the proposed development. • Foraging: 0.17ha of potential foraging habitat will be removed from the Subject Land as a result of the proposed development. The majority of mature trees will be retained within the Subject Land. As such, both of these species will continue to forage within the Subject Land in the same capacity. • Roosting: Approximately three small school buildings representing an area of approximately 300m^2 that are in good condition though have an open cavity underneath the flooring which these bats may occasionally utilise for temporary roosting, will be removed for the proposed development. The removal of these buildings reduces the likelihood of these bats roosting within the Subject Land, however this habitat is not considered important to the long-term viability of a population of either of these species in the locality. • Dispersal/Movement Pathways: Owing to the retention of vegetation within the Subject Land, habitat connectivity will be upheld across the Subject Land in a similar condition as present and will avoid the isolation of this habitat for the local populations of these species.	
f) A description of the extent to which the local population will become fragmented or isolated as a result of the proposed development.	Owing to the retention of vegetation within the Subject Land, habitat connectivity will be upheld across the Subject Land in a similar condition as present and will avoid the isolation of this habitat for the local populations of these species. Habitat corridors will continue to exist that connect with Irrawong Reserve.	

Serious and Irreversible Impact (SAII) **Impact assessment provisions for threatened species or populations:** Large-eared Pied Bat (*Chalinolobus dwyeri*) Eastern Cave Bat (*Vespadelus troughtoni*)	
g) The relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range.	Habitat corridors exist between the Subject Land and Irrawong Reserve, extending into Ku-ring-gai Chase National Park. The local population of this species is expected to disperse throughout these habitat patches and have good connectivity with other populations in the area. These habitat corridors will continue to exist post-development.
h) The extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population.	The Subject Land occurs in an existing school. The proposed development will not substantially alter the land-use or habitat values within the landscape. As such, the proposed development is unlikely to lead to a decrease in the viability of a local population.
i) An estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion.	The Commonwealth Conservation Advice for the Large-eared Pied Bat (DAWE 2021) estimates the total population of this species to be less than 20,000 individuals, and suggests that it is uncommon within the Sydney Basin IBRA region with a patchy distribution throughout sandstone areas. There is little available information about the Eastern Cave Bat. This species has been recorded in colonies of up to 500 individuals according to the OEH Profile. There is only one record in the 10km locality of the Subject Land.
j) The measure/s proposed to contribute to the recovery of the species in the IBRA subregion.	The retention of vegetation within the Subject Land ensures habitat connectivity will be upheld across the Subject Land in a similar condition as present and will avoid the isolation of this habitat for the local populations of these species. The habitat within the Subject Land will be supplemented with the planting of predominantly locally indigenous plants that will support foraging habitat for these species.

10. Impact Summary

10.1 Determine an offset requirement for impacts

10.1.1 Impacts on Native Vegetation and Threatened Ecological Communities

Impacts to native vegetation as a result of the proposed development that do not require offsetting are detailed in **Table 35**. There are no impacts that do not require offsetting for the proposed development.

Impacts to native vegetation as a result of the proposed development that do require offsetting are detailed in **Table 36**.

The impact area of the proposed development (0.17 ha) is defined as the maximum extent of vegetation disturbance measured by extent of the Tree Protection Zones as identified by the Arborist Report (Independent Arboricultural Services 2022) for trees being removed, and all potential disturbance of the shrub and groundcover layers according to the proposed development footprint. The precautionary principle has been applied, assuming the presence of native vegetation and the potential for disturbance within the proposed development footprint except where existing artificial infrastructure occurs.

Table 35. Impacts that do not require offset - ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Entity at risk of an SAII?	Current VI score
N/A	N/A	N/A	N/A	Choose an item.	N/A

Table 36. Impacts that require an offset - ecosystem credits

Vegetation zone	PCT name	Management Zone	TEC	Impact area	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
Mature Canopy	PCT 1793: Coastal Sand Bangalay Forest	Mature	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	0.15 ha	62.4	0	-62.4	2	5
Mature Canopy	PCT 1793: Coastal Sand Bangalay Forest	Overhang	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	0.02 ha	62.4	26.2	-36.2	2	
								Total credits	5

10.1.2 Impacts on Threatened Species and their Habitat (Species Credits)

Impacts to threatened species as a result of the proposed development that require offsetting are detailed in **Table 37.** The Species Polygons are shown in **Appendix D.**

Table 37. Impacts that require an offset - species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	0.17 ha	3	8
Eastern Cave Bat	*Vespadelus troughtoni*	Vulnerable	-	0.17 ha	3	8
					Total credits	16

10.1.3 Indirect and prescribed impacts

Proposed offsets for the residual indirect and prescribed impacts as a result of the proposed development are summarised in **Table 38.** There are no proposed offsets for residual indirect or prescribed impacts.

Table 38. Summary of proposed offsets for residual indirect and prescribed impacts

Residual indirect or prescribed impact (identified after mitigation)	Proposed offset (additional biodiversity credit requirement and/or other conservation measures)
N/A	N/A

10.2 Impacts that do not need further assessment

Impacts that do not need further assessment for ecosystem credits are detailed in **Table 39.** There are no impacts that do no require further assessment.

Table 39. Impacts that do not need further assessment for ecosystem credits

Impact	Location within subject land	Justification why no further assessment is required
N/A	N/A	N/A

11. Biodiversity Credit Report

11.1 Ecosystem credits

In accordance with section 9.2.1 of the BAM (DPIE 2020a) the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

a. ≥15, where the PCT is representative of an EEC or a CEEC

b. ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community

c. ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

The ecosystem credits requiring retirement for the proposed development are summarised in

Table 40.

Table 40. Ecosystem credits class and matching credit profile

Credits to Retire	Attributes shared with matching credits						
	PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC or EC	Offset trading group (BAM Section 10.2, Tables 4 & 5)	Hollow bearing trees present?	IBRA subregion (in which proposal is located)
5	**1793 - Coastal Sand Bangalay Forest**	South Coast Sands Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*	*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions* *This includes PCT's:* *659, 1793, 1794*	Yes	Pittwater

11.2 Species credits

In accordance with section 9.2.2 of the BAM (DPIE 2020a):

> 1. The assessor must determine an offset for the impacts of proposals on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥17.
>
> 2. The assessor must determine an offset for the impacts of proposals on threatened species that require species credits, identified in accordance with Chapter 5 of the BAM (DPIE 2020a).
>
> 3. The method for determining offset requirements for impacts on threatened species and threatened species habitat is described in Chapter 10 of the BAM (DPIE 2020a).
>
> 4. An offset requirement can be proposed for a prescribed impact in accordance with Section 8.6 of the BAM (DPIE 2020a).

The species credits that require offsetting for the proposed development are summarised in **Table 41**. The Species Polygons are shown in **Appendix D**.

Table 41. Species credit class and matching credit profile

Credits to Retire	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
8	*Chalinolobus dwyeri* / Large-eared Pied Bat	-	-	-	Any in NSW
8	*Vespadelus troughtoni* / Eastern Cave Bat	-	-	-	Any in NSW

12. Other Relevant Legislation, Plans & Policies Requiring Address

12.1 Pittwater Local Environmental Plan 2014

This section details Environmental Controls relevant to the terrestrial biodiversity associated with the Subject Property and surrounds (**Table 42**).

Table 42. Environmental controls relevant to the terrestrial biodiversity associated with the Subject Property and surrounds.

Local Environmental Plan Reference	Application	Suitable Action
Part 2.1 Land Use Zones	The Subject Property is zoned 'SP2 – Infrastructure'.	The proposed development is permitted with consent.
Part 7.2 Earthworks	The proposed development will require earthworks that will impact native vegetation.	All trees proposed to be retained can be protected without adverse effects through appropriate protective measures advised by a qualified Consulting Arborist (Independent Arboricultural Services 2022) and by following industry guidelines outline in the 'Blue Book' (Landcom 2004).
Part 7.6 Terrestrial Biodiversity	The entirety of the Subject Property is mapped as containing 'Biodiversity' on the Terrestrial Biodiversity Map (Northern Beaches Council 2022).	The native vegetation within the Subject Land is a patch of modified native vegetation which corresponds to 'PCT 1793: Coastal Sand Bangalay Forest' and qualifies as Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions EEC. A total of 0.17 ha of vegetation belonging to this community will be disturbed. The offsetting of credits, replacement plantings proposed as part of the Landscape Plan (Design Inc 2022) and the mitigation measures outlined in **Table 31** suitably address this control. No significant impacts to threatened flora, fauna or ecological communities are considered likely to occur as a result of the proposed development.

12.2 Pittwater Development Control Plan 2021

This section details Development Controls relevant to the terrestrial biodiversity within the Subject Property and surrounds (**Table 43**).

Table 43. Development controls relevant to the terrestrial biodiversity within the Subject Property and surrounds

Control Number	Control Name	Does this control apply?	Reason	Suitable Action Proposed
B4.1	Flora and Fauna Conservation Category 1 Land	No	Does not apply.	No action required.

Control Number	Control Name	Does this control apply?	Reason	Suitable Action Proposed
B4.2	Flora and Fauna Conservation Category 1 and Wildlife Corridor	No	Does not apply.	No action required.
B4.3	Flora and Fauna Habitat Enhancement Category 2 Land	Yes	The Subject Land is mapped within C02 on the Pittwater 21 DCP – Wildlife Corridor Map.	The proposed development will retain and enhance habitat for threatened species and endangered ecological communities. The Landscape Plan (Design Inc 2022) ensures no net loss of native canopy trees and includes at least 60% native vegetation and no environmental weeds.
B4.4	Flora and Fauna Conservation Category 2 and Wildlife Corridor	No	The Subject Land is mapped within C02 on the Pittwater 21 DCP – Wildlife Corridor Map.	The proposed development will retain and enhance habitat for threatened species and endangered ecological communities. The Landscape Plan (Design Inc 2022) ensures no net loss of native canopy trees and includes at least 60% native vegetation and no environmental weeds.
B4.5	Landscape and Flora and Fauna Enhancement Category 3 Land	No	Does not apply.	No action required.
B4.6	Wildlife Corridors	Yes	The Subject Land is mapped within C02 on the Pittwater 21 DCP – Wildlife Corridor Map.	The proposed development will retain and enhance habitat for threatened species and endangered ecological communities. The Landscape Plan (Design Inc 2022) ensures no net loss of native canopy trees and includes at least 60% native vegetation and no environmental weeds.
B4.7	Pittwater Spotted Gum Forest – Endangered Ecological Community (EEC)	No	No Pittwater Spotted Gum EEC occurs on the Subject Land.	No action required.
B4.8	Freshwater Wetland Endangered Ecological Community	No	The Subject Land has been mapped as a Coastal Wetland under the R&H SEPP however no Freshwater Wetlands EEC is	No action required.

Control Number	Control Name	Does this control apply?	Reason	Suitable Action Proposed
			located on or near the Subject Land.	
B4.9	Duffys Forest Endangered Ecological Community	No	No Duffys Forest EEC on or near the Subject Land.	No action required.
B4.10	Themeda Grasslands – Endangered Ecological Community	No	No Themeda grasslands located on or near the Subject Land.	No action required.
B4.11	Land Adjoining Bushland	No	No mapped bushland adjoins the Subject Land, though the Subject Land has connectivity to the Warriewood Wetlands, Irrawong Reserve and Ku-ring-gai National Park.	No action required.
B4.12	Mangrove Conservation	No	No mangroves located on or near the Subject Land.	No action required.
B4.13	Freshwater Wetlands (non Endangered Ecological Community)	No	The Subject Land has been mapped as a Coastal Wetland under the R&H SEPP. Northern Beaches Council mapping (Northern Beaches Council 2022) identifies the Subject Land within both the 'Low' and 'Medium' risk precincts on the flood hazard map, indicating the propensity for the Subject Land to become periodically inundated, operating as a freshwater wetland during these times.	The proposed development will maintain existing wildlife corridors and the Landscape Plan (Design Inc 2022) ensures no net loss of native canopy trees and includes at least 80% native vegetation in replanting efforts and no environmental weeds.
B4.14	Development in the Vicinity of Wetlands	Yes	The Subject Land has been mapped as a Coastal Wetland under the SEPP (Resilience and hazards) 2021. Swamp Oak Floodplain Forest has been identified along Mullet Creek, approximately 150m west of the Subject Land.	The proposed development will not adversely impact the Swamp Oak Floodplain Forest, will comply with Council's Water Management for Development Policy, will allow adequate buffers, will ensure wildlife corridors are maintained and will include at least 60% native vegetation in replanting efforts.
B4.15	Saltmarsh Endangered Ecological Community	No	No saltmarsh located on or near the Subject Land.	No action required.
B4.16	Seagrass Conservation	No	No seagrass habitat located on or near the Subject Land.	No action required.
B4.17	Littoral Rainforest – Endangered Ecological Community	No	No littoral rainforest located on or near the Subject Land.	No action required.
B4.18	Heathland/Woodland Vegetation	No	No heathland/woodland vegetation located on or near the Subject Land.	No action required.
B4.19	Estuarine Habitat	No	No estuarine habitat located on the Subject Land.	No action required.

Control Number	Control Name	Does this control apply?	Reason	Suitable Action Proposed
B4.20	Protection of Estuarine Water Quality	No	No estuarine habitat located on the Subject Land.	No action required.
B4.21	Bush-Stone Curlew Habitat	No	No habitat suitable for this species.	No action required.
B4.22	Preservation of Trees and Bushland Vegetation	Yes	The proposed DA will result in the select removal of seven trees within the Subject Land, retaining 8 other trees within the Subject Land.	All tree removal will be conducted with permission from Northern Beaches Council.

12.3 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

One Matter of National Significance was assumed present within the Subject Land:

- *Chalinolobus dwyeri* Large-eared Pied Bat – EPBC listed: Vulnerable

An EPBC Assessment of Significance was undertaken for this species. It is considered unlikely that the proposed development will significantly impact this species (**Appendix C**). A referral to the Commonwealth is not recommended in order for the proposed development to proceed.

12.4 State Environmental Planning Policy (Biodiversity and Conservation)

12.4.1 Chapter 2: Vegetation in Non-Rural Areas

All clearing of vegetation (native and non-native) including dying or dead vegetation that is required as habitat of native animals (ie. Hollow-bearing stags) requires a permit granted by the local council (Northern Beaches Council).

12.4.2 Chapter 4: Koala Habitat Protection

The Subject Land is located within a Local Government Area listed in Schedule 1 of the Koala Habitat Protection Chapter. Four species of 'Koala Use Tree Species' (OEH 2018, NSW DPIE 2022f) listed in Schedule 2 of this Koala Habitat Protection Chapter were identified within the Subject Land with documented koala use in the Central Coast Koala Management Area (**Table 44**). A review of NSW Wildlife Atlas data (BioNet) (NSW DPIE 2021c) revealed 16 koala records in the 10km locality, though the majority are historical records and spatially distorted on BioNet. The only recent record is from 2020 near the Wakehurst Parkway near Cromer Heights approximately 4.3km south-west of the Subject Land.

Table 44. Koala use tree species within the Subject Land

Species	Documented Koala Use in the Central Coast Koala Management Area
Angophora costata	Low use
Banksia integrifolia	No sourced evidence of use
Eucalyptus botryoides	Significant use
Eucalyptus robusta	High use

12.5 State Environmental Planning Policy (Resilience and Hazards) 2021

The R&H SEPP applies to land within the 'Coastal Environment Area' and aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*.

The Subject land is located within an area mapped as a 'Coastal Wetland' and occurs within the 'Coastal Environment Area' mapped under this SEPP (**Figure 4**).

As a result, the proposed development is declared to be a designated development. In order for the development to proceed, the consent authority must be satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland. The consent authority must also consider potential adverse impacts on:

> (a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,
>
> (b) coastal environmental values and natural coastal processes,
>
> (c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,
>
> (d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,
>
> (e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
>
> (f) Aboriginal cultural heritage, practices and places,
>
> (g) the use of the surf zone.

This BDAR has been prepared to address these potential impacts including the offset of vegetation and species habitat. Land Eco finds that the proposed development will not adversely impact the Coastal Wetland or the Coastal Environment Area as mapped under the R&H SEPP. The proposed development has been located and designed for the purposeful use of the Subject Land as a school while minimising native vegetation clearing and mitigating impacts to the ecological environment. Coastal environmental values and natural coastal processes will continue according to the status quo. Furthermore, native fauna and their habitat will not be significantly impacted. Offsetting is an appropriate action for the mitigation of the proposed development.

12.6 Fisheries Management Act 1994

The Subject Land contains no mapped 'Key Fish Habitat'. Mullet Creek, which is mapped as 'Key Fish Habitat – Sydney Metro', occurs approximately 200m west of the Subject Land. This watercourse will not be impacted by the proposed development.

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14. Appendices

Appendix A. Fauna recorded in Subject Property by Land Eco Consulting

Appendix B. Matters of National Environmental Significance

Appendix C. BAM VIS Field Survey Forms (copied from electronic data sheet)

Appendix D. Species Polygons for Threatened species within the Subject Land

Appendix E. Biodiversity Credit Reports from Biodiversity Assessment Method Calculator

Appendix A. Fauna recorded in Subject Property by Land Eco Consulting

Class	Species	Scientific Name	Status
Aves	Australasian Figbird	*Sphecotheres vieilloti*	Native Protected
Aves	Pacific Koel	*Eudynamys orientalis*	Native Protected
Aves	Australian King Parrot	*Alisterus scapularis*	Native Protected
Aves	Noisy Miner	*Manorina melanocephala*	Native Protected
Aves	Sulphur-crested Cockatoo	*Cacatua galerita*	Native Protected
Aves	Australian Raven	*Corvus coronoides*	Native Protected
Aves	Laughing Kookaburra	*Dacelo novaguineae*	Native Protected
Aves	Channel-billed Cuckoo	*Scythrops novaehollandiae*	Native Protected
Aves	Australian White Ibis	*Threskiornis moluccus*	Native Protected
Aves	Feral Pigeon	*Columba livia domestica*	Non-native, Pest
Aves	Welcome Swallow	*Hirundo neoxena*	Native Protected
Aves	Crested Pigeon	*Ocyphaps lophotes*	Native Protected
Mammalia	Rabbit	*Oryctolagus cuniculus*	Non-native, Pest

Appendix B. Matters of national environmental significance

Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 Vulnerable species Significant impact criteria	
Vulnerable Species ***Chalinolobus dwyeri* (Large-eared Pied Bat)** **EPBC Act: Vulnerable**	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
• lead to a long-term decrease in the size of an important population of a species	The proposed development will not impact important breeding habitat for this species or substantially reduce the foraging resources available. The loss of temporary roosting habitat is not important to the persistence of this population in the locality. As such, the Activity will not lead to a long-term decrease in the size of a population of either of these species.
• reduce the area of occupancy of an important population	The proposed development will remove a maximum of 0.17 ha of forest habitat. The Large-eared Pied Bat will continue to forage in the Subject Land post-development. The proposed Activity will not have a significant impact on the area of occupancy of this species.
• fragment an existing important population into two or more populations	Habitat corridors exist between the Subject Land and Irrawong Reserve, extending into Ku-ring-gai Chase National Park. The local population of this species is expected to disperse throughout these habitat patches and have good connectivity with other populations in the area. These habitat corridors will continue to exist post-development. The proposed development will not separate areas of habitat or fragment an existing population.
• adversely affect habitat critical to the survival of a species	The proposed development will not remove habitat critical to the survival of this species. This species is not known to breed in the Subject Land. The Subject Land does not represent critical foraging or roosting habitat as it is edge-effect due to its position within an existing school and urban matrix.
• disrupt the breeding cycle of an important population	The proposed development will not disrupt the breeding cycle of a population of this species. No breeding habitat will be directly impacted by the proposed development. While the Subject Land contains potential roosting and foraging habitat within 2km of potential breeding habitat within Irrawong Reserve, it is unlikely that the proposed development will prevent this species breeding at Irrawong Reserve.
• modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed development will remove a maximum of 0.17 ha of forest habitat. The Large-eared Pied Bat will continue to forage in the Subject Land post-development. No breeding habitat will be directly impacted for the proposed Activity. Approximately three small school buildings representing an area of approximately 300m^2 that are in good condition though have an open cavity underneath the flooring which these bats may occasionally utilise for temporary roosting, will be removed for the proposed development. The removal of these buildings reduces the likelihood of these bats roosting within the Subject Land, however this habitat is not considered important to the long-term viability of a population of either of these species in the locality. The impacts of the proposed development have been avoided and minimised to reduce potential impacts on this species. As such, the species is unlikely to decline as a result of the proposed Activity.
• result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Common urban invasive flora and fauna species including Fox, Black Rat, and a range of exotic weeds are present or considered likely to occur within the Subject Land regardless of the development. The proposed development will not result in an increased propensity of invasive species being introduced into the Subject Land.

Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 Vulnerable species Significant impact criteria	
• introduce disease that may cause the species to decline, or	The proposed development is unlikely to introduce a novel disease that may cause the species to decline.
• interfere substantially with the recovery of the species.	The proposed development will not remove important habitat for this species. The Large-eared Pied Bat is likely to continue foraging within the Subject Land post-development, though temporary roosting is slightly less likely. The proposed development will not substantially interfere with the recovery of this species.

Appendix C. BAM VIS Field Survey Forms (copied from electronic data sheet). Transcribed from the scanned data sheet completed by Isaac Mammott.

BAM Site - Field Survey Form

Date:	**10/6/22**	**Plot ID:**	**1**	**Photo #:**	
Zone:	**56**	**Plot Dimensions:**	**20x50**	**Easting:**	342204
Datum:		**Middle Bearing (o) at 0m:**	100	**Northing:**	6269855
PCT:	661	**Condition Class**		**Ecologists:**	Isaac Mammott

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

Growth Form	Scientific Name	Cover	Abundance	DBH	# Tree Stems Count	Number of Hollow-bearing Trees
Tree (TG)	*Banksia integrifolia*	10	N/A	**80+cm**	2	1
Fern (EG)	*Pteridium esculentum*	10	N/A	**50-79cm**	5	1
Fern (EG)	*Asplenium australasicum*	0.5	2	**30-49cm**	y	
Fern (EG)	*Nephrolepis cordifolia*	5	50	**20-29cm**	y	
Forb (FG)	*Viola hederacea*	3	100	**10-19cm**	y	
Forb (FG)	*Commelina cyanea*	0.5	30	**5-9cm**	y	
Forb (FG)	*Dichondra repens*	0.3	20	**<5cm**		
Grass & grasslike (GG)	*Lomandra longifolia*	0.5	6			
Grass & grasslike (GG)	*Oplismenus aemulus*	2	50	**Length of Logs (m)**	6	
Grass & grasslike (GG)	*Cyperus imbecillis*	1	30	(≥10 cm diameter, >50 cm in length)		
HTW	*Asparagus aethiopicus*	1	10			
HTW	*Ochna serrulata*	1	20	**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
HTW	*Ehrharta erecta*	1	30	**1**	60	
HTW	*Cinnamomum camphora*	5	5	**2**	30	
HTW	*Cestrum parqui*	0.5	4	**3**	50	
HTW	*Senna pendula*	0.5	2	**4**	60	
HTW	*Lantana camara*	0.3	1	**5**	50	
HTW	*Ligustrum sinense*	1	1	**Average (#no./5)**	**50**	
HTW	*Asparagus plumosus*	0.3	4	Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes		

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

Other (OG)	Smilax glyciphylla	0.2	3	leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.
Other (OG)	Archontophoenix cunninghamiana	0.5	1	
Other (OG)	Livistona australis	5	3	
Other (OG)	Hibbertia scandens	0.5	4	
Shrub (SG)	Banksia ericifolia	0.2	1	
Shrub (SG)	Breynia oblongifolia	1	20	
Shrub (SG)	Syzygium australe	1	2	
Shrub (SG)	Monotoca elliptica	2	2	
Shrub (SG)	Acacia longifolia	0.5	3	
Shrub (SG)	Synoum glandulosum subsp. glandulosum	0.1	1	
Shrub (SG)	Pittosporum undulatum	0.5	2	
Shrub (SG)	Elaeocarpus reticulatus	1	2	
Tree (TG)	Brachychiton acerifolius	5	2	
Tree (TG)	Notelaea longifolia	0.5	3	
Tree (TG)	Eucalyptus botryoides	20	N/A	
Tree (TG)	Glochidion ferdinandi	2	2	
#N/A	Strelitzia sp.	5	2	
#N/A	Solanum nigrum	1	10	
#N/A	Yucca sp.	0.5	3	
#N/A	Agapanthus sp.	0.3	2	
#N/A	Conyza sp.	0.2	4	

Growth Form	Composition Data	Structure Data
Tree	**5**	**37.5**
Shrub	**8**	**6.3**
Grass	**3**	**3.5**
Forb	**3**	**3.8**
Fern	**3**	**15.5**
Other	**4**	**6.2**
H.T.E	**9**	**10.6**

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

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

Appendix D. Species Polygons for Species Credits

Legend

Subject Land

Chalinolobus dwyeri

Vespadelus troughtoni

0 10 20 40 60 80 Metres

N W E S

Date: 12/12/2022

Imagery: © NSW EPI Nearmap

Coordinate System: GDA 1994 MGA Zone 56

Land Eco consulting

www.landeco.com.au

This map was produced for this report only.
It is not to be used for design or construction purposes.
The data used in these maps is not survey accurate.

Appendix F. BAM Credit Summary Report from the Biodiversity Assessment Method Calculator

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00025914/BAAS18059/22/00032728	Brooklyn Boardwalk - Kangaroo Point to Brooklyn Road	19/12/2022
Assessor Name	Report Created	BAM Data version *
Kurtis Lindsay	18/01/2023	56
Assessor Number	BAM Case Status	Date Finalised
BAAS18059	Finalised	18/01/2023
Assessment Revision	Assessment Type	BOS entry trigger
1	Part 4 Developments (Small Area)	BOS Threshold: Biodiversity Values Map

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

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

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

Central Coast Escarpment dry forest												
2	1557_Dryforest	Not a TEC	81.2	81.2	0.12	PCT Cleared - 35%	High Sensitivity to Gain			1.50		4
											Subtotal	**4**
Estuarine Swamp Oak forest												
1	1234_SwampOakEEC	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	55.8	55.8	0.01	PCT Cleared - 90%	High Sensitivity to Gain	Endangered Ecological Community	Endangered	2.00		1
											Subtotal	**1**
											Total	**5**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)									
1234_SwampOakEEC	55.8	55.8	0.01			Vulnerable	Not Listed	False	1

1557_Dryforest	81.2	81.2	0.12			Vulnerable	Not Listed	False	5
								Subtotal	**6**

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00025914/BAAS18059/22/00032728	Brooklyn Boardwalk - Kangaroo Point to Brooklyn Road	19/12/2022
Assessor Name	**Report Created**	**BAM Data version ***
Kurtis Lindsay	18/01/2023	56
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18059	Part 4 Developments (Small Area)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
1	18/01/2023	BOS Threshold: Biodiversity Values Map

* 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.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	1234_SwampOakEEC	1234-Estuarine Swamp Oak forest	SwampOakEEC	0.01	1	
2	1557_Dryforest	1557-Central Coast Escarpment dry forest	Dryforest	0.12	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00025914/BAAS18059/22/00032728	Brooklyn Boardwalk - Kangaroo Point to Brooklyn Road	19/12/2022
Assessor Name	**Report Created**	**BAM Data version ***
Kurtis Lindsay	18/01/2023	56
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18059	Part 4 Developments (Small Area)	Finalised
Assessment Revision	**BOS entry trigger**	**Date Finalised**
1	BOS Threshold: Biodiversity Values Map	18/01/2023

* 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.

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

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	1234-Estuarine Swamp Oak forest
Australian Painted Snipe	Rostratula australis	1234-Estuarine Swamp Oak forest
Barking Owl	Ninox connivens	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Beach Stone-curlew	Esacus magnirostris	1234-Estuarine Swamp Oak forest
Black Bittern	Ixobrychus flavicollis	1234-Estuarine Swamp Oak forest
Broad-headed Snake	Hoplocephalus bungaroides	1557-Central Coast Escarpment dry forest
Curlew Sandpiper	Calidris ferruginea	1234-Estuarine Swamp Oak forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest

Eastern Curlew	Numenius madagascariensis	1234-Estuarine Swamp Oak forest
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Eastern Osprey	Pandion cristatus	1234-Estuarine Swamp Oak forest
Gang-gang Cockatoo	Callocephalon fimbriatum	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Glossy Black-Cockatoo	Calyptorhynchus lathami	1557-Central Coast Escarpment dry forest
Great Knot	Calidris tenuirostris	1234-Estuarine Swamp Oak forest
Greater Broad-nosed Bat	Scoteanax rueppellii	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Greater Sand-plover	Charadrius leschenaultii	1234-Estuarine Swamp Oak forest
Grey-headed Flying-fox	Pteropus poliocephalus	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Lesser Sand-plover	Charadrius mongolus	1234-Estuarine Swamp Oak forest
Little Bent-winged Bat	Miniopterus australis	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Little Eagle	Hieraaetus morphnoides	1234-Estuarine Swamp Oak forest
Little Lorikeet	Glossopsitta pusilla	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Masked Owl	Tyto novaehollandiae	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
New Holland Mouse	Pseudomys novaehollandiae	1234-Estuarine Swamp Oak forest
Powerful Owl	Ninox strenua	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Red Knot	Calidris canutus	1234-Estuarine Swamp Oak forest
Regent Honeyeater	Anthochaera phrygia	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Rosenberg's Goanna	Varanus rosenbergi	1234-Estuarine Swamp Oak forest

Sanderling	Calidris alba	1234-Estuarine Swamp Oak forest
Spotted-tailed Quoll	Dasyurus maculatus	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Square-tailed Kite	Lophoictinia isura	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Superb Fruit-Dove	Ptilinopus superbus	1234-Estuarine Swamp Oak forest
Swift Parrot	Lathamus discolor	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Terek Sandpiper	Xenus cinereus	1234-Estuarine Swamp Oak forest
Turquoise Parrot	Neophema pulchella	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Varied Sittella	Daphoenositta chrysoptera	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
White-throated Needletail	Hirundapus caudacutus	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest

Threatened species Manually Added

Common Name	Scientific Name
Eastern Curlew	Numenius madagascariensis
Sanderling	Calidris alba
Curlew Sandpiper	Calidris ferruginea
Great Knot	Calidris tenuirostris
Greater Sand-plover	Charadrius leschenaultii
Lesser Sand-plover	Charadrius mongolus
Red Knot	Calidris canutus
Beach Stone-curlew	Esacus magnirostris
Broad-billed Sandpiper	Limicola falcinellus
Black-tailed Godwit	Limosa limosa
Eastern Grass Owl	Tyto longimembris
Terek Sandpiper	Xenus cinereus
Little Tern	Sternula albifrons

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

BAM Predicted Species Report

Common Name	Scientific Name	Plant Community Type(s)
Beach Stone-curlew	Esacus magnirostris	1557-Central Coast Escarpment dry forest
Black-tailed Godwit	Limosa limosa	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Broad-billed Sandpiper	Limicola falcinellus	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Curlew Sandpiper	Calidris ferruginea	1557-Central Coast Escarpment dry forest
Eastern Curlew	Numenius madagascariensis	1557-Central Coast Escarpment dry forest
Eastern Grass Owl	Tyto longimembris	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Flame Robin	Petroica phoenicea	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Golden-tipped Bat	Phoniscus papuensis	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Great Knot	Calidris tenuirostris	1557-Central Coast Escarpment dry forest
Greater Sand-plover	Charadrius leschenaultii	1557-Central Coast Escarpment dry forest
Lesser Sand-plover	Charadrius mongolus	1557-Central Coast Escarpment dry forest
Little Tern	Sternula albifrons	1234-Estuarine Swamp Oak forest
		1557-Central Coast Escarpment dry forest
Red Knot	Calidris canutus	1557-Central Coast Escarpment dry forest
Sanderling	Calidris alba	1557-Central Coast Escarpment dry forest
Scarlet Robin	Petroica boodang	1557-Central Coast Escarpment dry forest
Spotted Harrier	Circus assimilis	1234-Estuarine Swamp Oak forest
Terek Sandpiper	Xenus cinereus	1557-Central Coast Escarpment dry forest
Yellow-bellied Glider	Petaurus australis	1557-Central Coast Escarpment dry forest

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black-tailed Godwit	Limosa limosa	Species is vagrant
Broad-billed Sandpiper	Limicola falcinellus	Species is vagrant

Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	Species is vagrant
Eastern Grass Owl	Tyto longimembris	Species is vagrant
Flame Robin	Petroica phoenicea	Species is vagrant
Golden-tipped Bat	Phoniscus papuensis	Refer to BAR
Little Tern	Sternula albifrons	Refer to BAR
Scarlet Robin	Petroica boodang	Species is vagrant
Spotted Harrier	Circus assimilis	Species is vagrant
Yellow-bellied Glider	Petaurus australis	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id 00025914/BAAS18059/22/00032728	Proposal Name Brooklyn Boardwalk - Kangaroo Point to Brooklyn Road	BAM data last updated * 19/12/2022
Assessor Name Kurtis Lindsay	Report Created 18/01/2023	BAM Data version * 56
Assessor Number BAAS18059	Assessment Type Part 4 Developments (Small Area)	BAM Case Status Finalised
Assessment Revision 1	Date Finalised 18/01/2023	BOS entry trigger BOS Threshold: Biodiversity Values Map

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia terminalis subsp. Eastern Sydney Sunshine wattle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ancistrachne maidenii Ancistrachne maidenii	No (surveyed)	☑ Jan ☑ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Anthochaera phrygia Regent Honeyeater	No (surveyed) *Survey months are outside of the months specified in Bionet.	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☑ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Callistemon linearifolius Netted Bottle Brush	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Darwinia biflora Darwinia biflora	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Darwinia peduncularis Darwinia peduncularis	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Genoplesium baueri Bauer's Midge Orchid	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Grammitis stenophylla Narrow-leaf Finger Fern	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Grevillea shiressii Grevillea shiressii	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Heleioporus australiacus Giant Burrowing Frog	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus bungaroides Broad-headed Snake	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Kunzea rupestris Kunzea rupestris	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Lasiopetalum joyceae Lasiopetalum joyceae	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lathamus discolor Swift Parrot	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?

Melaleuca deanei Deane's Paperbark	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Micromyrtus blakelyi Micromyrtus blakelyi	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Numenius madagascariensis Eastern Curlew	No (surveyed) *Survey months are outside of the months specified in Bionet.	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☑ Survey month outside the specified months?

Pandion cristatus Eastern Osprey	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Persoonia hirsuta Hairy Geebung	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Pimelea curviflora var. curviflora Pimelea curviflora var. curviflora	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Pseudophryne australis Red-crowned Toadlet	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Rhodamnia rubescens Scrub Turpentine	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Rhodomyrtus psidioides Native Guava	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Syzygium paniculatum Magenta Lilly Pilly	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca glandulosa Tetratheca glandulosa	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto tenebricosa Sooty Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

Common Name	Scientific Name
Glossy Black-Cockatoo	Calyptorhynchus lathami
White-bellied Sea-Eagle	Haliaeetus leucogaster
Southern Myotis	Myotis macropus
Sunshine wattle	Acacia terminalis subsp. Eastern Sydney
Netted Bottle Brush	Callistemon linearifolius
Darwinia peduncularis	Darwinia peduncularis
Ancistrachne maidenii	Ancistrachne maidenii
Narrow-leaf Finger Fern	Grammitis stenophylla
Lasiopetalum joyceae	Lasiopetalum joyceae
Darwinia biflora	Darwinia biflora
Kunzea rupestris	Kunzea rupestris
Deane's Paperbark	Melaleuca deanei
Micromyrtus blakelyi	Micromyrtus blakelyi
Magenta Lilly Pilly	Syzygium paniculatum
Bauer's Midge Orchid	Genoplesium baueri
Grevillea shiressii	Grevillea shiressii
Hairy Geebung	Persoonia hirsuta
Pimelea curviflora var. curviflora	Pimelea curviflora var. curviflora
Giant Burrowing Frog	Heleioporus australiacus
Red-crowned Toadlet	Pseudophryne australis
Little Eagle	Hieraaetus morphnoides
Eastern Osprey	Pandion cristatus
Bush Stone-curlew	Burhinus grallarius
Barking Owl	Ninox connivens
Powerful Owl	Ninox strenua
Masked Owl	Tyto novaehollandiae
Sooty Owl	Tyto tenebricosa
Koala	Phascolarctos cinereus
Eastern Pygmy-possum	Cercartetus nanus
Grey-headed Flying-fox	Pteropus poliocephalus
Tetratheca glandulosa	Tetratheca glandulosa
Eastern Curlew	Numenius madagascariensis
Terek Sandpiper	Xenus cinereus

Green Turtle	Chelonia mydas

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Green Turtle	Chelonia mydas	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Orange-bellied Parrot	Neophema chrysogaster	Species is vagrant
Terek Sandpiper	Xenus cinereus	Species is vagrant

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00025914/BAAS18059/22/00032728

Proposal Name
Brooklyn Boardwalk - Kangaroo Point to Brooklyn Road

BAM data last updated *
19/12/2022

Assessor Name
Kurtis Lindsay

Assessor Number
BAAS18059

BAM Data version *
56

Proponent Names

Report Created
18/01/2023

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
18/01/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Circus assimilis / Spotted Harrier
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Phoniscus papuensis / Golden-tipped Bat
Petroica phoenicea / Flame Robin
Petaurus australis / Yellow-bellied Glider
Petroica boodang / Scarlet Robin
Limicola falcinellus / Broad-billed Sandpiper
Limosa limosa / Black-tailed Godwit
Tyto longimembris / Eastern Grass Owl
Sternula albifrons / Little Tern

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1234-Estuarine Swamp Oak forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.0	0	1	1
1557-Central Coast Escarpment dry forest	Not a TEC	0.1	4	0	4

1234-Estuarine Swamp Oak forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1234_SwampOakEEC	No	1	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1557-Central Coast Escarpment dry forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 690, 697, 698, 755, 1092, 1262, 1267, 1268, 1281, 1385, 1548, 1549, 1550, 1556, 1557, 1558, 1564, 1565, 1580, 1582, 1584, 1585, 1845, 1846, 1847, 1914	Northern Hinterland Wet Sclerophyll Forests <50%	1557_Dryforest	Yes	4	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1234_SwampOakEEC, 1557_Dryforest**	0.1	6.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis

Spp	IBRA subregion

	Myotis macropus / Southern Myotis	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00025914/BAAS18059/22/00032728

Proposal Name
Brooklyn Boardwalk - Kangaroo Point to Brooklyn Road

BAM data last updated *
19/12/2022

Assessor Name
Kurtis Lindsay

Assessor Number
BAAS18059

BAM Data version *
56

Proponent Name(s)

Report Created
18/01/2023

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
18/01/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

BAM Biodiversity Credit Report (Variations)

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Circus assimilis / Spotted Harrier
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Phoniscus papuensis / Golden-tipped Bat
Petroica phoenicea / Flame Robin
Petaurus australis / Yellow-bellied Glider
Petroica boodang / Scarlet Robin
Limicola falcinellus / Broad-billed Sandpiper
Limosa limosa / Black-tailed Godwit
Tyto longimembris / Eastern Grass Owl
Sternula albifrons / Little Tern

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1234-Estuarine Swamp Oak forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.0	0	1	1.00
1557-Central Coast Escarpment dry forest	Not a TEC	0.1	4	0	4.00

1234-Estuarine Swamp Oak forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1234_SwampOakEEC	No	1	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 1	1234_SwampOakEEC	No	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1557-Central Coast Escarpment dry forest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 690, 697, 698, 755, 1092, 1262, 1267, 1268, 1281, 1385, 1548, 1549, 1550, 1556, 1557, 1558, 1564, 1565, 1580, 1582, 1584, 1585, 1845, 1846, 1847, 1914	Northern Hinterland Wet Sclerophyll Forests <50%	1557_Dryforest	Yes	4	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Wet Sclerophyll Forests (Grassy sub-formation)	Tier 4 or higher threat status	1557_Dryforest	Yes (including artificial)	4	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1234_SwampOakEEC, 1557_Dryforest**	0.1	6.00

Credit Retirement Options

Like-for-like options

Myotis macropus/ Southern Myotis	Spp		IBRA region
	Myotis macropus/Southern Myotis		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Land Eco consulting

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