Streamlined Biodiversity Development Assessment Report

Taronga Wildlife Hospital – Nutrition Centre at Taronga Zoo Sydney

Report prepared by Narla Environmental Pty Ltd

For the Taronga Conservation Society Australia

December 2021

NARLA

environmental

Report:	Streamlined Biodiversity Development Assessment Report
Prepared for:	Taronga Conservation Society Australia
Prepared by:	Narla Environmental Pty Ltd
Project no:	Tazo4
Version:	Final v1.0

Narla Environmental Pty Ltd
www.narla.com.au

Report Certification

Works for this report were undertaken by:

Staff Name	Position
Chris Moore *BBioCon*	Narla Environmental Project Manager and Ecologist BAM Accredited Assessor (BAAS21009)
Sarah Cardenzana *BEnvSc*	Narla Environmental Ecologist

Document Control

Revision	Document Name	Issue Date	Internal Document Review
Draft v1.0	Streamlined Biodiversity Development Assessment Report - Taronga Wildlife Hospital – Nutrition Centre at Taronga Zoo Sydney	October 2021	Chris Moore
Final v1.0	Streamlined Biodiversity Development Assessment Report - Taronga Wildlife Hospital – Nutrition Centre at Taronga Zoo Sydney	7/12/2021	Chris Moore

Table of Contents

Figures

Tables

Plates

Glossary

Acronym/ Term	Definition
Accredited Biodiversity Assessor	Individuals accredited by the Department of Planning, Industry and Environment (DPIE) to apply the Biodiversity Assessment Method.
BAM	The NSW Biodiversity Assessment Method
BAMC	The NSW Biodiversity Assessment Method Calculator
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified.
Biodiversity Offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of development.
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
BOS	NSW Biodiversity Offset Scheme
DPIE	NSW Department of Planning, Industry and Environment (formerly OEH)
Ecosystem credit	The class of biodiversity credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered Ecological Community
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ha	Hectares
HTE	High Threat Exotic
km	Kilometres
LGA	Local Government Area
Locality	A 1500m buffer area surrounding the Subject Land
m	metres
Native Vegetation	Means any of the following types of plants native to New South Wales: (a) trees (including any sapling or shrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland.
NSW	The State of New South Wales
OEH	Office of Environment and Heritage (now DPIE)
PCT	NSW Plant Community Type
Proposal	The development, activity or action proposed.
SAII	Serious and Irreversible Impacts
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
Species credit	The class of biodiversity credit that relate to threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
SSDA	State Significant Development Application
Subject Land	The location of the proposed works within the Taronga Zoo Site
Subject Property	Taronga Zoo Sydney; Bradleys Head Rd, Mosman NSW 2088 (Lot 22/DP843294)
Threatened species, populations and	Species, populations and ecological communities specified in Schedules 1 and 2 of the BC Act 2016.

Acronym/ Term	Definition
ecological communities	
TPZ	Tree Protection Zone: A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development
VIS Plot	Vegetation Integrity Survey Plot

Executive Summary

Narla Environmental Pty Ltd (Narla) was commissioned by Taronga Conservation Society Australia ('the proponent') to prepare a Biodiversity Development Assessment Report (BDAR). The BDAR will accompany an Environmental Impact Statement (EIS) as part of the Secretary's Environmental Assessment Requirements (SEARs) for the proposed two-staged development of the Taronga Wildlife Hospital, located within Taronga Zoo at Bradleys Head Rd, Mosman NSW 2088 (Lot 22/DP843294; hereafter referred to as the 'Subject Property').

Stage 1, the Taronga Wildlife Hospital Nutrition Centre, is the subject of this report. Stage 2 will incorporate the main wildlife treatment, teaching and rehabilitation spaces, and will be delivered under a separate SSDA. This BDAR will assess the biodiversity impacts of the proposed Stage 1 development in accordance with the requirements of the Biodiversity Conservation Act 2016 and Biodiversity Conservation Regulation 2017. The assessment has been completed in accordance with Appendix L of the BAM (DPIE 2020a).

The proposed Nutrition Centre will involve the replacement of several standalone buildings currently providing animal food preparation and storage. The proposed development includes the operational and the construction footprint (0.16ha), which is collectively referred to as the 'Subject Land'. The proposed development has been positioned to minimise impacts on native vegetation and habitat as much as possible. The majority of the proposed development is located within historically modified land, comprising of existing buildings and hardstand, amongst small areas of planted and remnant native vegetation.

The proposed development is expected to impact one (1) Plant Community Type (PCT) 1778: Coastal sandstone foreshores forest. The following ecosystem credits are required to be offset in order to mitigate the impacts upon biodiversity as a result of the proposed development:

- One (1) ecosystem credit for PCT 1778.

One (1) SAII species, *Lathamus discolor* (Swift Parrot), contains mapped important areas within the Subject Land and was therefore considered present. In addition, *Myotis macropus* (Southern Myotis) was assumed present as it has been historically recorded within the broader Taronga Zoo, with the Subject Land containing known habitat (vegetation within 200m from waterbodies) for this species. The following species credits are required to be offset in order to mitigate the impacts to these species:

- One (1) species credit for *Lathamus discolor* (Swift Parrot); and
- One (1) species credit for *Myotis macropus* (Southern Myotis).

In order 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 (CEMP) produced for the site. This includes assigning an experienced, suitably qualified and licenced wildlife expert to undertake a pre-clearing survey and to supervise the clearing of all vegetation in relation to the proposed development.

1. Introduction

1.1 Overview

Narla Environmental Pty Ltd (Narla) was commissioned by Taronga Conservation Society Australia ('the proponent') to prepare a BDAR. This BDAR will accompany an Environmental Impact Statement (EIS) as part of the Secretary's Environmental Assessment Requirements (SEARs) for the proposed two-staged development of the Taronga Wildlife Hospital, located within Taronga Zoo at Bradleys Head Rd, Mosman NSW 2088 (Lot 22/DP843294; hereafter referred to as the 'Subject Property'). Stage 1, the Taronga Wildlife Hospital Nutrition Centre, is the subject of this report. Stage 2 will incorporate the main wildlife treatment, teaching and rehabilitation spaces, and will be delivered under a separate SSDA.

The Taronga Wildlife Hospital Nutrition Centre development is a SSD. Part 4, Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act) establishes the assessment framework for SSD's. The preparation of this BDAR is in response to Item 15 'Biodiversity' of the SEARs issued for the EIS by the NSW Department of Planning, Industry and Environment (DPIE 2021).

This BDAR has been prepared as a 'Streamlined assessment module- small area development that requires consent' as it does not exceed the area clearing threshold for small area developments as outlined in the Biodiversity Assessment Method (BAM; DPIE 2020a; **Table 1**). Narla have produced this report in accordance with the requirements of the Biodiversity Conservation Act 2016 and Biodiversity Conservation Regulation 2017. The assessment has been completed in accordance with Appendix L of the BAM (DPIE 2020a).

Table 1. Area limits for application of small area development threshold on land not shaded on the biodiversity value map. Dark border indicated clearing threshold relevant to this report.

Minimum lot size associated with the property	Maximum area clearing limit for application of the small area development module
Less than 1ha	≤1ha
Less than 40ha but not less than 1ha	≤2ha
Less than 1000ha but not less than 40ha	≤5ha
1000ha or more	≤10ha

1.2 The Subject Land and Project Area

The proposed development consists of the footprint of the proposed works, which includes the replacement of several standalone buildings currently providing animal food preparation and storage. The proposed development incorporates the following:

- New animal food and meat preparation facilities to serve the Taronga site;
- Open plan offices and meeting spaces to serve the Nutrition Centre and Stage 2 Hospital;
- A new tunnel under the back of house service road to link to the Stage 2 Hospital; and
- New pedestrian footpaths and vehicular access.

All aspects of the proposed development will hereafter be referred to as the Subject Land. The Subject Land covers an area of approximately 0.16ha, and encompasses all areas within the Project Area that will be impacted by the proposed Stage 1 development (**Appendix 1**). Areas within the Project Area that are to be retained as part

of the Stage 1 works have not been included within the Subject Land. These excluded areas have however been assessed for potential indirect impacts resulting from the proposed works.

The Subject Land is mostly comprised of existing buildings and hardstand, although contain some areas of planted and remnant native vegetation. The proposed works have been strategically located in a way that will minimise potential impacts on biodiversity where possible.

1.3 Site Location and Description

The Subject Property is situated within the suburb of Mosman in the Mosman Council Local Government Area (LGA), covering an area of approximately 28ha on land zoned as 'SP1 - Special Activities: Zoological Gardens'. The Subject Property is situated within the northern area of Bradleys Head, and is surrounded by Sydney Harbour National Park on the eastern and southern boundaries, and low density residential to the north (**Figure 2**).

1.4 Sources of Information Used

A thorough literature review was undertaken to gain an insight into the ecology and applicable legislation within the locality and the Mosman LGA. Relevant data and literature reviewed in preparation of this report included:

- Relevant State and Commonwealth Databases & Datasets:
    - NSW BioNet. The website of the Atlas of NSW Wildlife (DPIE 2021a);
    - NSW BioNet. Threatened Biodiversity Data Collection (DPIE 2021b);
    - NSW BioNet. Vegetation Classification System (DPIE 2021c); and
    - NSW Government Spatial Services: Six Maps Clip & Ship (NSW Government Spatial Services 2021)
- Vegetation and Soil Mapping:
    - The Native Vegetation of the Sydney Metropolitan Area and Vegetation Information System (VIS) 3.1 (OEH 2016)
    - Soil Landscapes of the Sydney 1:100 000 Sheet (Chapman and Murphy 2009).
- NSW State Guidelines:
    - Biodiversity Assessment Method (DPIE 2020a);
    - Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE 2019a);
    - Biodiversity Assessment Method Calculator Version 1.3.0.00 (DPIE 2021d);
    - Biodiversity Offsets and Agreement Management System (BOAMS);
    - Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b); and
    - Threatened Species Survey and Assessment: Guidelines for developments and activities. Working Draft (DEC 2004).
- Council Documents:
    - Mosman Local Environmental Plan (LEP) 2012
    - Mosman Development Control Plan (DCP) 2012
    - Weeds Declared in the Greater Sydney Region (DPI 2021)

Preparation of this BDAR also involved the review of the following accompanying project documents:

- Taronga Wildlife Hospital and Nutrition Centre – Site Plans (DWP 2021a; DWP 2021b; **Appendix 1**).

These sources were used to gain an understanding of the natural environment and ecology of the Subject Land and its surrounds. Searches using NSW Wildlife Atlas (BioNet) were conducted to identify current threatened flora and fauna records within and surrounding the Subject Land. These data were used to assist in establishing the

presence or likelihood of any biodiversity values as occurring on, or adjacent to, the Subject Land, and helped inform our Ecologist on what to look for during the site assessment.

Figure 1. The location of the Subject Land within the Subject Property.

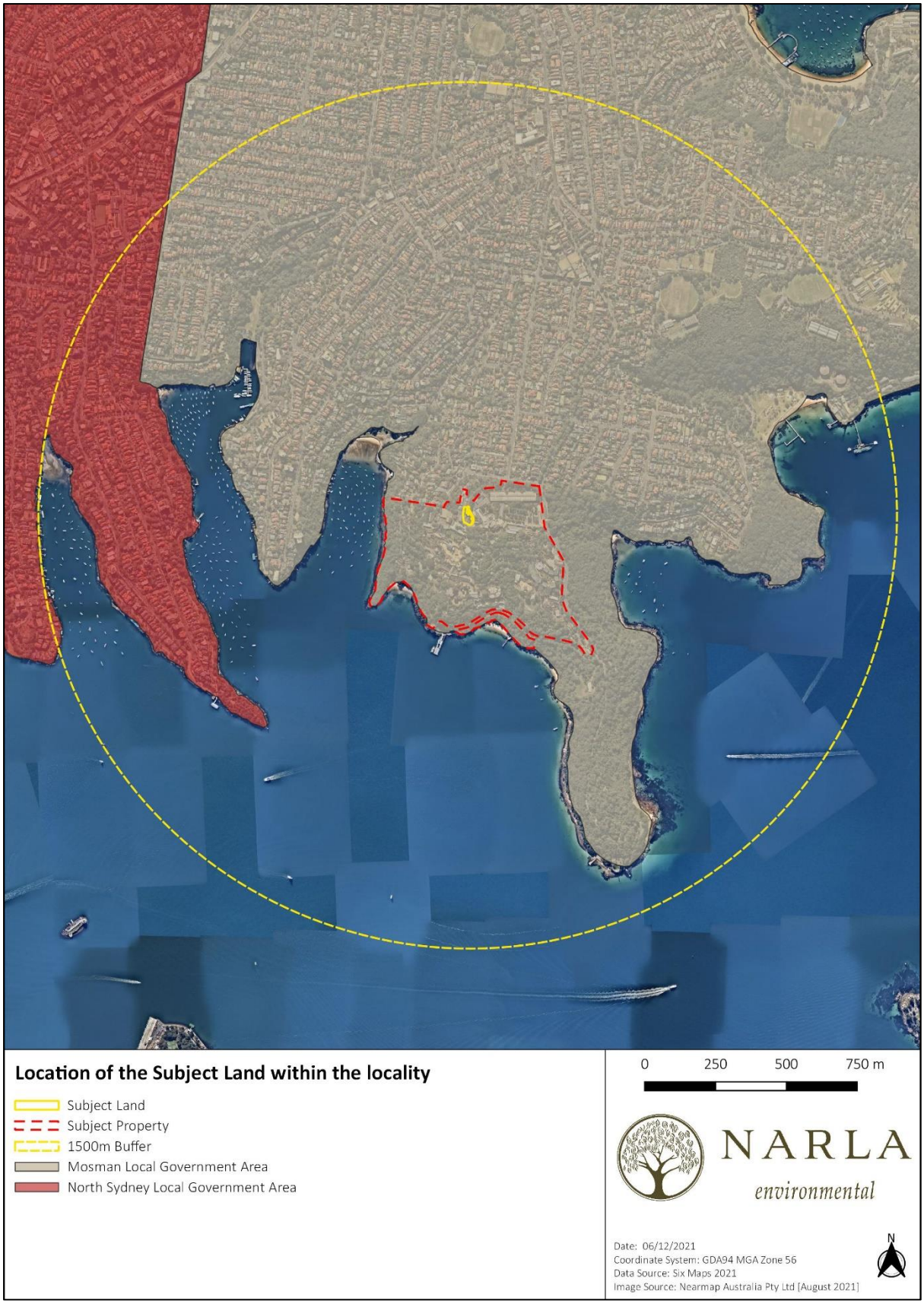


Figure 2. The location of the Subject Land within the locality.

1.5 Aim and Approach

This report has been prepared in accordance with the BAM (DPIE 2020a) and aims to:

- Describe the biodiversity values present within the Subject Land, including the extent of native vegetation, vegetation integrity and the presence of Threatened Ecological Communities (TECs);
- Determine the habitat suitability within the Subject Land for candidate threatened species;
- Prepare an impact assessment in regard to potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and SAIIs within the Subject Land;
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values; and
- Calculate the biodiversity credits (i.e., ecosystem credits and species credits) that measure potential impacts of the development on biodiversity values. This calculation will inform the decision maker as to the number and class of offset credits required to be purchased and retired as a result of the proposed development.

2. Landscape Context

2.1 IBRA Bioregion and Subregion

The Subject Land occurs within the 'Pittwater' Interim Biogeographic Regionalisation for Australia 7 (IBRA7) Subregion, which is part of the 'Sydney Basin' IBRA7 Bioregion (**Figure 3**).

2.2 Topography, Geology and Soils

The Subject Land is situated on a relatively steep terrain with an elevation ranging between 70m and 76m above sea level (Google Earth 2021). The Subject Land is mapped as occurring on the Gymea/Lambert Soil Landscape. The Gymea/Lambert Soil Landscape is typically characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. The Gymea Soil Landscape occurs extensively throughout the Hornsby Plateau and along the foreshores of Sydney Harbour and the Parramatta and Georges Rivers. Examples include areas of Northbridge, Forestville, Drummoyne, Balmain, Arcadia and Berrilee. The underlying geology is typical of Hawkesbury Sandstone, which is a medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Soils are shallow to moderately deep (30-100cm) Yellow Earths and Earthy Sands on crests and inside of benches; shallow (Siliceous Sands on leading edges of benches; localised Gleyed Podzolic Soils and Yellow Podzolic Soils on shale lenses; shallow to moderately deep (<100cm) Siliceous Sands and Leached Sands along drainage lines (Chapman et al. 2009).

2.3 Areas of Geological Significance and Soil Hazards

The Subject Land did not contain any areas of geological significance, such as karsts, caves, cliffs or crevices. The Subject Land was not mapped as occurring on Acid Sulfate Soils nor mapped as having risk/probability of exhibiting occurrence of acid sulfate soils.

2.4 Hydrology

No mapped watercourses are located within the Subject Land. Several 1st order watercourses occur within the 1500m buffer (**Figure 4**).

The Subject Land and the immediate surrounds (within the 1500m buffer) do not contain any areas of native vegetation identified as 'Coastal Wetlands' as per the State Environmental Planning Policy (Coastal Management) 2018. However, areas mapped as containing Coastal Use Area and Coastal Environmental Area as per the SEPP were mapped within the Subject Land, and areas of Littoral Rainforest and Proximity to Littoral Rainforest occur within the broader landscape (**Figure 5**).

2.5 Native Vegetation Cover and Connectivity

Native vegetation cover and connectivity have been assessed in accordance with Section 3.2 of the BAM (DPIE 2020a). The native vegetation cover will be used to assess the habitat suitability of the Subject Land for threatened species. Areas of connectivity will determine the extent of habitat that may facilitate the movement of threatened species across their range. A 1500m buffer around the boundary of the Subject Land was calculated to determine the extent of native vegetation and habitat connectivity. Native vegetation covered approximately 125ha within the buffer circle (total land area = 418ha) and was assigned to the >10–30% class.

Areas of connectivity will determine the extent of habitat that may facilitate the movement of threatened species across their range. Areas of connectivity that may facilitate the movement of threatened species were evident

within the 1500m surrounding the Subject Land (**Figure 6**; **Figure 7**) with the most significant areas being located to the south and east along the Sydney Harbour foreshore.

2.6 Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value occur on the Subject Land or surrounding area.

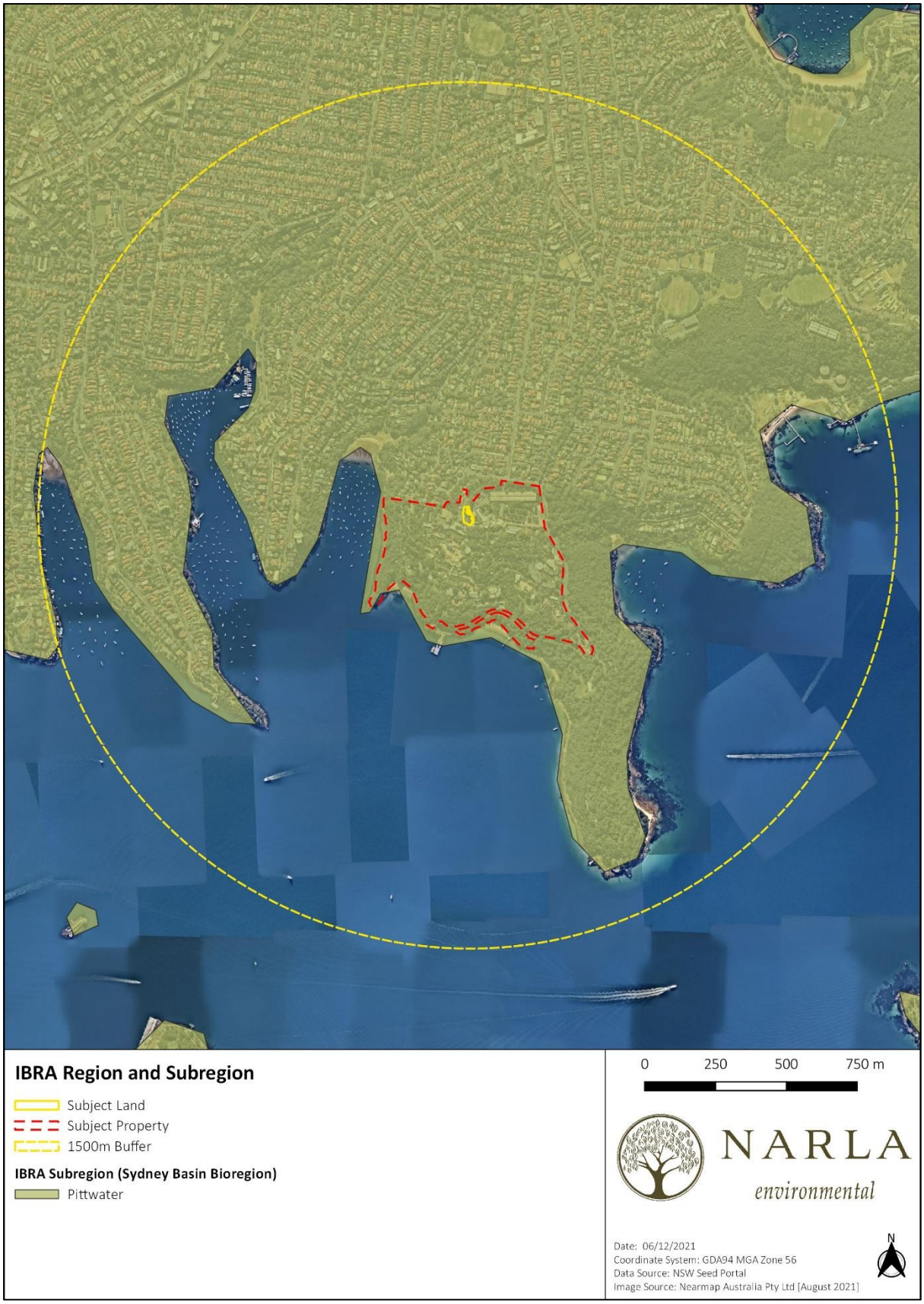


Figure 3. IBRA Bioregion and Subregion of the Subject Land, and within a 1500m buffer.

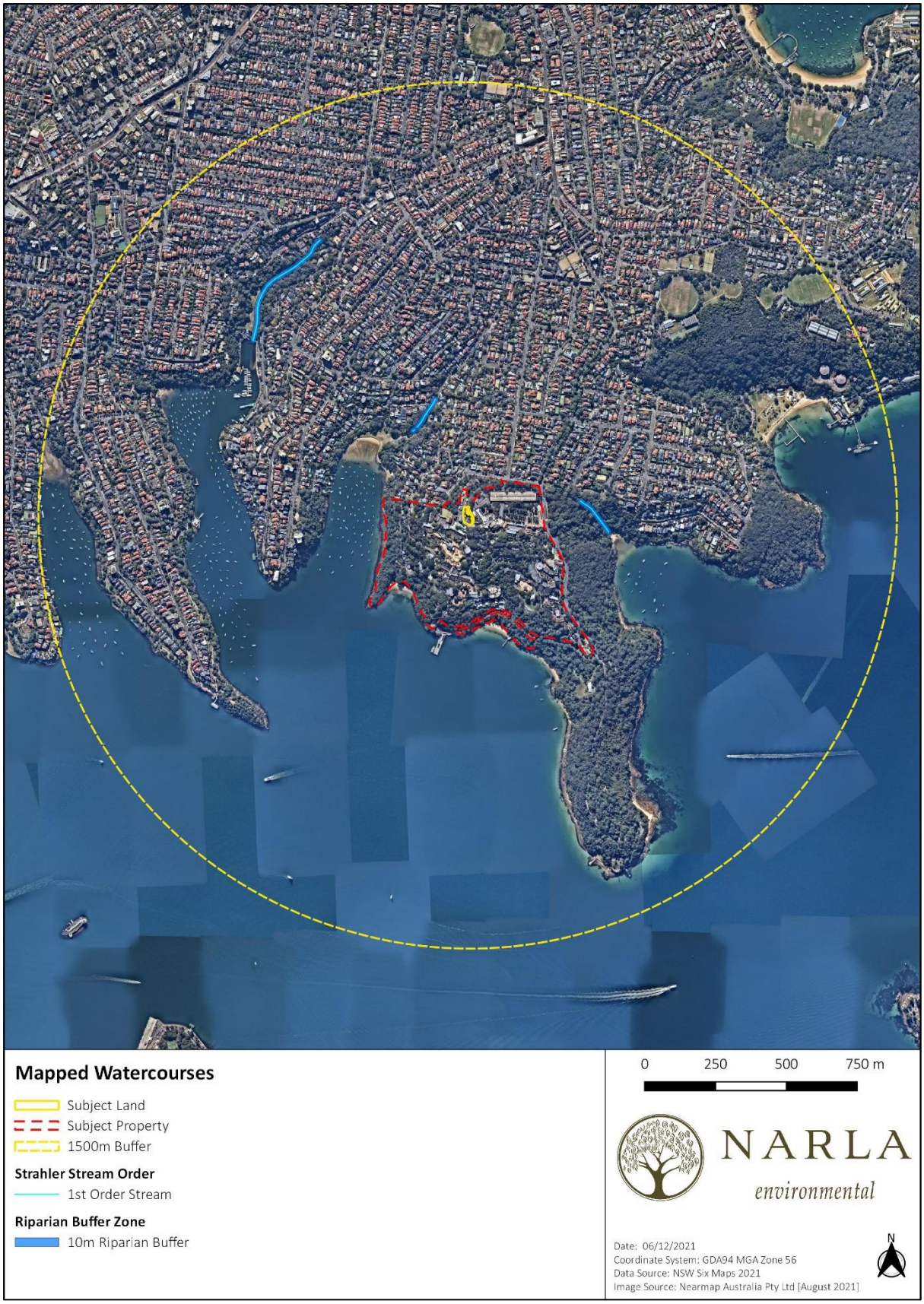


Figure 4. Rivers and streams (with associated riparian buffers) occurring within the 1500m buffer.

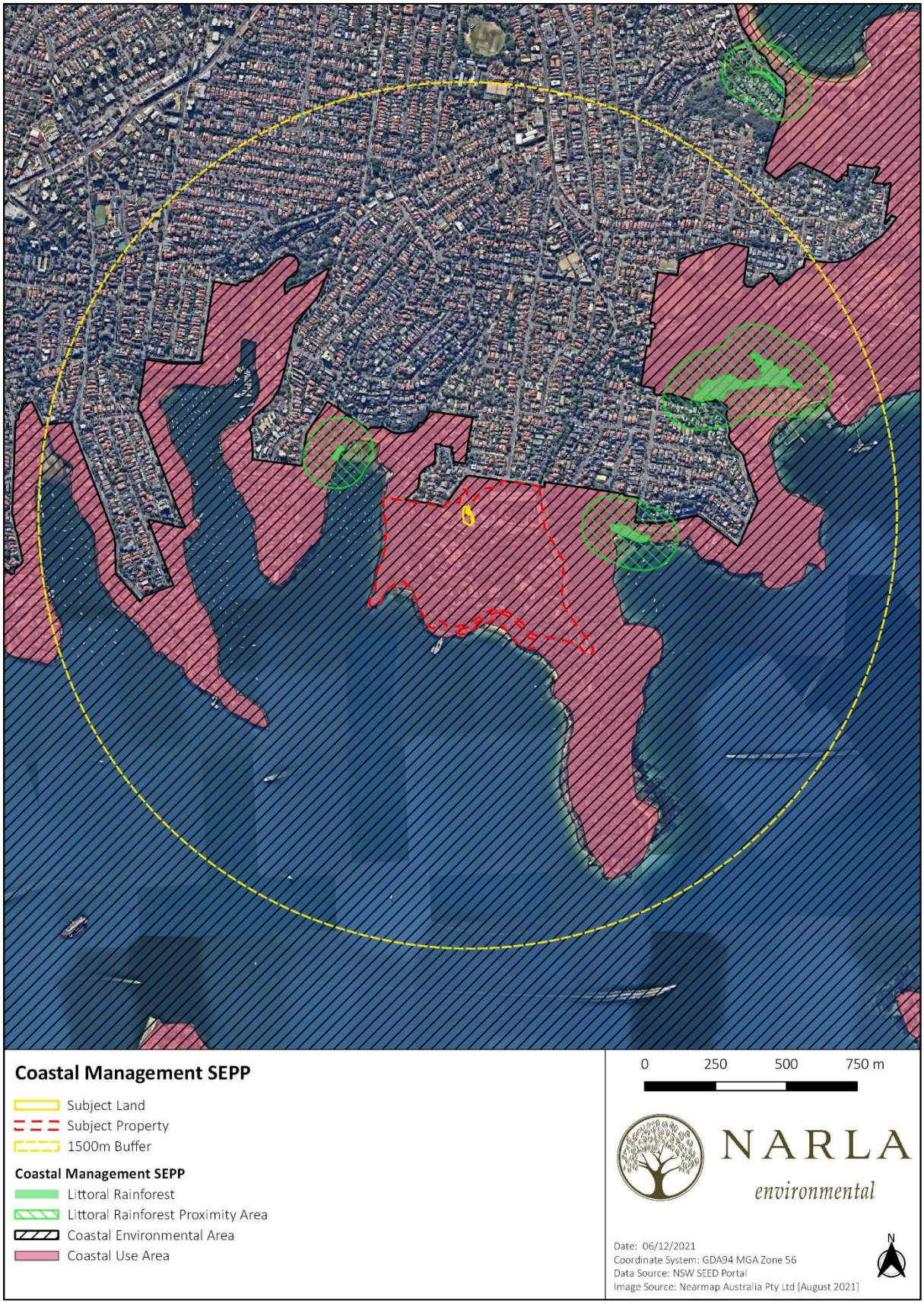


Figure 5. Areas mapped under the Coastal Management SEPP in relation to the Subject Land and general locality.

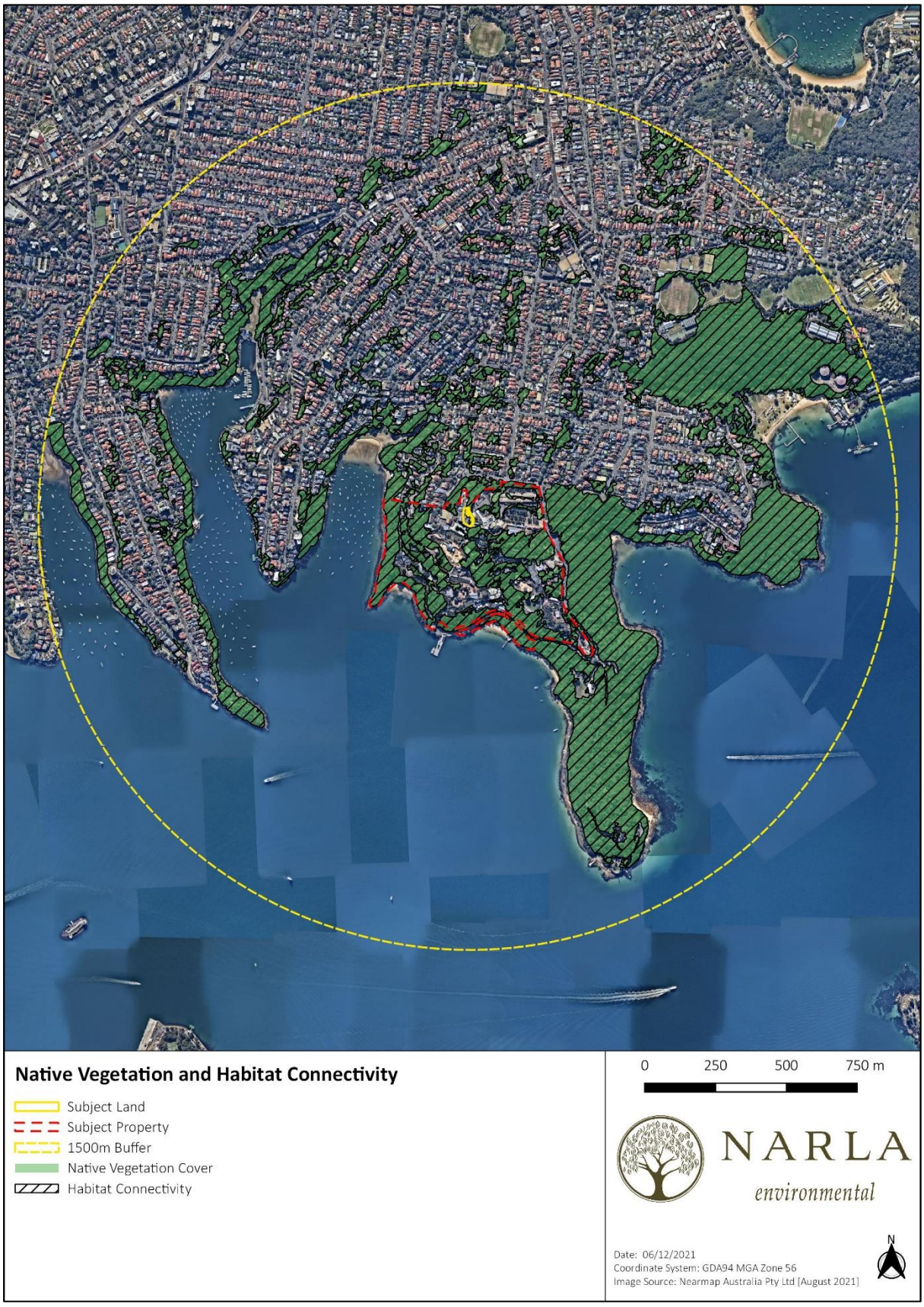


Figure 6. The extent of native vegetation and habitat connectivity within the 1500m buffer.

Figure 7. The extent of native vegetation and habitat connectivity within the Subject Land.

3. Native Vegetation

3.1 Plant Community Types (PCTs) Identified within the Subject Land

3.1.1 Historically Mapped Vegetation

The Native Vegetation of the Sydney Metropolitan Area (OEH 2016a; OEH 2016b) indicated the presence of one (1) PCT within the Subject Land:

- PCT 1778 - Coastal sandstone foreshores forest

3.1.2 Plant Community Type Selection Process

Historically, the Subject Land has undergone development and the majority of vegetation within the Subject Land has been altered through historic landscaping. Due to the restricted nature of the Subject Land, with multiple buildings present, a BAM plot could not be established within the Subject Land. It was therefore positioned in remnant bushland within the Project Area (adjacent to the Subject Land), which was indicative of the PCT within the Subject Land. Flora species assemblage, structure and landscape interpretation data collected from the BAM plot were compared against all potentially occurring PCTs in order to determine the most likely candidates that occur within the Subject Land. Selection was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2021c).

A single PCT was assigned to vegetation within the Subject Land as the assessment is a streamlined assessment, in which only the dominating PCT is assigned to vegetation. Best-fit PCT selection for the vegetation was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2021c). The following selection criteria were used in the PCT Filter Tool to develop the PCT shortlist:

- IBRA Bioregion: Sydney Basin
- IBRA Subregion: Pittwater
- Dominant Species: *Eucalyptus punctata, Eucalyptus robusta, Eucalyptus tereticornis* and *Eucalyptus botryoides.*

This process delivered a selection of six (6) PCT's that occur within the Pittwater IBRA Subregion (and Sydney Basin Bioregion) that had two or more (out of four) of the observed dominant species (i.e., the highest potential of occurring within the Subject Land). Based on historical mapping, an additional PCT (PCT 1778) was added to the selection process. The geographical distribution and landscape position of each shortlisted PCT was then compared against the location and landscape of the Subject Land, resulting in one (1) candidate PCT (Table 2). The steps taken to justify the candidate PCT within the Subject Land are detailed in Table 3.

Table 2. Output from the PCT Filter Tool (DPIE 2021c) and subsequent shortlisting of candidate PCTs. Green shading indicates the PCTs from the output that occur within the distribution and landscape position of the Subject Land.

Plant Community Type (PCT)	Subject Land within known distribution/landscape position?	No. of Floristic Matches	*Eucalyptus punctata*	*Eucalyptus robusta*	*Eucalyptus tereticornis*	*Eucalyptus botryoides*
PCT 659: Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin	No. The Subject Land does not occur on deep coastal sands.	2		x		x

Plant Community Type (PCT)	Subject Land within known distribution/landscape position?	No. of Floristic Matches	*Eucalyptus punctata*	*Eucalyptus robusta*	*Eucalyptus tereticornis*	*Eucalyptus botryoides*
Bioregion and South East Corner Bioregion						
PCT 661: Coastal sand littoral forest	No. The Subject Land does not occur on coastal dune sand.	2		x		x
PCT 1231: Coastal sand Swamp Mahogany Forest	No. The Subject Land does not occur on drainage lines and depressions on sandy alluvium, and sand flats in low altitude coastal areas.	2		x		x
PCT 1385: Rough-barked Apple - Grey Gum grassy open forest of the hinterland hills of the Central Coast, Sydney Basin Bioregion	No. The Subject Land does not occur within Mangrove Creek Catchment or Dharug National Park.	2	x		x	
PCT 1598: Forest Red Gum grassy open forest on floodplains of the lower Hunter	No. The Subject Land does not occur on a floodplain in the Lower Hunter.	2	x		x	
PCT 1778: Coastal sandstone foreshores forest	Partial. The Subject Land occurs on sheltered sandstone slopes along the foreshores of Sydney's major waterways, although occurs at an elevation above 45m.	1				x
PCT 1847: Sydney Foreshores shale forest	No. The Subject Land does not occur at an elevation between 6m and 20m.	2	x		x	

Table 3. PCT Selection Criteria. Green indicates the selected PCT.

Candidate PCT	Characteristics (DPIE 2021c)	Justification
PCT 1778: Coastal sandstone foreshores forest	**Landscape position/ geology**	Narla have assigned this PCT to the vegetation within the Subject Land as it is the best fit within the landscape profile and comprises a number of diagnostic species. The Subject Land is situated on sheltered sandstone slopes along the foreshores of Sydney's major waterways (Sydney Harbour) and coastal escarpments. The underlying geology is Hawksbury Sandstone. The majority of the Subject Land is situated at an elevation between 70m and 76m above sea level. However, this PCT has been historically mapped as occurring within the Subject Land. Mean annual rainfall recorded at the closest weather station (Sydney Botanic Gardens; which is approximately 4.5km from Mosman) is 1229 mm Furthermore, PCT 1778 is described as having a canopy that contains localised patches of bangalay (*Eucalyptus botryoides*), coast banksia (*Banksia integrifolia*), as well as stands of smooth-barked apple (*Angophora costata*), which were all identified within or immediately surrounding the Subject Land. This PCT also contained a number of diagnostic floristic species which were identified within the Subject Land and wider Project Area.
	Occurs on sheltered sandstone slopes along the foreshores of Sydney's major waterways and coastal escarpments, within 10 km of the coastline. It is restricted to sandstone soils derived from either Hawkesbury or Narrabeen geology. The distribution is coastal and requires a combination of low elevation (between two and 45 metres above sea level) and mean annual rainfall that exceeds 1100 millimetres per annum.	
	Characteristic canopy	
	Banksia integrifolia and *Eucalyptus botryoides.*	
	Characteristic mid-storey/ shrub	
	Glochidion ferdinandi, Pittosporum undulatum, Allocasuarina littoralis, Breynia oblongifolia, Notelaea longifolia, Dodonaea triquetra, Elaeocarpus reticulatus, Polyscias sambucifolia and *Acacia longifolia.*	
	Characteristic ground layer	
	Dianella caerulea, Pteridium esculentum, Lomandra longifolia, Entolasia stricta, Imperata cylindrica, Microlaena stipoides var. *stipoides, Poa affinis, Themeda australis* and *Xanthorrhoea arborea.*	

3.1.3 Final PCT and Vegetation Zone Selection

Field surveys conducted by Narla confirmed that one (1) PCT was identified within the Subject Land:

- PCT 1778: Coastal sandstone foreshores forest

One (1) vegetation zone was identified within the Subject Land:

- Zone 1: PCT 1778 Moderate Condition.

This vegetation zone is detailed in **Table 4**, and displayed in **Figure 8**.

Table 4. Vegetation zones identified within the Subject Land.

PCT 1778: Coastal sandstone foreshores forest	
Vegetation class	Sydney Coastal Dry Sclerophyll Forests
Total area within Subject Land	0.04ha
Condition Class	Moderate Condition
Field survey effort	A site assessment was conducted by experienced Narla Ecologist Sarah Cardenzana on the 13th January 2021. One (1) BAM plot was established within the Project Area.
Description of vegetation within the Subject Land	
Vegetation within this zone consisted of a mixture of predominately planted locally indigenous native species, with minor levels of weed infestation (**Plate 1**). The south-eastern portion of the Subject Land comprised a planted native garden bed, with the northern portion comprising more established native species, potentially remnant or regenerated species. Native canopy species located within BAM plot included *Commelina cyanea, Cupaniopsis anacardioides, Dianella caerulea, Eucalyptus botryoides, Eucalyptus punctata, Eucalyptus robusta, Eucalyptus tereticornis, Glochidion ferdinandi, Pittosporum undulatum* and *Polyscias sambucifolia*.	
Description in the VIS (DPIE 2021c)	
Coastal Sandstone Foreshores Forest is found on sheltered sandstone slopes along the foreshores of Sydney's major waterways and coastal escarpments. It is an open forest with a moist shrub layer and a ground cover of ferns, rushes and grasses. The flora of this community has a maritime influence given its exposure to prevailing sea breezes. The canopy can be dominated by pure stands of smooth-barked apple (*Angophora costata*), though more regularly this is found in combination with other tree species. Localised patches of bangalay (*Eucalyptus botryoides)* and coast banksia (*Banksia integrifolia*) occur closest to the coast, whereas Sydney peppermint (*Eucalyptus piperita*) and blackbutt (*Eucalyptus pilularis*) prefer more protected locations and in the case of the latter some minor shale enrichment in the soil. A prominent layer of hardy mesic small trees and shrubs is present. These include sweet pittosporum *(Pittosporum undulatum*), cheese tree (*Glochidion ferdinandi*) and blueberry ash (*Elaeocarpus reticulatus*). In the suburban environment the proliferation of these species in the understorey at long unburnt sites has generated considerable debate, particularly as there appears to be strong correlation between time since fire and their density (Rose and Fairweather 1997). It also appears that these species are more common in these littoral zones than in other sheltered sandstone forests situated further away from the coast. This forest is restricted to sandstone soils derived from either Hawkesbury or Narrabeen geology. The distribution is coastal and requires a combination of low elevation (between two and 45 metres above sea level) and mean annual rainfall that exceeds 1100 millimetres per annum. It is noticeable that most sites are exposed to salt-laden winds. Samples are situated up to 10 kilometres from the coastline, but still in close proximity to major waterways.	

PCT 1778: Coastal sandstone foreshores forest	
Structure of vegetation	All stratum (canopy, shrub and groundcover) were present across the zone and within the broader Project Area. Native vegetation within the BAM plot comprised of trees (68.2%), shrubs (19.9% cover) and groundcovers (4.2%). A moderate litter cover of 64% was present, as well as 20m of fallen logs. The vegetation zone contained trees in all stem size classes, including regenerating trees and one large tree (>50cm). No hollow bearing trees were recorded within the zone.
Scientific Reference from VIS (DPIE 2021c)	OEH (2016) The Native Vegetation of the Sydney Metropolitan Area NSW Office of Environment and Heritage Sydney.
TEC Status (BC Act 2016 and EPBC Act 1999)	Not listed
Estimate of percent cleared value of PCT in the major catchment area	90%

Plate 1. Representative photo of PCT 1778 (Vegetation Zone 1) in the Subject Land.

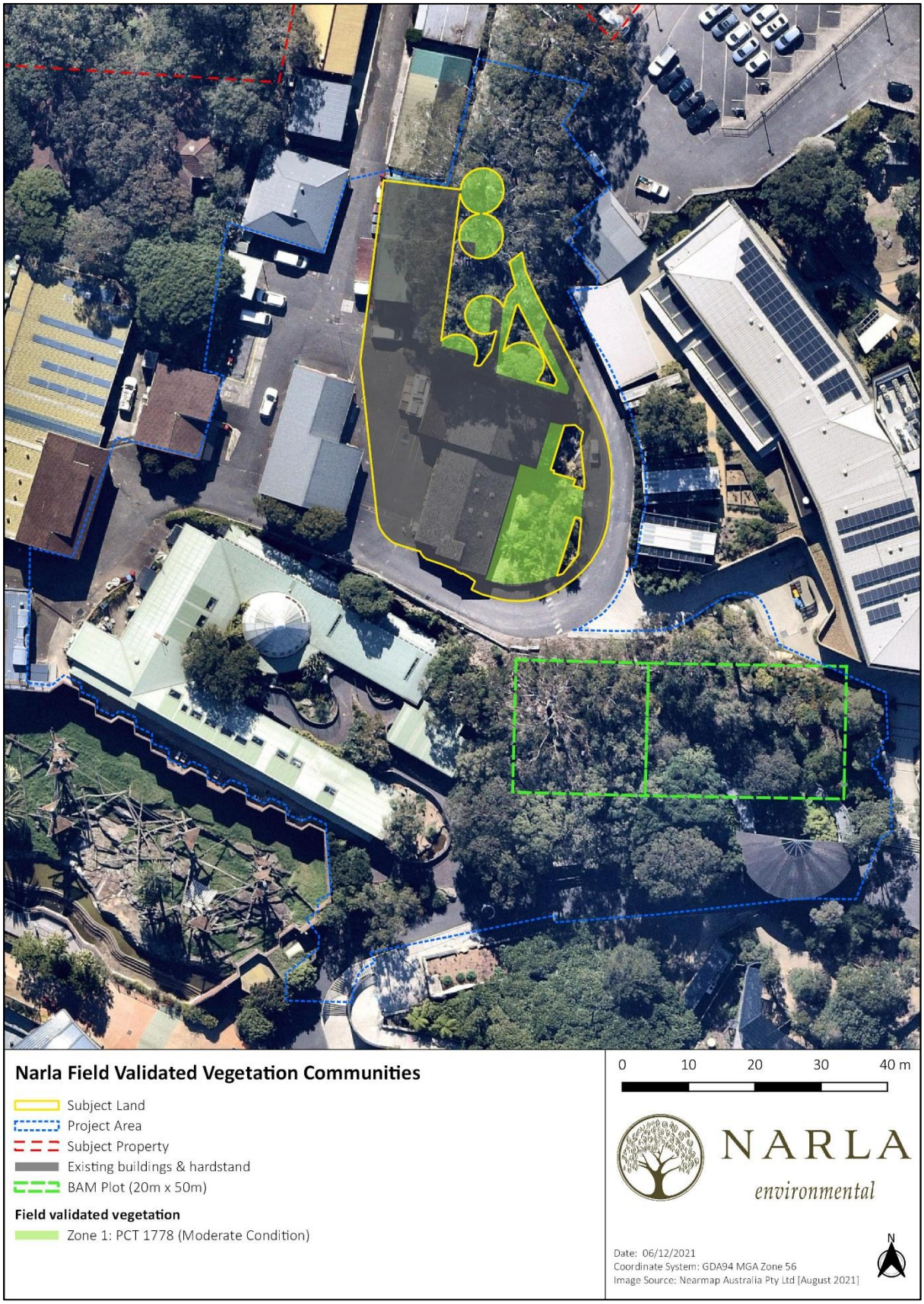


Figure 8. Narla field validated vegetation mapping and location of BAM plots within the Subject Land.

3.2 Assessing Patch Size

As defined by the BAM, a patch is an area of native vegetation that occurs on the Subject Land and includes native vegetation that has a gap of less than 100m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). A patch may extend onto adjoining land. For each vegetation zone, the assessor must determine the patch size in hectares and assign it to one of the following classes:

- <5ha
- 5–<25ha
- 25–<100ha
- ≥100ha.

The patch size class is used to assess habitat suitability on the Subject Land for threatened species. The assessor may assign more than one patch size class to the vegetation zone if both of the following apply:

- A vegetation zone comprises two or more discontinuous areas of native vegetation, and
- The areas of discontinuous native vegetation have more than one patch size class.

As areas outside of the Subject Property were not assessed as part of the scope of this assessment, the vegetation zones identified within the Subject Land were separated into the following categories to allow for aerial mapping of patch size within the broader area (Figure 9):

- Woody Ecosystems:
    - Zone 1: PCT 1778.

Table 5. Patch size classes of each PCT and associated vegetation zones.

Plant Community Type	Category	Vegetation Zone	Patch Size Class
PCT 1778	Woody Ecosystems	Zone 1	≥100ha

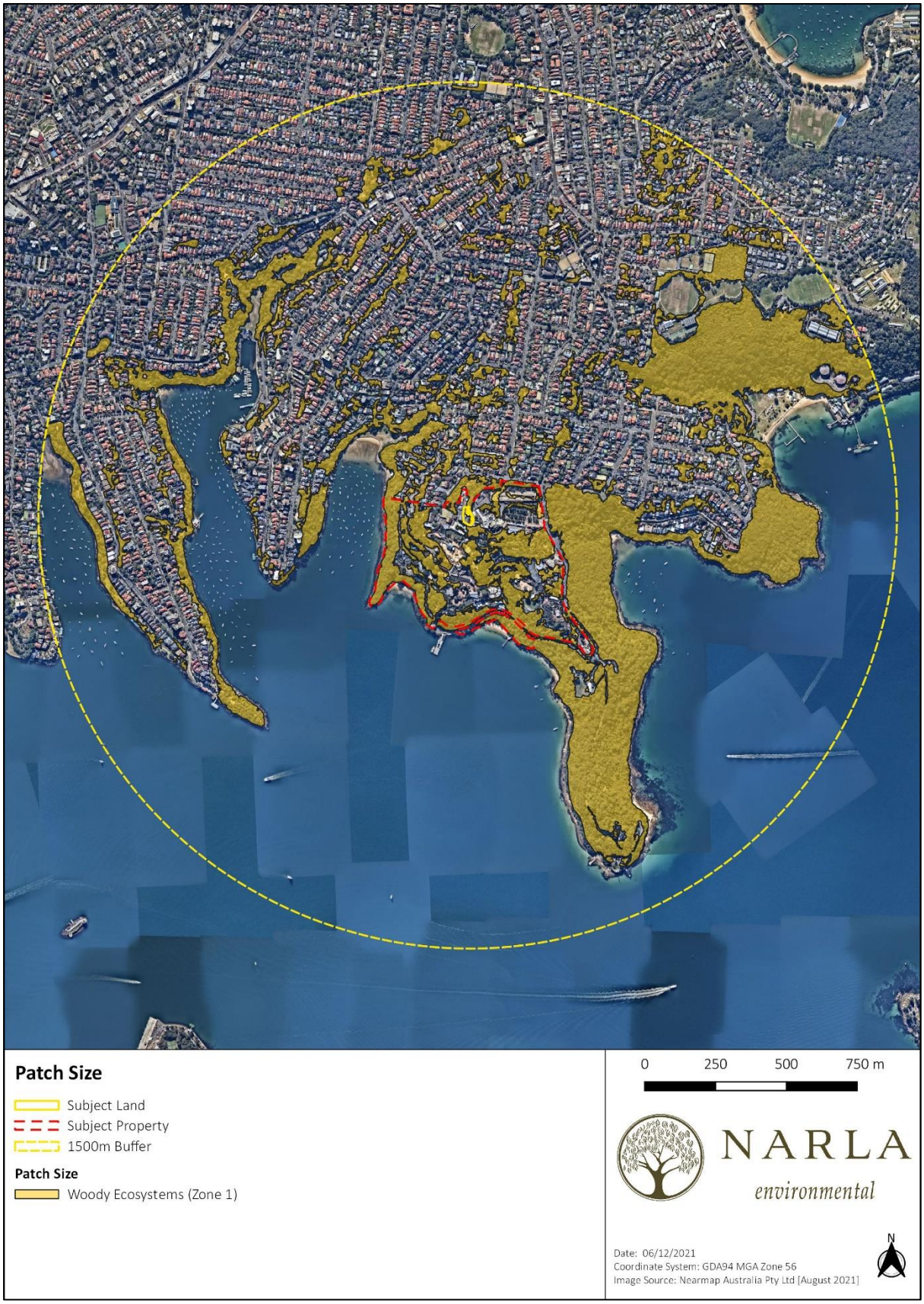


Figure 9. The patch size of Vegetation Zone 1 occurring within the 1500m buffer. The patch does however extend further than the buffer boundary.

3.3 Vegetation Integrity Survey (VIS) Plots

One (1) BAM VIS Plot was established within the Project Area. Due to the restricted nature of the Subject Land, with multiple buildings present, a BAM plot could not be established within the Subject Land. It was therefore positioned in remnant bushland within the Project Area (adjacent to the Subject Land), which was indicative of the PCT within the Subject Land. Plot data gathered for each attribute used to assess the function of the Subject Land vegetation is detailed in **Appendix 2**. Vegetation Integrity (VI) Scores represented by existing vegetation within the vegetation zone are detailed in **Table 6**.

3.3.1 Determining future vegetation integrity scores

Most projects will result in complete clearing of vegetation and threatened species habitat within the development footprint. In this scenario, the assessor must assess the proposed future value of each of the VI attributes as zero in the BAMC (DPIE 2020a).

The Subject Land will be exposed to full clearing as a result of the proposed development (**Figure 10**):

- Vegetation Zone 1: PCT 1778:
    - Management Zone 1.1: Total Impact – this area is defined by the construction and operational footprints, and will require the removal of all vegetation to allow for the proposed development.

All areas outside of the above management zone consist of existing buildings and hardstand and have therefore not been assigned to a management zone.

Table 6. Vegetation integrity scores for each identified zone.

PCT	Management Zone	Area (ha)	Survey Effort	Composition Condition Score	Structure Condition Score	Function Condition Score	VI Score	Future VI Score	Change in VI Score	Total VI Loss	Hollow bearing trees
PCT 1778: Coastal sandstone foreshores forest	Management Zone 1.1: Total Impact	0.04	1 x 1000m^2 (20m x 50m) VIS Plot	39.6	38.1	63.7	45.8	0	-45.8	-45.8	0

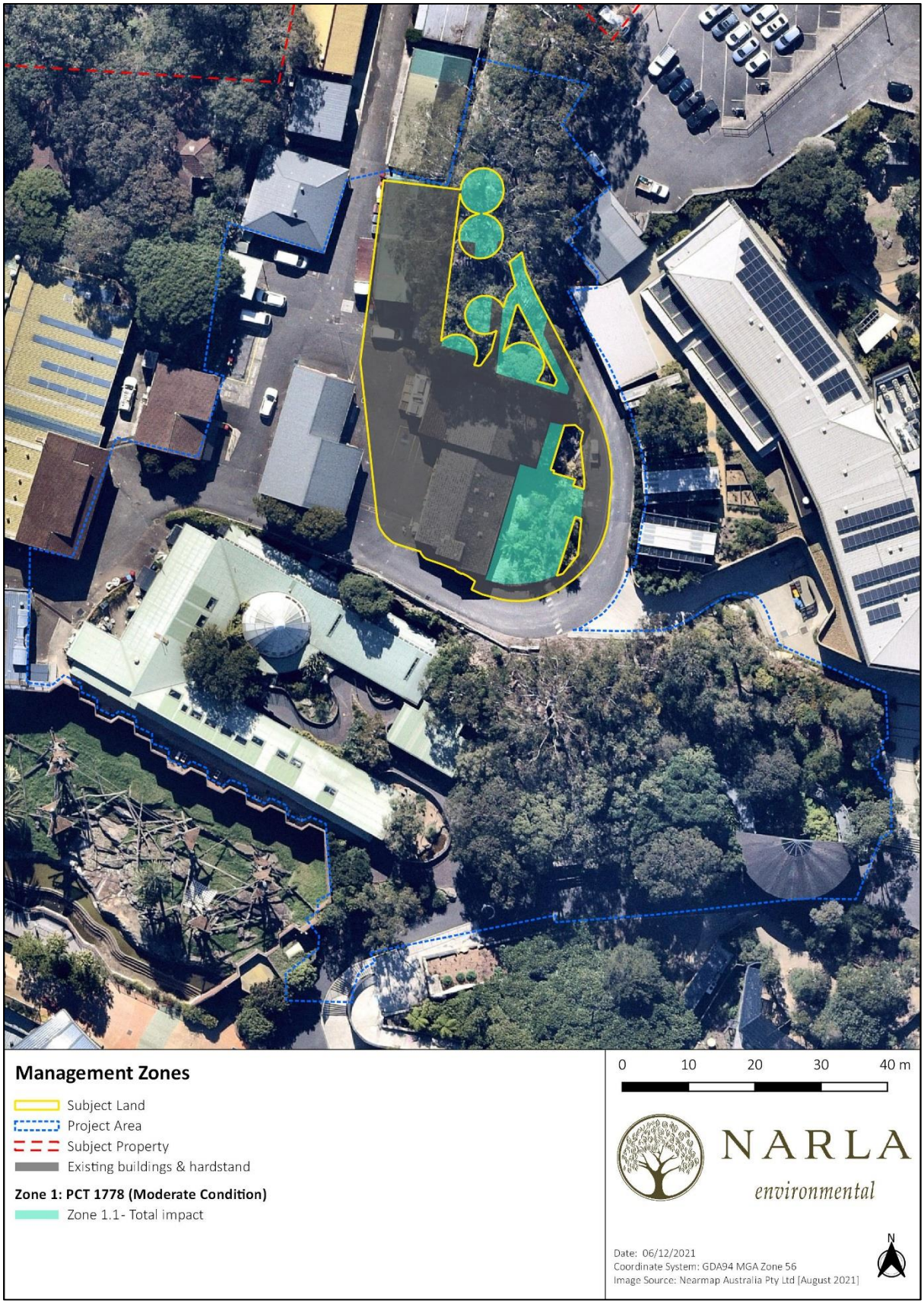


Figure 10. Management zones within the Subject Land.

4. Threatened Species

4.1 Candidate Ecosystem Credit Species

Ecosystem credit species associated with the Subject Land are listed below in **Table 7.** No species predicted by the BAM calculator as potential ecosystem credits were excluded from the assessment due to habitat constraints.

Table 7. Candidate ecosystem credits predicted to occur within the Subject Land.

Scientific Name	BC Act Status	Excluded from Assessment	Reason for Exclusion from Assessment
Anthochaera phrygia Regent Honeyeater (Foraging)	Critically Endangered	No	-
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	No	-
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Vulnerable	No	-
Daphoenositta chrysoptera Varied Sittella	Vulnerable	No	-
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	No	-
Glossopsitta pusilla Little Lorikeet	Vulnerable	No	-
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Vulnerable	No	-
Hieraaetus morphnoides Little Eagle (Foraging)	Vulnerable	No	-
Hirundapus caudacutus White-throated Needletail	Vulnerable	No	-
Lathamus discolour Swift Parrot (Foraging)	Endangered	No	-
Lophoictinia isura Square-tailed Kite (Foraging)	Vulnerable	No	-
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Vulnerable	No	-
Miniopterus australis Little Bent-winged Bat (Foraging)	Vulnerable	No	-
Miniopterus orianae oceanensis Large Bent-winged bat (Foraging)	Vulnerable	No	-
Ninox connivens Barking Owl (Foraging)	Vulnerable	No	-
Ninox strenua Powerful Owl (Foraging)	Vulnerable	No	-
Pandion cristatus Eastern Osprey (Foraging)	Vulnerable	No	-
Phascolarctos cinereus Koala (Foraging)	Vulnerable	No	-

Scientific Name	BC Act Status	Excluded from Assessment	Reason for Exclusion from Assessment
Pseudomys novaehollandiae New Holland Mouse	Vulnerable	No	-
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	Vulnerable	No	-
Tyto novaehollandiae Masked Owl (Foraging)	Vulnerable	No	-
Varanus rosenbergi Rosenberg's Goanna	Vulnerable	No	-

4.2 Historically Recorded Threatened Species

The following threatened species credit species have been historically recorded within the broader Subject Property however outside the Subject Land (**Figure 11**):

- *Acacia terminalis* subsp. Eastern Sydney (Sunshine Wattle);
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat);
- *Myotis macropus* (Southern Myotis);
- *Petaurus norfolcensis* (Squirrel Glider);
- *Pteropus poliocephalus* (Grey-headed Flying Fox); and
- *Syzygium paniculatum* (Magenta Lilly Pilly).

Each species is therefore required to have their specific habitat requirements assessed in this assessment regardless of whether or not the species is considered an SAII. If suitable habitat is identified within the Subject Land, these species are required to be assumed present or be surveyed to rule out their presence in accordance with section 5.2 of the BAM (DPIE 2020a).

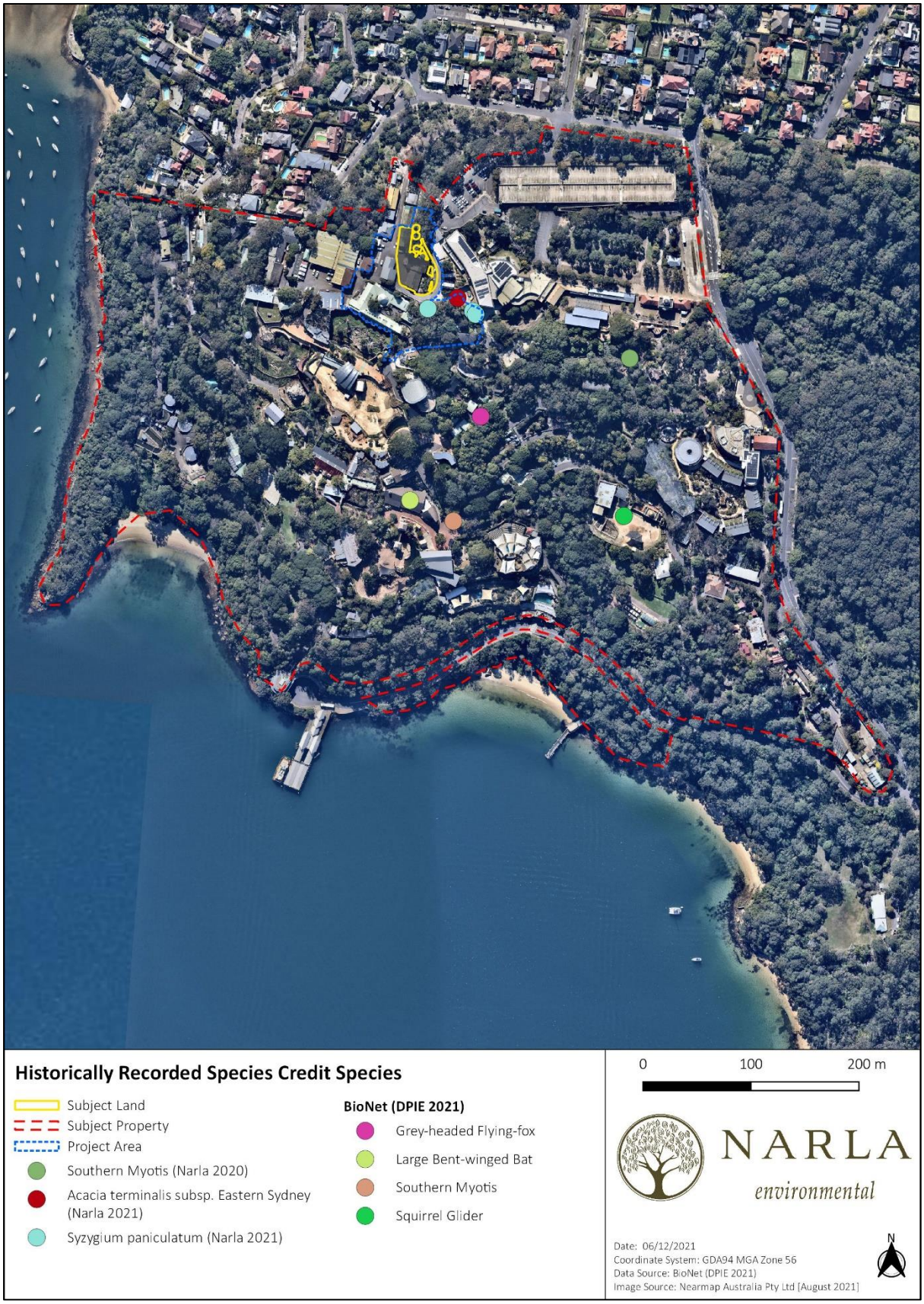


Figure 11. Historically recorded species credit species within the Subject Property.

4.3 Candidate Species Credit Species Summary

This section provides a summary of the candidate species credit fauna and flora species for the Subject Land derived from BAMC (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 8**; **Table 9**).

As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species or those threatened species incidentally located where suitable habitat was present.

Table 8. Candidate fauna credit species predicted to occur within the Subject Land.

Scientific Name	Included in Assessment?	Targeted Survey conducted?	Present within Subject Land?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Anthochaera phrygia Regent Honeyeater (Breeding)	No, the Subject Land is not included on the map of important areas for Regent Honeyeaters.	No	NA	Very High - 3	No
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High -2	No
Cercartetus nanus Eastern Pygmy-possum	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Chalinolobus dwyeri Large-eared Pied Bat	This species is known to occur within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels. Such geological features were not observed within or adjacent to the Subject Land. Potential foraging habitat occurs within the Subject Land, however, as foraging habitat is not considered an SAII it has not been assessed in this BDAR.	No	NA	Very High - 3	No
Eudyptula minor - endangered population Little Penguin in the Manly	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species.	No	NA	High - 2	No

Scientific Name	Included in Assessment?	Targeted Survey conducted?	Present within Subject Land?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)	This species is not an SAII species and was therefore excluded from the assessment.				
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Hieraaetus morphnoides Little Eagle (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Lathamus discolour Swift Parrot (Breeding)	Yes, the Subject Land is included on the map of important areas for Swift Parrot.	No	Yes (important habitat map)	Very High - 3	**Yes**
Lophoictinia isura Square-tailed Kite (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	Moderate - 1.5	No
Meridolum maryae Maroubra Woodland Snail	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No

Scientific Name	Included in Assessment?	Targeted Survey conducted?	Present within Subject Land?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Miniopterus australis Little Bent-winged Bat (Breeding)	This species is known to breed in caves, tunnels, mines and culverts. As such habitat constraints are not present within the Subject Land, this species was excluded from the assessment.	No	NA	Very High - 3	No
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	This species is known to breed in caves, tunnels, mines and culverts. This species has been historically recorded within the broader Taronga Zoo, however as there is no breeding habitat (caves, tunnels, mines and culverts) present within the Subject Land, this species was excluded from the assessment.	No	NA	Very High - 3	No
Myotis macropus Southern Myotis	This species has been historically recorded with the broader Taronga Zoo (Narla 2020). As the Subject Land is located within 200m of known habitat for this species, this species is required to be assumed present and offset accordingly.	No	Assumed Present	High - 2	**Yes**
Ninox connivens Barking Owl (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Ninox strenua Powerful Owl (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Pandion cristatus Eastern Osprey (Breeding)	As per Appendix C of the BAM (DPIE2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	Moderate - 1.5	No

Scientific Name	Included in Assessment?	Targeted Survey conducted?	Present within Subject Land?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Perameles nasuta - endangered population Long-nosed Bandicoot, North Head	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Petaurus norfolcensis Squirrel Glider	One (1) historic record of the species is located within the broader Taronga Zoo, however outside the Subject Land. This species prefers vegetation with large old trees with hollows (DPIE 2021c). Such habitat was not present within the Subject Land. Therefore, this species has been excluded from the assessment.	No	NA	High - 2	No
Phascolarctos cinereus Koala (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Phascolarctos cinereus - endangered population Koala in the Pittwater Local Government Area	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Pseudophryne australis Red-crowned Toadlet	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	Moderate - 1.5	No
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	One (1) historic records of this species occur in the broader Taronga Zoo however, no camps were present within the Subject Land. Therefore, this species has been excluded from the assessment.	NA	NA	High - 2	No
Tyto novaehollandiae Masked Owl (Breeding)	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No

Table 9. Candidate Flora Credit Species predicted to occur within the Subject Land.

Scientific Name	Included in Assessment?	Targeted Survey conducted?	Present within Subject Land?	Biodiversity Risk Weighting	Biodiversity Offset Credits Required?
Acacia terminalis subsp. Eastern Sydney Sunshine wattle	Although not identified within the BAMC (DPIE 2021d) as having the potential to occur within the Subject Land, this species was incidentally located within the broader Project Area during the site assessment. However, the one (1) individual located was planted and was not observed within the Subject Land and is not expected to be impacted by the proposed works associated with stage 1.	Yes	No	High - 2	No
Allocasuarina portuensis Nielsen Park She-oak	As the Subject Land is located to the east of Gladesville and within 5km of the Sydney Harbour foreshore it is within the geographic distribution for this species. Therefore, the species was included in the assessment.	Yes	No	Very High – 3	No
Leptospermum deanei	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High - 2	No
Melaleuca biconvexa Biconvex Paperbark	As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. This species is not an SAII species and was therefore excluded from the assessment.	No	NA	High – 2	No
Syzygium paniculatum Magenta Lilly Pilly	Although not identified within the BAMC (DPIE 2021d) as having the potential to occur within the Subject Land, this species was incidentally located within the Project Area during the site assessment. However, the three (3) individuals located were planted and was not observed within the Subject Land. This species is not expected to be impacted by the proposed works associated with Stage 1.	Yes	No	High - 2	No

4.4 Targeted Species Credit Surveys

Targeted surveys were undertaken for species credit species considered likely to have suitable habitat within the Subject Land. These surveys were implemented in accordance with Section 6.5 of the BAM and all relevant OEH and DPIE threatened species survey guidelines.

Targeted surveys were undertaken on 13th January 2021. Weather conditions taken from the nearest weather station (Sydney - Observatory Hill station no. 066214) in the lead up and during the field survey are outlined in **Table 10.**

Pre-survey weather conditions were generally conducive for identifying threatened species should they occur within the Subject Land. Rainfall in the week and month prior to the targeted survey provided ideal conditions for the flowering and/or emergence of the targeted flora species. Such rainfall also allowed for optimal conditions for the emergence of shrubs and groundcovers within the Subject Land, which ensured maximum species diversity was observed during the site visit.

Table 10. Weather conditions taken from the nearest weather stations (Station number 067021) in the lead up and during the field survey (BOM 2021). Survey date is in bold.

Timing/activities	Date	Day	Temperature		Rainfall (mm)
			Min	Max	
Lead up to the survey	6/01/2021	Wednesday	19.8	25.4	1.6
	7/01/2021	Thursday	18.4	23.5	1.8
	8/01/2021	Friday	17.6	22.7	5.4
	9/01/2021	Saturday	16.7	26.7	0
	10/01/2021	Sunday	17	27.8	0
	11/01/2021	Monday	18.2	28.6	0
	12/01/2021	Tuesday	18.8	29.3	0
Site Assessment	**13/01/2021**	**Wednesday**	**20.9**	**29.8**	**0**

4.4.1 Fauna Species Credit Survey

A total of twenty-tree (23) threatened fauna species were identified within the BAMC (DPIE 2021d) as having the potential to occur within the Subject Land. One (1) SAII species, *Lathamus discolor* (Swift Parrot), is mapped as occurring within the Subject Land (important areas map) and was therefore considered present. In addition, *Myotis macropus* (Southern Myotis) was assumed present as it has been historically recorded within the broader Taronga Zoo, with the Subject Land containing known habitat (vegetation within 200m from waterbodies) for this species. The remaining twenty-one (21) species were excluded from assessment due to the following:

- Species are considered unlikely to occur and no further assessment is required for that species if it is determined that no habitat constraints are present on the entire Subject Land for the threatened species (as per Section 5.2.2 of the BAM, DPIE 2020a);
- As per Appendix C of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. Therefore, all non-SAII species were excluded from the assessment.

4.4.2 Flora Species Credit Survey

A total of three (3) threatened flora species were identified as having the potential to occur within the Subject Land. Two (2) of these species; *Leptospermum deanei* and *Melaleuca biconvexa* were not surveyed for due to the following:

- As per Appendix c of the BAM (DPIE 2020a), the Streamlined Assessment Module only requires surveying for SAII species. Therefore, all non-SAII species were excluded from the assessment.

The remaining three (3) species were surveyed for within the Subject Land. The targeted surveys were undertaken for these species in accordance with the 'Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method' (DPIE 2020e; **Figure 12**). These species were not located within the Subject Land.

Table 11. Species credit flora species requiring targeted surveys.

Candidate Fauna Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Allocasuarina portuensis Nielsen Park She-oak	✓											
Acacia terminalis subsp. Eastern Sydney Sunshine wattle	✓											
Syzygium paniculatum Magenta Lilly Pilly	✓											
Key	✓ = Surveyed				= Optimum Survey Period							

4.5 Species Polygons

A species polygon was created for two (2) species credit species assumed or considered present within the Subject Land:

- *Lathamus discolor* (Swift Parrot): considered to be present within the Subject Land as it is located within mapped important areas for that species. According to Section 5.2.5 of the BAM (DPIE 2020a), the species polygon must include the entire area mapped on the important habitat map that contains suitable habitat within the Subject Land. As such, the species polygon for this species is considered to be 0.02ha of vegetation within Zone 1 (**Figure 13**). Vegetation overhanging existing buildings and hardstand was excluded from the species polygon, as these did not form part of the vegetation within Zone 1.
- *Myotis macropus* (Southern Myotis): assumed to be present within the Subject Land as it is located within 200m of known habitat. According to Section 5.2.5 of the BAM (DPIE 202a), where a species is assumed to be present on the Subject Land, the species polygon is to comprise of the entire vegetation zone(s) the species is predicted to occur within. As such, the species polygon for this species is considered to be 0.02ha of vegetation within Zone 1 (**Figure 14**).

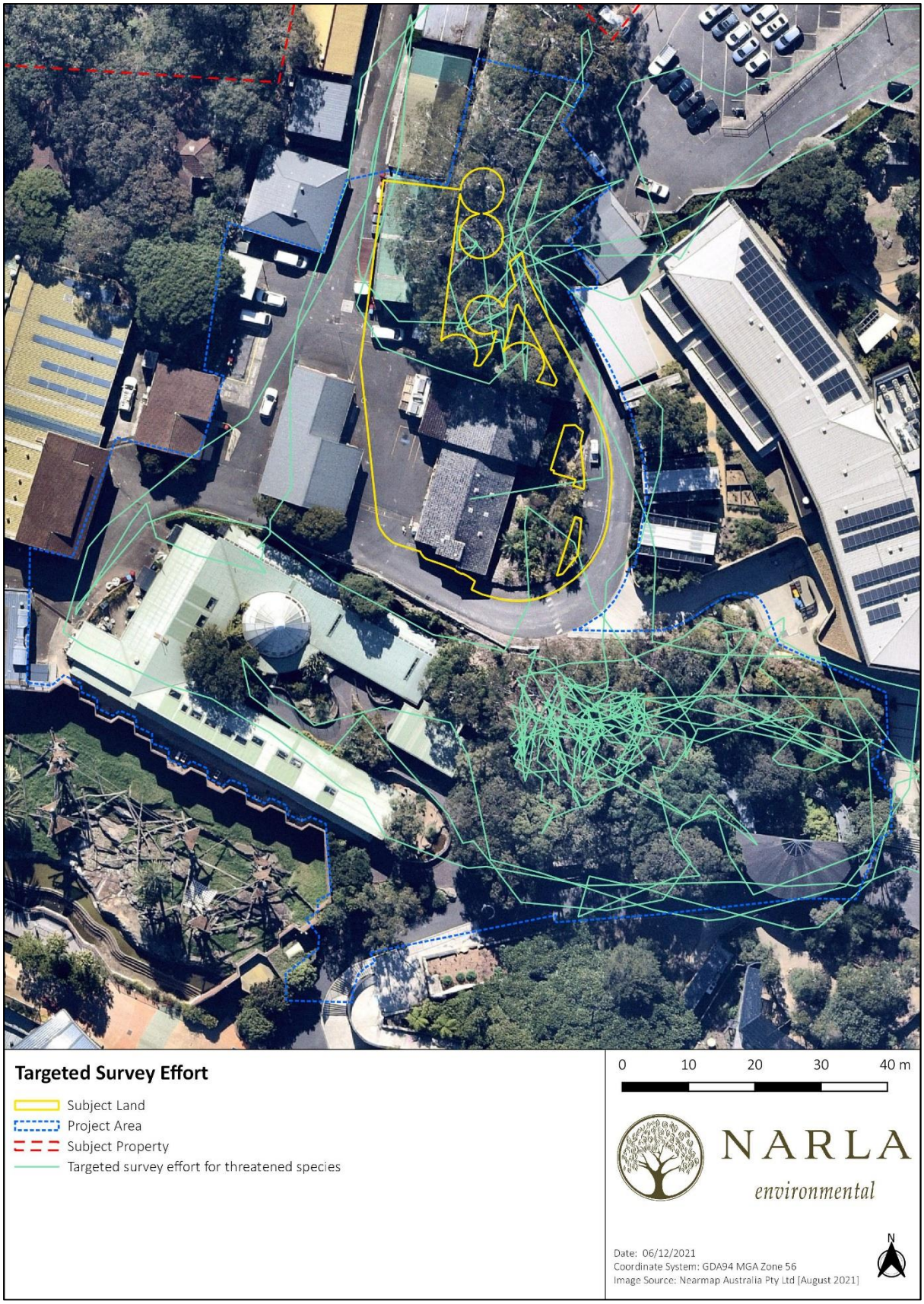


Figure 12. Targeted survey effort for species credit species within the Subject Land.

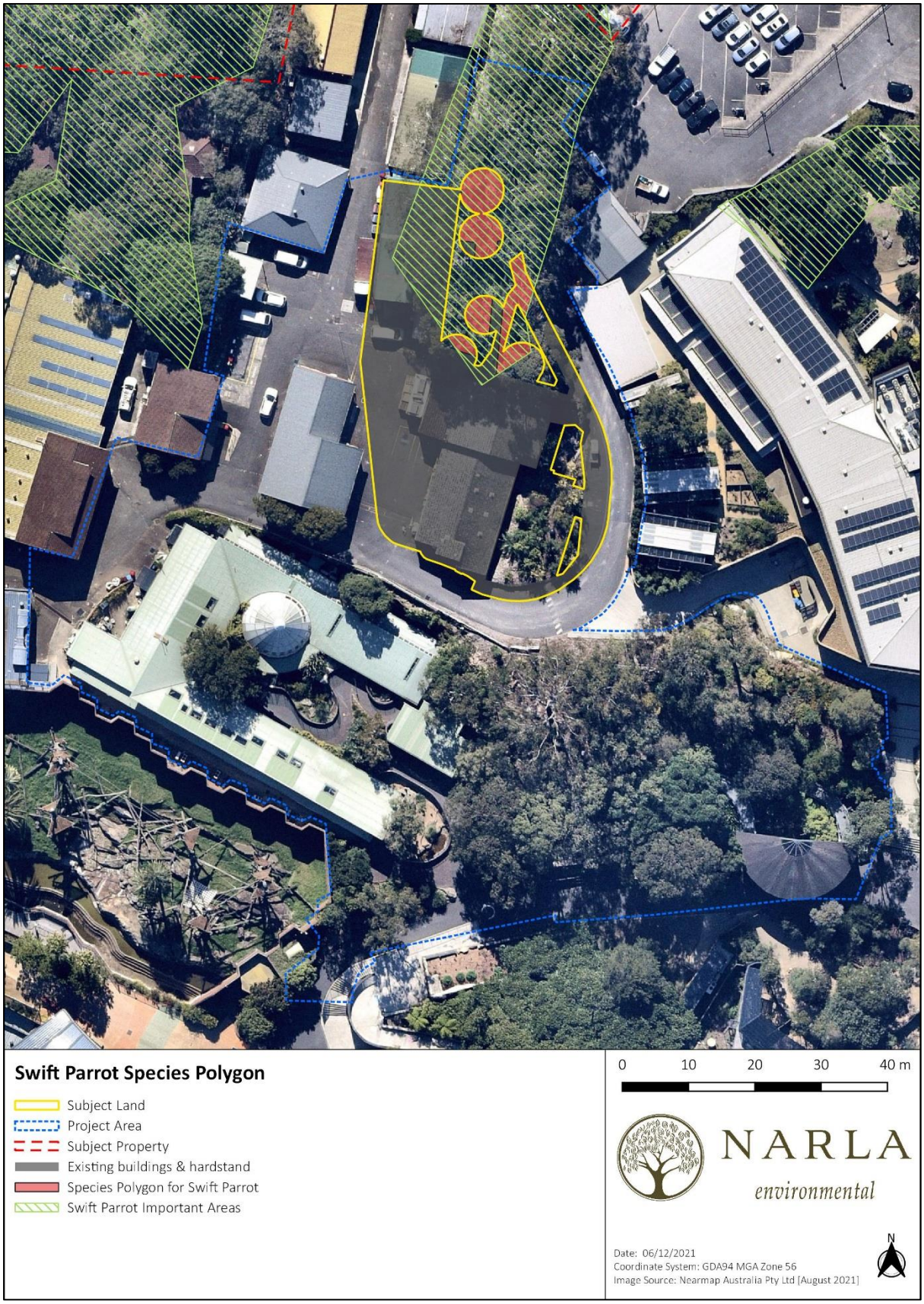


Figure 13. Swift Parrot species polygon.

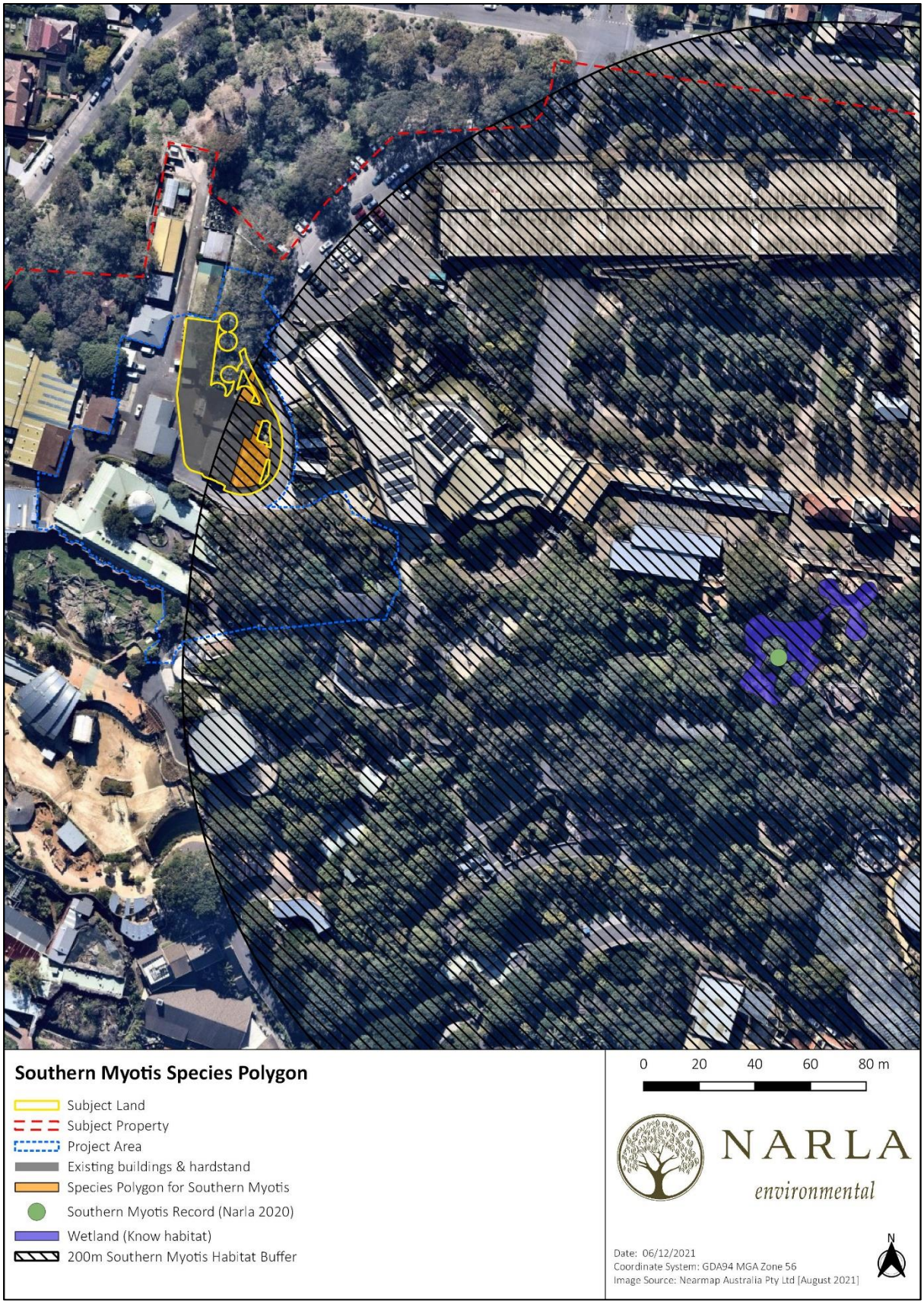


Figure 14. Southern Myotis species polygon.

5. Prescribed Impacts

Certain projects may have impacts on biodiversity values in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. For many of these impacts, the biodiversity values may be difficult to quantify, replace or offset, making avoiding and minimising impacts critical. Prescribed biodiversity impacts require an assessment of the impacts of the subdivision on the habitat of threatened species or ecological communities. This is discussed in Table 12.

Table 12. Prescribed and uncertain impacts associated with the proposed development.

Will there be impacts on any of the following?	Yes/No	If Yes, Address all of the assessment questions from section 6 of the BAM
Habitat of threatened entities including: ▪ karst, caves, crevices, cliffs, rocks and other geological features of significance, or ▪ human-made structures, or ▪ non-native vegetation	Yes	There are no karsts, caves, crevices, cliffs, rocks and other features of geological significance on or near the Subject Land. The Subject Land contains human-made structures including the warehouse, food preparation and grain store. Demolition will be completed as an exempt development and has therefore not been assessed as part of the proposed development. Non-native vegetation was present within the Subject Land; however, it only exists in the form of herbaceous weeds, landscape plants and exotic grasses, the removal of which is not expected to impact any threatened species.
On areas connecting threatened species habitat, such as movement corridors	No	It is unlikely the proposed development will interrupt connectivity for any threatened species, as areas of habitat connectivity will continue to exist in vegetated areas surrounding the Subject Land.
That affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)	No	It is not expected that the removal of vegetation within the Subject Land will impact upon any groundwater processes or hydrological processes within the surrounding landscape, particularly as most of the vegetation has been historically planted and largely altered.

Will there be impacts on any of the following?	Yes/No	If Yes, Address all of the assessment questions from section 6 of the BAM
On threatened and protected animals from turbine strikes from a wind farm	No	No wind farms are associated with the proposed development.
On threatened species or fauna that are part of a TEC from vehicle strikes.	No	The Subject Land has the potential to support threatened species. However, due to the nature of the proposed development, it is highly unlikely that vehicle strikes will be an issue given the slow speed requirements of vehicles within the property.

6. Avoid and Minimise Impacts

6.1 Impact Mitigation and Minimisation Measures

This section details the measures to be implemented before, during and post construction to avoid and minimise the impacts of the project (**Table 13**).

Table 13. Mitigation and minimisation of impacts associated with the proposed development.

Action	Outcome	Timing	Responsibility
Avoid and Minimise Impact - Project Location and Design	The development has been strategically positioned to minimise impacts on native vegetation and habitat as much as possible. The proponent has located the proposed works within historically modified areas, mostly situated within the footprint of existing buildings and hardstand areas. Only minor impacts to areas of existing vegetation, mostly comprising of planted native vegetation, is anticipated. Any temporary structures required for construction works should be located within hardstand and cleared areas that have minimal biodiversity values. This will avoid unnecessary impacts on native vegetation and habitat elsewhere within the Subject Property.	Pre-construction phase	Proponent
Preparation of a Construction Management Plan (CMP)	A CMP will be required for the construction phase of the project, and will be prepared as part of the SSDA. The CMP is to include measures for the management of soil erosion and sedimentation; hazardous materials; noise, vibration and dust; and rubbish removal. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and nearby waterways in accordance with relevant policy documentation and Government guidelines. In order to address the potential impacts of the proposal on biodiversity, the mitigation and management measures outlined within this table would be implemented as part of the CMP for the site.	Pre-construction phase	Proponent Construction Contractor

Action	Outcome	Timing	Responsibility
Tree Protections	Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on construction sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ. A Minor Encroachment is less than 10% of the TPZ and is outside the SRZ. A Minor Encroachment is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods.	Pre-construction phase	Proponent Arborist
Assigning a Project Ecologist for vegetation clearing	Prior to construction, the applicant should commission the services of a qualified and experienced Ecologist Consultant (minimum 3 years' experience) with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. 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 may be commissioned to: ▪ Undertake an extensive pre-clearing survey, delineating habitat-bearing trees and shrubs to be retained/removed; and ▪ Supervise the clearance of trees and shrubs (native and exotic) in order to capture, treat and/or relocate any displaced fauna.	Prior to and during vegetation clearance works	Proponent Project Ecologist
Relocation of woody debris	Any woody debris (fallen trees and logs) within the Subject Land are to be relocated to areas of native vegetation elsewhere with the Zoo.	Construction phase	Project Ecologist Proponent Bush regeneration contractor

Action	Outcome	Timing	Responsibility
Erosion and Sedimentation	Appropriate erosion and sediment control must be erected and maintained at all times during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. As a minimum, such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).	Construction phase	Proponent Construction Contractor
Erection of temporary fencing	Temporary fencing should be erected around retained native vegetation that may incur indirect impacts on biodiversity values due to the construction works.	Construction phase	Proponent Construction Contractor
Storage and Stockpiling (Soil and Materials)	Allocate all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site in order to avoid the potential of incurring indirect impacts on biodiversity values.	Construction phase	Construction Contractors
Stormwater	Potential impacts relating to stormwater and runoff will be managed during construction and operation phases. The CEMP will guide stormwater management during the construction phase of development.	Post-construction phase	Proponent Construction Contractors/ Architect

7. Assessment of Impacts

7.1 Direct Impacts

The proposed development will result in impacts to the following vegetation:

- 0.04ha of vegetation representative of PCT 1778.

The development has been strategically positioned to minimise impacts on native vegetation and habitat as much as possible. The proponent has located the proposed works within historically modified areas, with the majority comprising of existing buildings and hardstand areas.

7.2 Prescribed Impacts

There will be no prescribed impacts on threatened entities associated with the proposed development.

7.3 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. The indirect impacts of this proposed development are outlined in **Table 14.**

Table 14. Indirect impacts associated with the proposed development.

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	There is the potential for minor impacts to vegetation directly adjacent to the Subject Land as a result of the proposed development. However, the vegetation adjacent to the Subject Land is already highly modified and subject to considerable, ongoing human disturbance. It is therefore likely that the proposed works will result in negligible/low inadvertent impacts during or post construction.	One PCT (PCT1778- not a TEC) occurs within the Subject Land. *Lathamus discolor* (Swift Parrot) considered present within the Subject Land, and *Myotis macropus* (Southern Myotis) assumed present within the Subject Land. Threatened flora species (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*) are present within the broader Project Area.	While changes to vegetation condition may have a low and localised impact to PCT 1778, threatened species and their habitats, this is not expected to impact on their bioregional persistence. In addition, exclusion fencing, pre-clearing surveys and clearing supervision has been proposed to reduce the risk of indirect impacts to any native vegetation and potentially occurring threatened species adjacent to the Subject Land.

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
		Foraging habitat for threatened species may be inadvertently impacted.	
(b) reduced viability of adjacent habitat due to edge effects	Due to the highly modified nature of the vegetation adjacent to the Subject Land, as well as the already existing presence of exotic vegetation, it is unlikely that the proposed development will result in a reduction in the viability of adjacent habitat due to edge effects.	One PCT (PCT1778- not a TEC) occurs within the Subject Land. *Lathamus discolor* (Swift Parrot) considered present within the Subject Land, and *Myotis macropus* (Southern Myotis) assumed present within the Subject Land. Threatened flora species (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*) are present within the broader Project Area. There is also potential that threatened species use habitat adjacent to the Subject Land. Such species may be impacted	While edge effects may have a localised impact to PCT 1778 and threatened species, this is not expected to impact on their bioregional persistence, considering the areas of habitat connectivity surrounding the Subject Land.

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
		by edge effect leading to a reduced viability in habitat.	
(c) reduced viability of adjacent habitat due to noise, dust or light spill	An increase in noise is to be expected during construction, which may impact on species roosting or foraging in habitat adjacent to the site. It is not expected that construction would occur throughout the night, and as such would not impact on nocturnal species that may utilise adjacent habitat, or diurnal species that roost in adjacent habitat. Post-construction it is expected that noise levels will return to current levels, as the site will be used in a similar manner (i.e., as a zoological park). The construction may increase dust in adjacent habitat. Dust can impact on a plants ability to photosynthesise and may increase plant mortality in the adjacent vegetation. It is however not expected that this would have such an impact to decrease the viability of adjacent habitat. It is expected that the construction would occur during normal working hours, and as such light spill is not expected to affect adjacent habitat.	*Lathamus discolor* (Swift Parrot) considered present within the Subject Land, and *Myotis macropu*s (Southern Myotis) assumed present within the Subject Land. Threatened flora species (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*) are present within the broader Project Area. There is potential that threatened species use habitat adjacent to the Subject Land. These species may be impacted by an increase in noise within the Subject Land.	While the proposed development may have a localised impact to threatened species, this is not expected to impact on their bioregional persistence, considering large areas of habitat connectivity allowing their movement away from impacted areas.

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
(d) transport of weeds and pathogens from the site to adjacent vegetation	As previously discussed, the proposed construction may lead to an increase in weed infiltration into adjacent habitat due to enhanced edge effects. It is however not expected that weeds will be transported via human or vehicular traffic into surrounding areas during construction. Temporary fencing will be erected around retained native vegetation to avoid such indirect impacts occurring during construction.	One PCT (PCT 1778) was identified within the Subject Land. Threatened flora species (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*) are present within the broader Project Area. There is also potential that threatened species use habitat adjacent to the Subject Land. The PCT and threatened species may be impacted by weed and pathogen transportation leading to a reduced viability in habitat.	While weeds and pathogens may have a localised impact to PCTs and threatened species, this is not expected to impact on their bioregional persistence, considering the large habitat connectivity within the surrounding areas.
(e) increased risk of starvation, exposure and loss of shade or shelter	It is highly unlikely that any threatened fauna would be exposed to increased risks from starvation, exposure, and loss of shade and shelter as a result of the proposed development given the small area of vegetation being removed. No habitat is to be removed beyond the Subject Land, although	N/A	N/A

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
	disturbances from other indirect impacts may deem such habitats unsuitable for certain species. However, due to the areas of habitat connectivity adjoining the Subject Land, it is unlikely that this localised impact will be significant as such habitats will continue to provide food resources and shelter for fauna species.		
(f) loss of breeding habitats	No breeding habitat features (e.g., hollows, nests caves) were identified immediately adjacent to the Subject Land. It is therefore considered unlikely that the proposed works would result in a loss of breeding habitats.	N/A	N/A
(g) trampling of threatened flora species	Although no threatened flora species were recorded within the Subject Land, two (2) threatened flora species were recorded in remnant native vegetation within the broader Project Area (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*). In order to prevent any impacts to these threatened flora species, retained native vegetation areas will be delineated with temporary fencing to avoid such impacts occurring during construction.	Threatened flora species (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*) may be impacted by accidental trampling or impacts.	While the proposed development may result in a localised increase in threatened flora being accidentally trampled or impacted, this is not considered a high risk, and is not expected to impact on their bioregional persistence, considering exclusion fencing has been suggested around all vegetation to be retained.

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
(h) inhibition of nitrogen fixation and increased soil salinity	It is unlikely that the inhibition of nitrogen fixation will affect vegetation adjacent to the Subject Land. Increased soil salinity may result due to clearing of vegetation leading to the rising of the water table. However, clearing will be limited to the Subject Land and as such is not expected to affect vegetation directly adjacent to the Subject Land.	N/A	N/A
(i) fertiliser drift	This issue is not likely to affect the vegetation surrounding the Subject Land. Although fertiliser may be used in landscaped vegetation, no fertiliser drift is expected to impact on adjacent vegetation.	N/A	N/A
(j) rubbish dumping	Large scale rubbish dumping is not considered to be an issue in vegetation adjacent to the Subject Land as it is regularly maintained by Zoo staff. The minor dumping/littering of food resources may provide a food source for fauna, including threatened species. However, this may also encourage invasive species into such habitats.	*Lathamus discolor* (Swift Parrot) considered present within the Subject Land, and *Myotis macropu*s (Southern Myotis) assumed present within the Subject Land. Threatened flora species (*Acacia terminalis* subsp. Eastern Sydney and *Syzygium paniculatum*) are	This impact is expected to be localised and will not have an overall impact on the bioregional persistence of the threatened species.

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
		present within the broader Project Area. There is potential that threatened fauna species use habitat adjacent to the Subject Land. Such species may be impacted by the dumping of rubbish, particularly food resources. This may result in both positive (food source) and negative impacts (increase in predators) to such species.	
(k) wood collection	Wood collection is not considered to be an issue within the vegetation adjacent to the Subject Land. No wood collection is associated with the proposed development.	N/A	N/A
(l) bush rock removal and disturbance	No bush rock is proposed for removal within the vegetation adjacent to the Subject Land as a result of the proposed development.	N/A	N/A

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
(m) increase in predatory species populations	It is unlikely that introduced predators have access to the Subject Land as the proposed development is situated within Taronga Zoo Sydney which is surrounded by fencing. The zoo is also known to conduct predatory species trapping and monitoring through the use of wildlife cameras.	N/A	N/A
(n) increase in pest animal populations	There is potential that pest animal populations already inhabit areas surrounding the Subject Land (particularly smaller species which may fit through the chain-link fence). The proposed development is not likely to increase this potential risk.	N/A	N/A
(o) increased risk of fire	The vegetation immediately adjacent to the Subject Land is not identified by Mosman Council as occurring within bushfire prone land. It is not expected that the proposed development will alter the bushfire risk of vegetation surrounding the Subject Land.	N/A	N/A
(p) disturbance to specialist breeding and foraging habitat,	No specialist breeding and foraging habitat was identified adjacent to the Subject Land. It is therefore not expected that	N/A	N/A

Indirect Impact	Nature, extent and duration	TEC's/PCTs and/or Threatened Species and their habitat likely to be impacted	Consequences of the impacts for the bioregional persistence of the native vegetation, threatened species, threatened ecological communities and their habitats.
e.g., beach nesting for shorebirds.	the proposed development will disturb any specialist breeding and foraging habitat.		

8. Thresholds for Assessing and Offsetting

8.1 Impacts on Native Vegetation

The following native vegetation within the Subject Land is proposed to be impacted as a result of the proposed development:

- 0.04ha representative of PCT 1788.

The purchase and retirement of Biodiversity Offset Credits will be required for the following native vegetation within the Subject Land (**Figure 15**):

- 0.04ha within Zone 1, representative of PCT 1778.

8.2 Impacts on Threatened Species

The following threatened species has been assumed present within the Subject Land and will require the purchase and retirement of Biodiversity Offset Credits:

- *Lathamus discolor* (Swift Parrot); and
- *Myotis macropus* (Southern Myotis).

8.3 Serious and Irreversible Impacts (SAII's)

One (1) threatened species considered present within the Subject Land, *Lathamus discolor* (Swift Parrot), has been identified as an entity at risk of a SAII in the Threatened Biodiversity Data Collection (DPIE 2021b).

The SAII threshold for this species is Mapped Important Areas. As the Subject Land occurs within a DPIE Mapped Important area the SAII threshold has been met. Therefore, a determination of whether or not the proposed impacts are serious and irreversible have been undertaken in accordance with Appendix B of 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019a). This is outlined in **Table 15.**

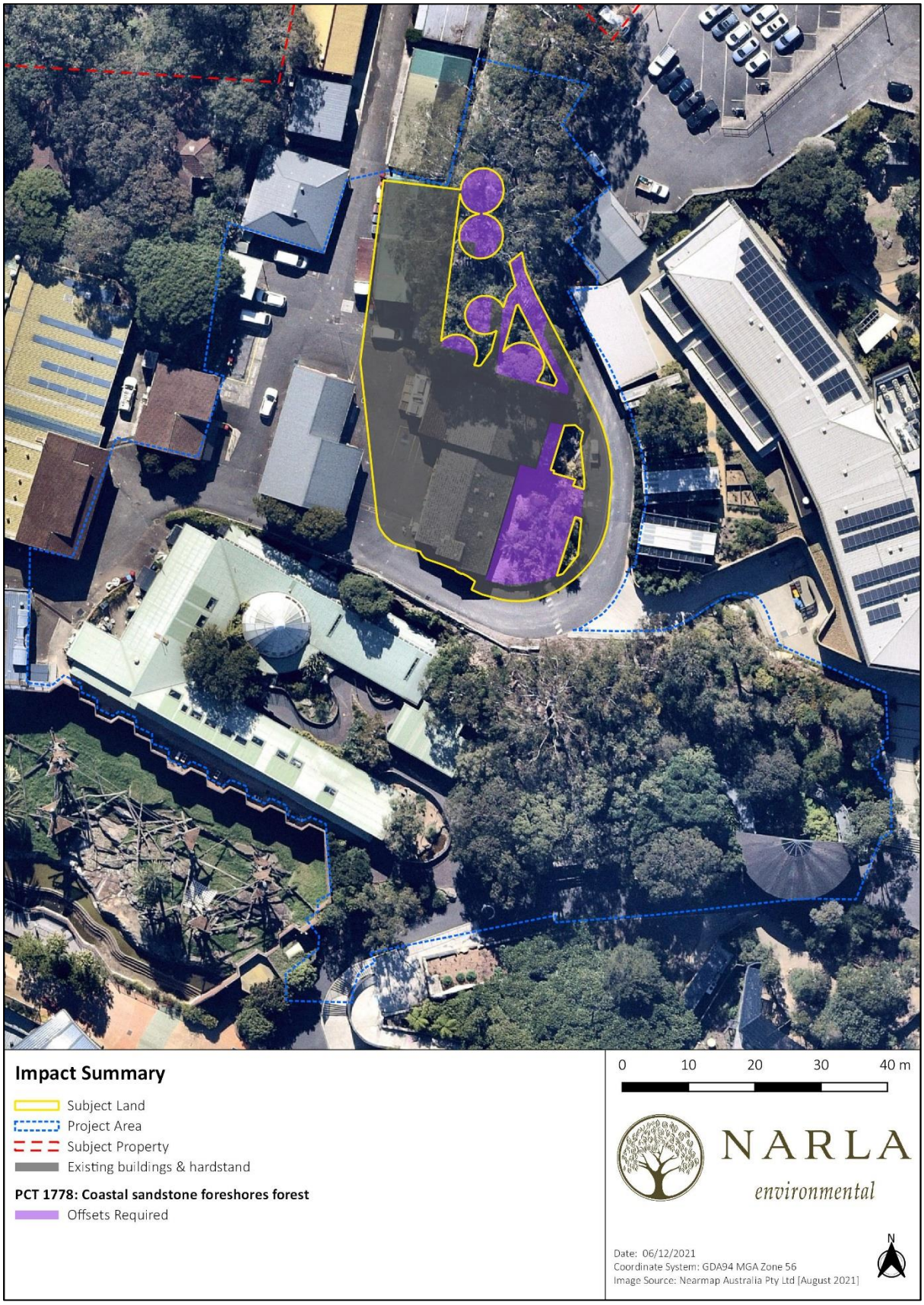


Figure 15. Impacts on native vegetation and offset requirements.

Table 15. Additional impact assessment provisions for threatened species or populations that are associated with a serious and irreversible impact.

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species or populations: *Lathamus discolour* (Swift Parrot)		
BC Act Status: Endangered		
a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII		The proposed development will require the removal of approximately 0.02ha of vegetation that is mapped as Important Habitat for this species. This comprises of six (6) native trees that may provide habitat for this species. A number of measures have been taken to avoid direct and indirect impacts on this species, attributed to minimising vegetation clearing. The removal of vegetation within the Subject Land has been largely avoided, as the proposed development is mostly located within the boundary of existing buildings and hardstand areas. Only minor impacts to areas of existing native vegetation are anticipated, with these areas predominately comprising of planted native vegetation.
b) the size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification		No individuals of this species were identified during the site assessment, and there are no historical records of this species within the Subject Land or broader Subject Property. Additionally, there are only 6 historical records within a 100km^2 area surrounding the Subject Land (DPIE 2021a). Along with the small nature of the proposed development and minimal vegetation clearing, it is not anticipated that the local population will be directly or indirectly impacted by the proposed development.
c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact		The SAII threshold for this species is impacts upon areas of mapped Important Habitat. As the Subject Land is located within areas of mapped Important Habitat for this species it exceeds the threshold for this species. Considering however the small area of native vegetation clearance within the important habitat area (0.02ha) and the proposed mitigation measures outlined in **Table 13**, it is unlikely the proposed works would result in a Serious and Irreversible Impact on this species.
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 small area (0.02ha) of native vegetation mapped as important habitat for this species will require removal to accommodate the proposed development.
	ii) the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and	The native vegetation proposed for removal mapped as important habitat for this species (0.02ha) will not significantly reduce available habitat for this species, particularly as the Subject Land is located within a highly modified area comprising of multiple buildings, hardstand areas, and planted gardens. Only six (6) native trees are proposed for removal within this area,

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species or populations: *Lathamus discolour* (Swift Parrot)		
BC Act Status: Endangered		
		with multiple nectar-bearing trees proposed for retention within the broader area. The trees proposed for removal would only ever provide intermittent foraging habitat for this species.
	iii) modification of habitat required for the maintenance of processes 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.	The native vegetation proposed for removal mapped as important habitat for this species (0.02ha) will not impact on habitat required for the maintenance of processes important to the species' life cycle. This species is highly nomadic and as such the vegetation proposed for removal would only ever provide intermittent foraging habitat for this species. In addition, no breeding habitat for this species will be impacted as a result of the proposed development.
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	The removal of native vegetation within the Subject Land is not expected to significantly impact on the breeding, foraging, roosting or dispersal of this species. The proposed development is located within a highly modified area, comprising multiple buildings, hardstand areas, and planted gardens. The native vegetation proposed for removal would only provide intermittent foraging habitat for this species, if at all. The removal of six (6) trees will not significantly impact on this species ability to disperse or move, considering the Subject Land is situated within a highly fragmented area that would already impact on this species ability to move across the landscape. No breeding habitat will be impacted as part of the proposed development.
f) a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development		The removal of native vegetation as a result of the proposed development is not expected to fragment or isolate a local population of this species. A small area of native vegetation within a highly fragmented landscape is proposed for removal. This species is highly nomadic and as such the vegetation proposed for removal would only ever provide intermittent foraging habitat for this species.
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		This species is known to breed in Tasmania however migrates to NSW from May to August where it is depended on flowering resources across a wide range of habitats (NSW Scientific Committee 2000). No individuals were located within the Subject Land at the time of the site assessment, although any habitat within the Important Habitat maps must be considered important to the survival of the species. It is however highly unlikely that the small size of the development along with the mitigation measure proposed would

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species or populations: *Lathamus discolour* (Swift Parrot)	
BC Act Status: Endangered	
	impact upon the local populations ability to interact with other populations of the species.
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	It is highly unlikely the proposed development will lead to an increase in threats to this species, considering such threats would already be present within the broader landscape. The proposed development has the potential to lead to an increase in indirect impacts, such as an increase in weeds and pest species. However, this is expected to be minimal, and as such will not impact on 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 Swift Parrot breeds in Tasmania, where the breeding population has declined from in excess of 10,000 pairs to less than 1,000 pairs (Forshaw 1993, Garnett 1993, Brereton 1998). Numbers in New South Wales are considerably less than this (NSW Scientific Committee 2000)
j) the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.	The 'Saving our Species Program' (OEH 2015) has proposed various measures to manage key threats to conserve this species across the Cumberland Subregion and NSW: ▪ Raise public awareness of the importance of large old trees of species that provide important food resources. Protect large old trees, including from the effects of fire. Ensure the recruitment of large old trees by retaining medium-sized trees, facilitating regeneration, and undertaking replanting. ▪ Within a region, increase the extent and quality of habitat to increase food supply and improve foraging efficiency. Focus on sites that may better function as drought refuges. Include locally occurring species that provide important food resources in revegetation programs where appropriate. Ensure that fuel reduction burns do not result in canopy scorch, which can reduce flowering in subsequent years. Manage aggressive honeyeater impacts through habitat modification (e.g. reduce the amount of edge and establish a structurally complex understorey). ▪ Engage the community in the identification and enhanced management of priority sites. Priority sites are those that (1) have been used by a large proportion of the population, or (2) have been used in multiple seasons, or (3) have been used for an extended period of

Serious and Irreversible Impact (SAII) Impact assessment provisions for threatened species or populations: *Lathamus discolour* (Swift Parrot)	
BC Act Status: Endangered	
	time within a season. Engage stakeholders in the identification and development of site-based management projects for priority areas, being areas containing a high proportion of priority sites, or areas that contribute to the overall diversity and distribution of resources available to swift parrots under a range of environmental conditions. ▪ With the assistance of the community, monitor swift parrot distribution, abundance, and habitat use. Investigate knowledge gaps to improve the effectiveness of management actions, including understanding the phenology of key food species, determining movement strategies, patterns and pathways between regions, and modelling the impacts of climate change projections on the distribution and abundance of foraging habitat and resources. ▪ Establish the Beak and Feather Disease Virus (BFDV) status of rehabilitated parrots proposed to be released using appropriate tests and quarantine procedures. Parrots carrying BFDV should not be released into the wild. ▪ Raise public awareness on collision risks and how these can be minimised. At priority sites and movement pathways assessed as having a high risk of collision, develop and implement mitigation strategies.

9. Biodiversity Offset Credit Requirements

The preferred approach to offset the residual impacts of the proposal is to purchase and retire the appropriate species credits from registered Biodiversity Stewardship Sites that comply with the trading rules of the NSW BOS in accordance with the 'like for like' report generated by the BAM calculator. If such credits are unavailable, credits would be sourced in accordance with the 'variation report' generated by the BAMC.

A payment to the Biodiversity Conservation Trust (BCT) would be considered as a contingency option if a suitable number and type of biodiversity credits cannot be secured.

Estimated costs to purchase these credits, or alternatively, to allocate offset funds directly into the NSW BCT are available in the NSW Biodiversity Offsets Payment Calculator (DPIE 2021g).

9.1 Offset Requirement for Ecosystem Credits

A total of one (1) ecosystem credit is required to offset the biodiversity impacts of the proposed development (**Table 16**).

Table 16. Ecosystem credits required to offset the proposed development.

PCT	BC Act Status	Zone	Total Area (ha)	Ecosystem Credits Required
PCT 1778: Coastal sandstone foreshores forest	NA	Zone 1	0.04	1
Total Ecosystem Credits				**1**

9.2 Offset Requirement for Species Credits

Two (2) candidate species credit species will require offsetting through the retiring of biodiversity offset species credits under the BOS as a result of the proposed development (**Table 17**).

Table 17. Species credits required to offset the proposed development.

Species	BC Act Status	Zone	Total Area (ha)	Species Credits Required
Lathamus discolor Swift Parrot	Endangered	Zone 1	0.02	1
		Subtotal		**1**
Myotis macropus Southern Myotis	Vulnerable	Zone 1	0.02	1
		Subtotal		**1**

10. Other Relevant Legislation and Planning Policies

10.1 Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The proposed development will abide by the environmental objectives of the Sydney Regional Environmental Plan (Sydney Harbour Catchment) (2005) which are to:

- Ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained:
    - As an outstanding natural asset, and
    - As a public asset of national and heritage significance, for existing and future generations
- Ensure a healthy, sustainable environment on land and water;
- Achieve a high quality and ecologically sustainable urban environment
- Ensure a prosperous working harbour and an effective transport corridor;
- Encourage a culturally rich and vibrant place for people;
- Ensure accessibility to and along Sydney Harbour and its foreshores;
- Ensure the protection, maintenance and rehabilitation of watercourse, wetlands, riparian lands, remnant vegetation and ecological connectivity; and
- Provide a consolidated, simplified and updated legislative framework for future planting.

The Subject Land is located within the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 Foreshores and Waterways Area Map. Division 2 Section 21 'Biodiversity, ecology and environment protection' identifies a number of matters to be taken into consideration in relation to biodiversity, ecology and environment protection, including:

- Development should have a neutral or beneficial effect on the quality of water entering the waterways;
- Development should protect and enhance terrestrial and aquatic species, populations and ecological communities and, in particular, should avoid physical damage and shading of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities);
- Development should promote ecological connectivity between neighbouring areas of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities);
- Development should avoid indirect impacts on aquatic vegetation (such as changes to flow, current and wave action and changes to water quality) as a result of increased access;
- Development should protect and reinstate natural intertidal foreshore areas, natural landforms and native vegetation;
- Development should retain, rehabilitate and restore riparian land;
- Development on land adjoining wetlands should maintain and enhance the ecological integrity of the wetlands and, where possible, should provide a vegetative buffer to protect the wetlands;
- The cumulative environmental impact of development; and
- Whether sediments in the waterway adjacent to the development are contaminated, and what means will minimise their disturbance.

10.2 State Environmental Planning Policy (Koala Habitat Protection) 2021

This SEPP seeks to address the declining status of koalas in NSW through better conservation and management of koala habitat as part of the planning and assessment process. The overarching aim of the SEPP is to "… encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline" (DPIE 2020b). This SEPP applies to local government areas that are listed in Schedule 1 'Local government areas' of the SEPP. As Mosman LGA is not included in Schedule 1, this SEPP does not apply to the Subject Land.

10.3 State Environmental Planning Policy No 19—Bushland in Urban Areas

SEPP 19 – Bushland in Urban Areas applies to the areas and parts of areas specified in Schedule 1 of the SEPP that adjoin bushland zoned or reserved for public open space purposes. As the Subject Land does not adjoin land zoned or reserved for public open space, this SEPP does not apply to the proposed development.

10.4 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 applies to land within the coastal zone. The coastal zone means the area of land comprised of the following coastal management areas:

- the coastal wetlands and littoral rainforests area;
- the coastal vulnerability area;
- the coastal environment area; or
- the coastal use area.

The Subject Land is located within the SEPP's 'coastal environment area' and 'Coastal Use Area', however, this clause does not apply to land within the Foreshores and Waterways Area within the meaning of Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005. As such, this SEPP is not triggered by the proposed development.

11. References

Australian Bureau of Meteorology (BOM) (2021) Sydney - Observatory Hill, New South Wales. January 2021 Daily Weather Observations http://www.bom.gov.au/

Australian Government Department of the Environment and Energy (2018) Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)

Australian Standard 4970 (2009) Protection of Trees on Development Sites

Biodiversity Conservation Act (2016) https://legislation.nsw.gov.au/#/view/act/2016/63/full

Biodiversity Conservation Regulation (2017) https://www.legislation.nsw.gov.au/#/view/regulation/2017/432

Chapman GA, Murphy CL, Tille PJ, Atkinson G and Morse RJ, (2009) Ed. 4, Soil Landscapes of the Sydney 1:100,000 Sheet map, Department of Environment, Climate Change and Water, Sydney

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

Department of Planning, Industry and Environment (DPIE) (2019a) Guidance to assist a decision-maker to determine a serious and irreversible impact https://www.environment.nsw.gov.au/-media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidance-decision-makers-determine-serious-irreversible-impact-190511.pdf

Department of Planning, Industry and Environment (DPIE) (2020a) Biodiversity Assessment Methodology

Department of Planning, Industry and Environment (DPIE) (2020b) Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method

Department of Planning, Industry and Environment (DPIE) (2021a) NSW BioNet. The website of the Atlas of NSW Wildlife http://www.bionet.nsw.gov.au/

Department of Planning, Industry and Environment (DPIE) (2021b) NSW BioNet. Threatened Biodiversity Data Collection

Department of Planning, Industry and Environment (DPIE) (2021c) NSW BioNet. Vegetation Classification System

Department of Planning, Industry and Environment (DPIE) (2021d) Biodiversity Assessment Method Calculator Version 1.3.0.00

Department of Planning, Industry and Environment (DPIE) (2021e) Biodiversity Offset Payment Calculator Version 2.0 https://www.lmbc.nsw.gov.au/offsetpaycalc

Department of Planning, Industry and Environment (DPIE) (2021f) Soil Landscapes http://espade.environment.nsw.gov.au

DWP (2021a) Taronga Wildlife Hospital and Nutrition Centre – Site Plan - Existing/Demolition.

DWP (2021b) Taronga Wildlife Hospital and Nutrition Centre – Site Plan – New Works Roof. Drawing Number AA-N1001, Issue N.

Google Earth (2021) Taronga Zoo, Mosman.

Landcom (2004) Managing Urban Stormwater: Soils and Construction 'The Blue Book', Volume 1, Fourth Edition, New South Wales Government, ISBN 0-9752030-3-7

Mitchell, P.B (2002) NSW Ecosystems Study: Background and Methodology (Unpublished).

Mosman Council (2012) Mosman Local Environment Plan

Mosman Council (2012) Mosman Open Space and Infrastructure Development Control Plan

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

Nearmap Australia Pty Ltd (2021) Taronga Zoo, Bradleys Head Road, Mosman. Accessed September 2021.

NSW Government Spatial Services (2021) Six Maps Clip & Ship https://maps.six.nsw.gov.au/clipnship.html

Office of Environment and Heritage (OEH) (2016a) The Native Vegetation of the Sydney Metropolitan Area. Volume 1: Technical Report. Version 2.0, Department of Premier and Cabinet, Sydney.

Office of Environment and Heritage (OEH) (2016b) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0, Department of Premier and Cabinet, Sydney.

Office of Environment and Heritage (OEH) (2017) Biodiversity Conservation Regulation 2017: Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules

PlantNET (2021) The NSW Plant Information Network System, Royal Botanic Gardens and Domain Trust, Sydney. http://plantnet.rbgsyd.nsw.gov.au

Robinson, L. (2003) 'Field Guide to the Native Plants of Sydney', Third Edition, Kangaroo Press

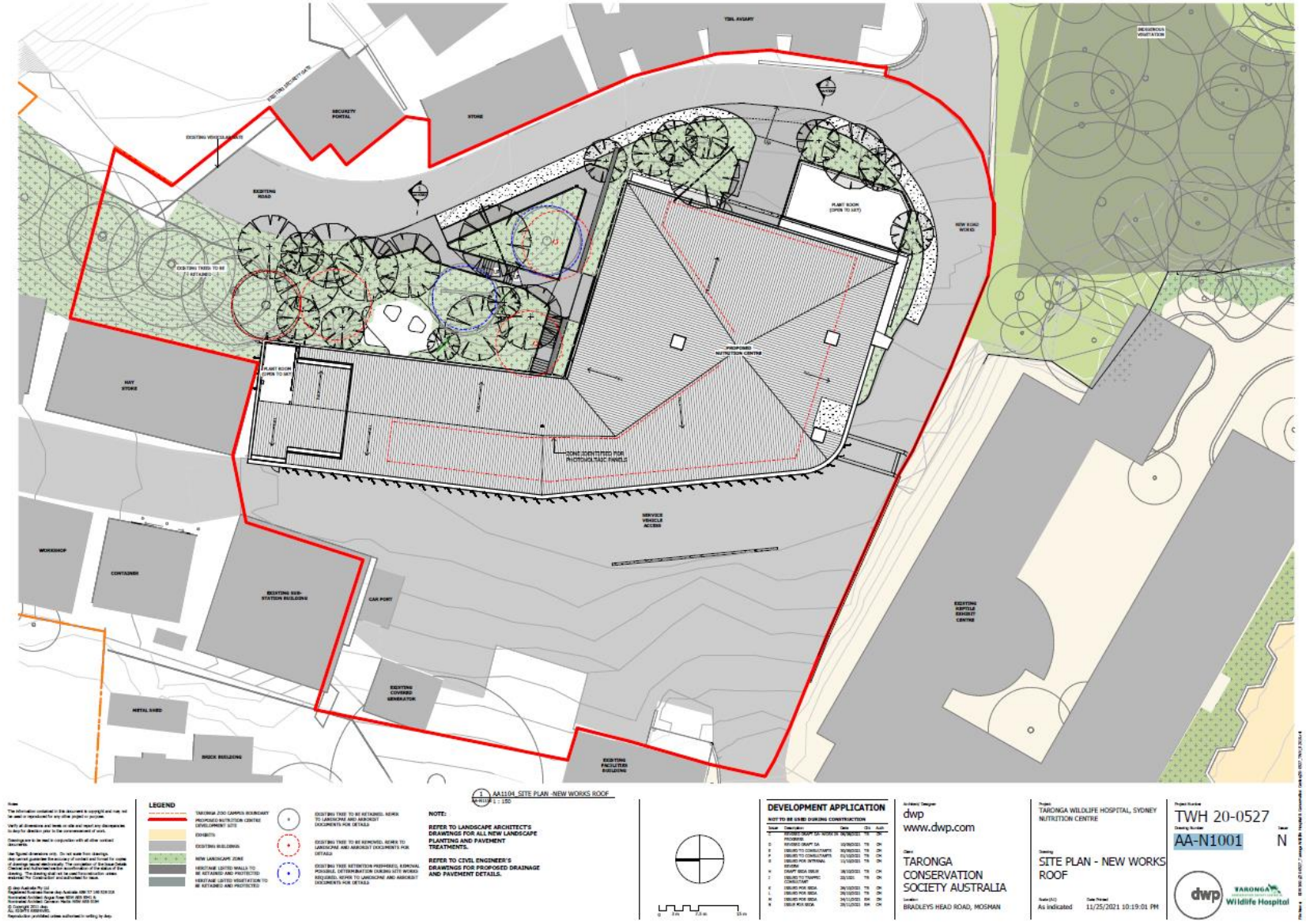
12. Appendices

Appendix 1. Proposed Site Plan – New Works Roof (DWP 2021b).

Appendix 2. BAM Site - Field Survey Forma (copied directly from Electronic Data Sheet).

Appendix 3. BAMC Generated Biodiversity Credit Report.

Appendix 1. Proposed Site Plan – New Works Roof (DWP 2021b).



Appendix 2. BAM Site - Field Survey Forma (copied directly from Electronic Data Sheet).

BAM Site – Field Survey Form					
Date:	13.01.21	**Plot ID:**	Plot 1	**Photo #:**	0
Zone:	56H	**Plot Dimensions:**	50m x 20m	**Easting:**	337238.14 m E
Datum:	94	**Middle bearing from 0m:**	80	**Northing:**	6253910.32 m S
PCT:	Zone 1: PCT 1778				

Growth Form	Scientific Name	Cover	Abundance
Shrub (SG)	*Acacia linifolia*	2	1
Shrub (SG)	*Acacia longifolia*	0.1	1
Shrub (SG)	*Allocasuarina distyla*	2	3
Tree (TG)	*Angophora costata*	1	2
HTE	*Anredera cordifolia*	0.3	15
HTE	*Asparagus aethiopicus*	0.1	10
Tree (TG)	*Banksia integrifolia*	0.1	1
Shrub (SG)	*Breynia oblongifolia*	2	10
Tree (TG)	*Casuarina glauca*	1	1
Other (OG)	*Cayratia clematidea*	0.1	5
Exotic	*Cenchrus setaceus*	1	5
HTE	*Cestrum parqui*	0.1	1
Forb (FG)	*Commelina cyanea*	1	40
Exotic	*Conyza sumatrensis*	0.1	10
Shrub (SG)	*Crowea saligna*	0.1	1
Tree (TG)	*Cupaniopsis anacardioides*	5	10
Grass & grasslike (GG)	*Cyperus laevis*	0.1	5
Forb (FG)	*Dianella caerulea*	0.5	15
Grass & grasslike (GG)	*Digitaria parviflora*	2	30
HTE	*Ehrharta erecta*	20	N/A
HTE	*Eragrostis curvula*	0.5	5
Tree (TG)	*Eucalyptus botryoides*	10	N/A
Tree (TG)	*Eucalyptus punctata*	20	N/A
Tree (TG)	*Eucalyptus robusta*	15	N/A
Tree (TG)	*Eucalyptus tereticornis*	10	N/A
Tree (TG)	*Ficus sp.*	0.1	1
Tree (TG)	*Glochidion ferdinandi*	5	5
Other (OG)	*Kennedia rubicunda*	0.1	2
HTE	*Ligustrum lucidum*	0.1	1
Grass & grasslike (GG)	*Lomandra longifolia*	0.2	1
Tree (TG)	*Neolitsea dealbata*	0.5	1
Tree (TG)	*Notelaea longifolia*	0.5	1
HTE	*Olea europaea subsp. cuspidata*	0.2	10
Exotic	*Parietaria judaica*	0.1	1
Grass & grasslike (GG)	*Paspalidium distans*	0.1	1
HTE	*Phoenix canariensis*	0.2	1
Shrub (SG)	*Phyllota spp.*	0.2	1
Shrub (SG)	*Pittosporum undulatum*	10	N/A

Forb (FG)	*Plectranthus parviflorus*	0.1	1
Shrub (SG)	*Polyscias sambucifolia*	3	10
Exotic	*Solanum nigrum*	0.1	15
HTE	*Solanum seaforthianum*	1	10
Shrub (SG)	*Syzygium paniculatum*	0.5	1

DBH	# Tree Stems Count	# Hollow Bearing Trees
80+cm	0	0
50-79cm	1	
30-49cm	Present	
20-29cm	Present	
10-19cm	Present	
5-9cm	Present	
<5cm	Present	

Length of Logs (m)	20

BAM Attribute (1x1m)	Litter Cover (%)
1 (5m)	100
2 (15m)	100
3 (25m)	45
4 (35m)	60
5 (45m)	15
Average	**64**

Growth Form	Composition Data (Count of Native Cover)	Structure Data (Sum of Cover)
Tree	12	68.2
Shrub	9	19.9
Grass	4	2.4
Forb	3	1.6
Fern	0	0
Other	2	0.2
High Threat Exotics	9	22.5

Appendix 3. BAMC Generated Biodiversity Credit Report.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00028375/BAAS21009/21/00028376	Proposal Name Taronga Wildlife Hospital Nutrition Centre	BAM data last updated * 24/11/2021
Assessor Name Christopher Moore	Assessor Number BAAS21009	BAM Data version * 50
Proponent Names Taronga Zoo	Report Created 07/12/2021	BAM Case Status Finalised
Assessment Revision 0	Assessment Type Major Projects	Date Finalised 07/12/2021

* 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
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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
1778-Coastal sandstone foreshores forest	Not a TEC	0.0	0	1	1

1778-Coastal sandstone foreshores forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1778	Sydney Coastal Dry Sclerophyll Forests >=90%	1778_Zone1	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)

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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
1778-Coastal sandstone foreshores forest	Not a TEC	0.0	0	1	1

1778-Coastal sandstone foreshores forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1778	Sydney Coastal Dry Sclerophyll Forests >=90%	1778_Zone1	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.

NARLA

environmental

Eastern Sydney Office
Unit 2, 6-7/8 Apollo Street
Warriewood
NSW 2102

Western Sydney Office
7 Twentyfifth Avenue
West Hoxton
NSW 2171

Hunter Valley Office
10/103 Glenwood Drive
Thornton
NSW 2322

www.narla.com.au
Ph: 02 9986 1295