Macquarie Park Innovation Precinct Stage 2 – Biodiversity Vegetation Assessment

DPHI

DOCUMENT TRACKING

Project Name	Biodiversity Vegetation Assessment
Project Number	24SYD-7551
Project Manager	David Bonjer
Prepared by	Polina Irwin
Reviewed by	Chris Wellington and David Bonjer
Approved by	David Bonjer
Status	**Final**
Version Number	**2**
Last saved on	**4 June 2024**

This report should be cited as 'Eco Logical Australia 2024. *Biodiversity Vegetation Assessment*. Prepared for DPHI.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from RPS AAP Consulting Pty Ltd

Template 2.8.1

Contents

List of Figures

List of Tables

List of Plates

Executive Summary

Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by the NSW Department of Planning, Housing and Infrastructure (DPHI) to prepare a Biodiversity Vegetation Assessment (BVA) to support the Stage 2 rezoning of the Macquarie Park Innovation Precinct. The Stage 2 boundary includes neighbourhoods 1, 4 (part), 5, 6 and 7 of the precinct, referred to as the Study Area. The scope of this BVA is to identify and document the potential biodiversity values and management recommendations associated with the Proposal.

Methods

ELA undertook a desktop assessment to evaluate the landscape conditions and documented biodiversity values of the Study Area. A historical canopy assessment was undertaken using aerial photographs from 1942, 1978 and at present day to identify potential remnant vegetation. This was followed by a field-based vegetation assessment of vegetation within the Study Area, limited to areas accessible via public roads and reserves.

Results

Vegetation within the Study Area has been assigned to one of three general categories: remnant, modified (potentially planted) or exotic/planted. Four native Plant Community Types have been identified or assigned to the vegetation within the Study Area:

- PCT 3259: Sydney Coastal Shale-Sandstone Forest, associated with the following Threatened Ecological Community:

  o *Biodiversity Conservation Act 2016* listed – Duffys Forest Ecological Community in the Sydney Basin Bioregion (Endangered Ecological Community [EEC]);

- PCT 3262: Sydney Turpentine Ironbark Forest, associated with the following TECs:

  o *Biodiversity Conservation Act 2016* listed – Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (Critically Endangered Ecological Community [CEEC]); and
  o *Environmental Protection and Biodiversity Conservation Act 1999* listed – Turpentine-Ironbark Forest of the Sydney Basin Bioregion (CEEC);

- PCT 3592: Sydney Coastal Enriched Sandstone Forest; and
- PCT 3595: Sydney Coastal Sandstone Gully Forest.

The vegetation identified within the Study Area is considered likely to provide varying degrees of potential habitat for threatened species, with the highest potential estimated within remnant native vegetation connecting to Lane Cove National Park from neighbourhood 7.

Recommendations

The Study Area has been categorised into areas of low, moderate, high and very high biodiversity constraints. The Proposal is recommended to implement the avoid, minimise and mitigate hierarchy for biodiversity values, with avoidance of both very high and high biodiversity constraint areas recommended as priorities. Additional recommendations have been made for retaining connectivity and minimising potential direct and indirect impacts on threatened ecological communities, threatened species and the adjoining Lane Cove National Park. Biodiversity considerations have been provided for incorporation into the Macquarie Park Innovation Precinct Design Guide.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by the Department of Planning, Housing and Infrastructure (DPHI) to prepare a Biodiversity Vegetation Assessment (BVA) to support the Stage 2 renewal of the Macquarie Park Innovation Precinct. The Stage 2 boundary includes neighbourhoods 1, 4 (part), 5, 6 and 7 of the precinct as displayed in **Figure 1**, hereafter referred to as the 'Study Area' (**Figure 2**). This BVA will form part of the master plan and rezoning package to support the implementation of the Macquarie Park Place Strategy and inform requirements for rezoning, development controls and supporting infrastructure for the Stage 2 neighbourhoods, hereafter referred to as the 'Proposal'.

1.1. Project background

The Macquarie Park Innovation Precinct is located north-west of Sydney's Central Business District and sits in the City of Ryde Local Government Area (LGA). The Macquarie Park Innovation Precinct Place Strategy was finalised in September 2022 to guide and support detailed master planning of the neighbourhoods within Macquarie Park and subsequent rezonings. It provides a strategic framework to guide future development in the area, including approximately 20,000 additional jobs and up to 7,650 new dwellings and supporting infrastructure, including improved public and active transport.

The Place Strategy considers the 350 hectares (ha) that includes land between Macquarie Centre and Ivanhoe Estate to Lachlan's Line and Riverside Corporate Park. This area is bound by Epping Road, Delhi Road, M2 Motorway and Vimiera Road and sits adjacent to the Lane Cove National Park. The strategic investigation area, Place Strategy and Master Plan sit within the broader Macquarie Park Corridor and cover an area of approximately 170 ha.

The Study Area encompasses the following 5 neighbourhoods:

- Neighbourhood 1: North Park – Ngalawala (Reciprocity);
- Neighbourhood 4 (Part): Macquarie Living Station – Gari Nawi (Saltwater Canoe);
- Neighbourhood 5: Porters Creek – Burbigal (Morning);
- Neighbourhood 6: Wicks Road South – Garungul (Unbreakable); and
- Neighbourhood 7: North Ryde Riverside – Narrami Badu-Gumada (Connecting Water Spirit).

Macquarie Park Innovation Precinct

- ┅┅ Macquarie Park Corridor
- ▭ Stage 1 Rezoning
- ▭ Stage 2 Rezoning

Neighbourhood

1. North Park - Ngalawala (Reciprocity)
2. Waterloo Park - Butbut (Heart)
3. Shrimptons Quarter - Waragal Birrung (Evening Star)
4. Macquarie Living Station - Gari Nawi (Saltwater Canoe)
5. Porters Creek - Burbigal (Morning)
6. Wicks Road South - Garungul (Unbreakable)
7. North Ryde Riverside - Narrami Badu-Gumada (Connecting Water Spirit)

Macquarie University Station (Herring Road) Urban Activation Precinct

North Ryde Station Urban Activation Precinct

0   0.25   0.5   1 km

N

Figure 1: Study Area, this report relates to neighbourhoods 1, 4 (part), 5, 6 and 7 of the Macquarie Park Innovation Precinct (DPHI 2024)

Figure 2: Study Area extent

1.2. Scope

The scope of this BVA is to identify and document the potential biodiversity values and management recommendations associated with the Proposal. This will include consideration of proposed land-use intensification and sensitivity outcomes identified in the Master Plan and Place Strategy. The following has been undertaken:

- Field survey to identify and categorise canopy vegetation within the Study Area;
- Identify potential impacts on common and threatened species, ecological communities and/or their habitat listed under the *Biodiversity Conservation Act 2016* (BC Act) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with key consideration of Lane Cove National Park;
- Identify biodiversity constraints associated with the Proposal;
- Provide advice and input on site suitability for proposed land use outcomes in the context of biodiversity, including specific recommendations relating to Lane Cove National Park (if required);
- Provide recommendations for further investigation and potential management of biodiversity required for future development; and
- Provide any controls for biodiversity, suitable for the design guide.

1.3. Definitions

Terms and abbreviations used in this report are defined in **Table 1**.

Table 1: Definitions of terms and abbreviations

Term	Definition
asl	above sea level
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BCD	Biodiversity and Conservation Division
BVA	Biodiversity Vegetation Assessment
CEEC	Critically Endangered Ecological Community
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DA	Development Application
DCS	NSW Department of Customer Service
DPE	NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre
LGA	Local Government Area
Locality	Land within a 5 km radius of the Study Area

Term	Definition
m	metre
MPIP	Macquarie Park Innovation Precinct
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water (formerly DPE)
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
Proposal	The master plan and rezoning package to support the implementation of the Macquarie Park Place Strategy
RDP	Rapid Data Point
Study Area	Stage 2 boundary of the Macquarie Park Innovation Precinct, including neighbourhoods 1, 4 (part), 5, 6 and 7
SVTM	NSW State Vegetation Type Map
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee

2. Methodology

2.1. Desktop research

2.1.1. Databases

Information relevant to the Proposal was reviewed to gain an understanding of the biodiversity values occurring or potentially occurring within the Study Area. Information sources reviewed for a 5 km radius of the Study Area (i.e., locality) included:

- Flora and fauna records contained in the Biodiversity and Conservation Division (BCD) BioNet Atlas of NSW Wildlife database (NSW DCCEEW 2024a); and
- Flora and fauna records contained in the EPBC Protected Matters Search Tool (Cth DCCEEW 2024a).

2.1.2. Spatial datasets

The following spatial resources/datasets were interrogated to evaluate landscape condition of the Study Area:

- Cadastral and topographic mapping (DCS Spatial Services 2024a);
- Historical imagery (DCS Spatial Services 2024b);
- Biodiversity Values Map and Threshold Report (NSW DCCEEW 2024a);
- eSPADE, NSW Soil and Land Information (NSW DCCEEW 2024d);
- NSW State Vegetation Type Map (DPE 2022);
- National Flying-fox monitoring viewer (Cth DCCEEW 2024b);
- Mitchell Landscapes (OEH 2016);
- Interim Biogeographic Regionalisation for Australia (IBRA) Region and Subregion Mapping (IBRA7; DCCEEW 2012); and
- Aerial imagery of the Study Area (Nearmap 2024).

2.1.3. Literature

Literature used in this assessment is provided in **Section 6**.

2.1.4. Preliminary tree canopy assessment

ELA spatial analysts mapped tree canopy based on current and historical imagery of the Study Area at the following time periods: 1943, 1978 and present (Nearmap imagery dated 12/03/2024). As a desktop exercise, the classification of vegetation into Plant Community Types (PCTs) was not possible. Historical imagery was reviewed to understand the pattern of land development and the likelihood of native vegetation remaining before the urbanisation of Macquarie Park. This preliminary assessment was utilised to guide survey efforts detailed below.

2.2. Vegetation assessment

A vegetation assessment was performed within the Study Area on 12-13th of March 2024, by two Ecologists. The assessment involved the classification of vegetation within the Study Area, identifying areas of exotic, planted and remnant vegetation. The classification and description of vegetation was aided by the analysis of species recorded from Rapid Data Points (RDPs). RDPs were sampled

opportunistically to aid vegetation boundary delineation, typing and condition analysis. Data collected at each RDP included dominant tree species within a 10 m radius of the RDP. The location of all RDPs sampled is displayed in **Figure 3**.

Vegetation mapping was aided by the dual consideration of visual observations against descriptive attributes of PCTs, dominant canopy species present, soil type and landscape position. This approach was employed to aid vegetation boundary delineation, typing and condition analysis.

2.3. Limitations

2.3.1. Vegetation assessment

This assessment has been limited to the identification of canopy tree species as a proxy for PCT identification. No assessment of shrub and groundcover vegetation has been performed, however incidental observations of vegetation condition have been noted where relevant. No field surveys have been undertaken to identify threatened flora, fauna or their habitats.

Access to private property was unavailable during preparation of this assessment. Therefore, the vegetation assessment was limited to the assessment of street trees accessible from public roads and reserves only. Significant areas of the Study Area could not be accessed, including various industrial properties and the Ryde Hunters Hill District Hockey Club. As a result, vegetation assessments from accessible areas have been extrapolated where possible to inaccessible areas, with the aid of aerial imagery. Future detailed assessments may yield differing results to those detailed in this report.

2.3.2. Data availability and accuracy

The collated threatened flora and fauna species records obtained from the BioNet Atlas of NSW Wildlife database for the locality are known to vary in accuracy and reliability. Traditionally, this is due to the reliability of information provided to the Biodiversity Conservation Division (BCD) for collation and/or the need to protect specific threatened species locations. For the purposes of this report, this information has been considered to have an accuracy of ± 1 km, however for some threatened species, records may be denatured by up to 2 km.
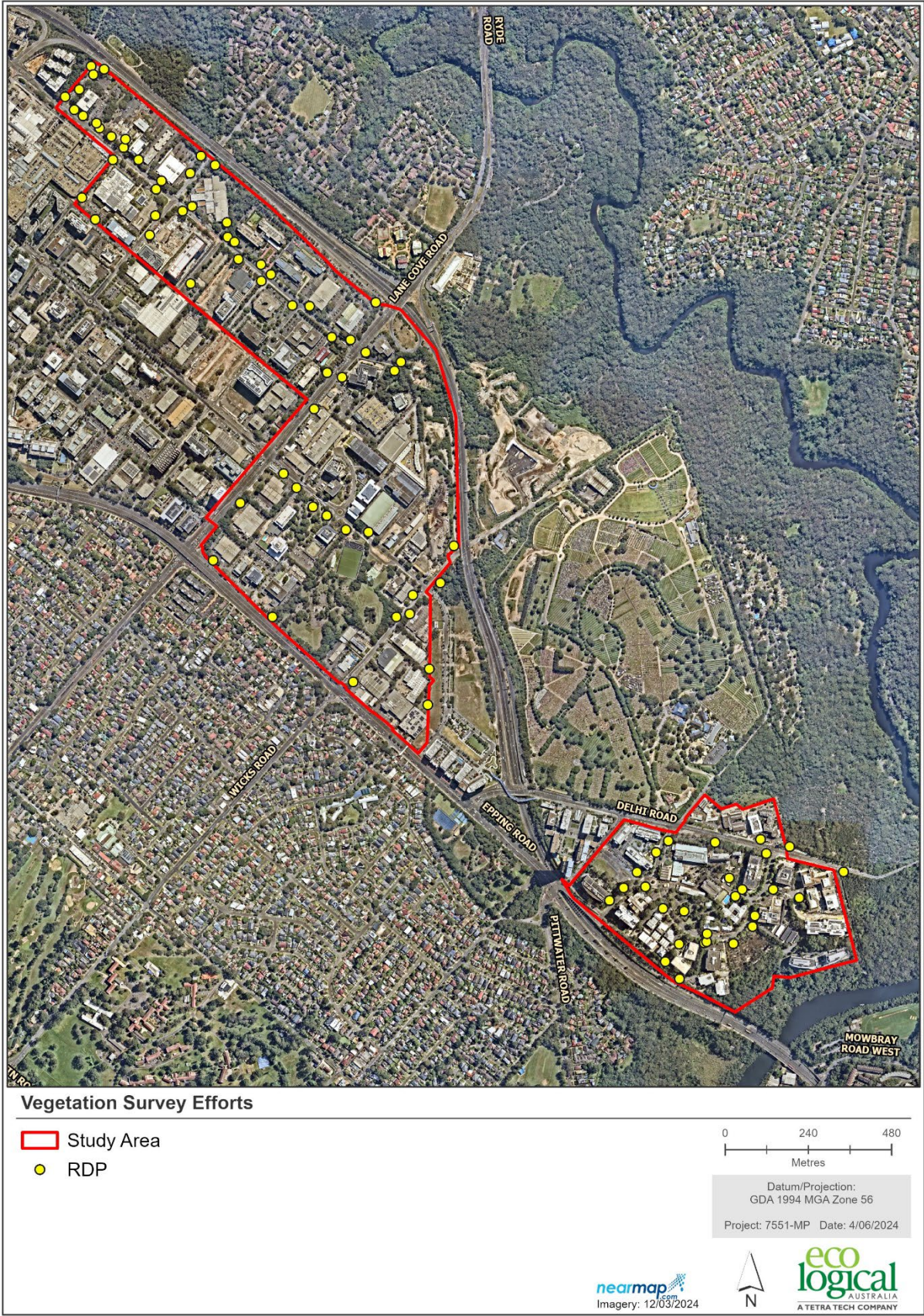
Figure 3: Rapid Data Points (RPDs) sampled within the Study Area

3. Results

3.1. Historical imagery

Figure 4 displays historical aerial photos which show the Study Area as being partially cleared for agricultural purposes in 1943, with scattered vegetation (most likely native) remaining in several large patches within neighbourhoods 1, 4, 5 and 6. Significant remnant vegetation was visible within neighbourhood 7, connecting to remnant bushland to the north and east. **Figure 5** from 1978 shows the early stages of urbanisation, with fewer patches of native vegetation remaining and few street trees. As development progresses through to the present day, remnant vegetation is further cleared and fragmented, replaced with street trees and landscaping (**Figure 6**). Relatively large patches of canopy vegetation remain in neighbourhoods 5 and 7.

Canopy vegetation visible within the Study Area during 1943, 1978 and at present has been combined to display the reduction in vegetation cover to present day (**Figure 7**). This canopy mapping was used to guide field-validated vegetation categorisation detailed in **Section 3.2.2** below.
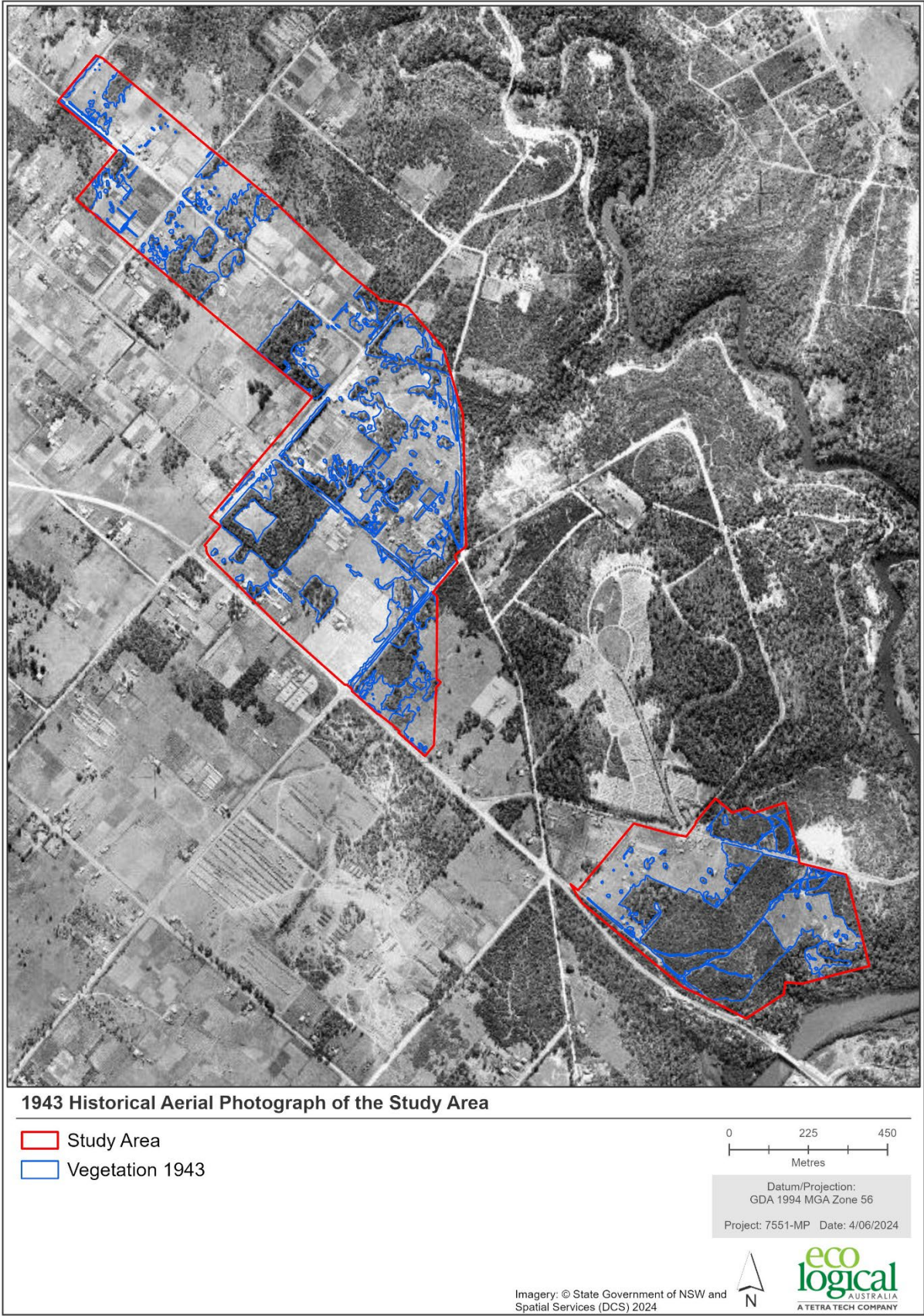
Figure 4: Canopy vegetation visible in 1943

Figure 5: Canopy vegetation visible in 1978

2024 Historical Aerial Photograph of the Study Area

Study Area
Vegetation 2024

0   225   450
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

Project: 7551-MP   Date: 4/06/2024

nearmap
Imagery: 12/03/2024

N

eco
logical
AUSTRALIA
A TETRA TECH COMPANY

Figure 6: Canopy vegetation visible in 2024

Figure 7: Canopy vegetation visible within the Study Area during 1943, 1978 and at present

3.2. Vegetation

3.2.1. State Vegetation Type Map

The State Vegetation Type Map (SVTM; DPE 2022) indicates that the majority of the Study Area is void of native vegetation. Small areas of four PCTs are mapped by the SVTM as occurring within the Study Area (**Figure 8**):

- PCT 3155: Illawarra North-Pittwater Bangalay Moist Forest;
- PCT 3259: Sydney Coastal Shale-Sandstone Forest;
- PCT 3592: Sydney Coastal Enriched Sandstone Forest; and
- PCT 3595: Sydney Coastal Sandstone Gully Forest.

3.2.2. Vegetation categories

Data obtained during the field survey was used to assign canopy vegetation of the Study Area into one of three categories:

1. Remnant vegetation – vegetation present in historical imagery (1943 & 1978), with remnant canopy species identified during field surveys. Represents patches of vegetation which have remained untouched from development or modification and may contain native vegetation in all strata layers (example displayed in **Plate 1**);
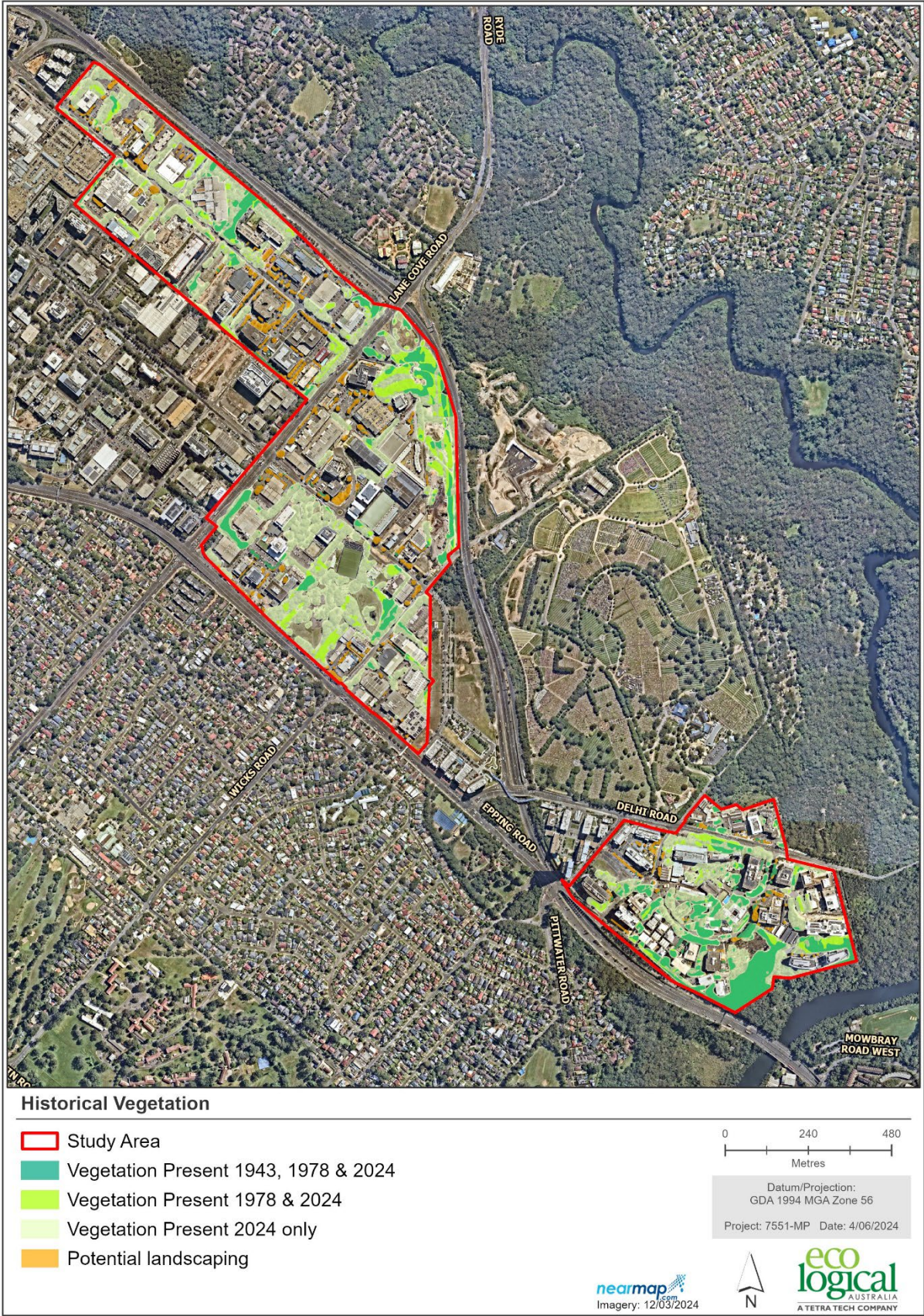
2. Modified (potentially planted) vegetation – a mix of commonly cultivated native species, native species characteristic of remnant vegetation, and exotic planted species. Trees may be remnant, planted or regrown, with no evidence obtained during field surveys to determine which is applicable. These have been assigned to best-fit PCTs, however occur in a modified state limited to the canopy stratum only (example displayed in **Plate 2**); and

3. Exotic/planted – planted exotic species or native species with clear evidence of planting (i.e., planting boxes, tree guards present; example displayed in **Plate 3**).

The distribution of these vegetation categories is displayed in **Figure 9**.

3.2.2.1. Best-fit PCTs

The following PCTs have been identified or assigned within the Study Area:

- PCT 3259: Sydney Coastal Shale-Sandstone Forest, associated with the following Threatened Ecological Community (TEC):

  o BC Act listed – Duffys Forest Ecological Community in the Sydney Basin Bioregion (Endangered Ecological Community [EEC]);

- PCT 3262: Sydney Turpentine Ironbark Forest, associated with the following TECs:

  o BC Act listed – Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (Critically Endangered Ecological Community [CEEC]); and
  o EPBC Act listed – Turpentine-Ironbark Forest of the Sydney Basin Bioregion (CEEC);

- PCT 3592: Sydney Coastal Enriched Sandstone Forest; and
- PCT 3595: Sydney Coastal Sandstone Gully Forest.

The distribution of these PCTs is displayed in **Figure 9**, and general descriptions are provided in **Table 2**. Given this assessment was limited to the identification of canopy tree species, detailed assessments of vegetation composition and structure will be required at the Development Application stage to adequately confirm if any vegetation would be categorised as a PCT.

Plate 1: Example of remnant vegetation identified within the Study Area

Plate 2: Example of modified (potentially planted) vegetation identified within the Study Area

Plate 3: Example of exotic/planted vegetation identified within the Study Area

Table 2: PCTs identified within the Study Area as remnant and best-fit modified vegetation

PCT	Description of remnant vegetation within Study Area	Description of modified (potentially planted) vegetation within Study Area	Associated TEC
PCT 3259: Sydney Coastal Shale-Sandstone Forest	N/A	Remnant, potentially planted or regrown native canopy species: • *Allocasuarina littoralis* (Black She-oak) • *Angophora costata* (Sydney Red Gum) • *Corymbia eximia* (Yellow Bloodwood) • *Corymbia gummifera* (Red Bloodwood) • *Corymbia maculata* (Spotted Gum) • *Eucalyptus globoidea* (White Stringybark) • *Eucalyptus haemastoma* (Scribbly Gum) • *Eucalyptus pilularis* (Blackbutt) • *Eucalyptus punctata* (Grey Gum) • *Eucalyptus resinifera* (Red Mahogany) • *Eucalyptus robusta* (Swamp Mahogany) • *Eucalyptus saligna* (Sydney Blue Gum) Additional canopy species identified include species not native to the area or exotic species: • *Acer negundo* (Maple) • *Brachychiton acerifolius* (Illawarra Flame Tree) • *Cinnamomum camphora* (Camphor Laurel) • *Cupaniopsis anacardioides* (Tuckeroo) • *Grevillea robusta* (Silky Oak) • *Jacaranda mimosifolia* (Jacaranda) • *Liquidambar styraciflua* (Sweetgum) • *Lophostemon confertus* (Brush Box)	BC Act: Duffys Forest Ecological Community in the Sydney Basin Bioregion (EEC) EPBC Act: N/A

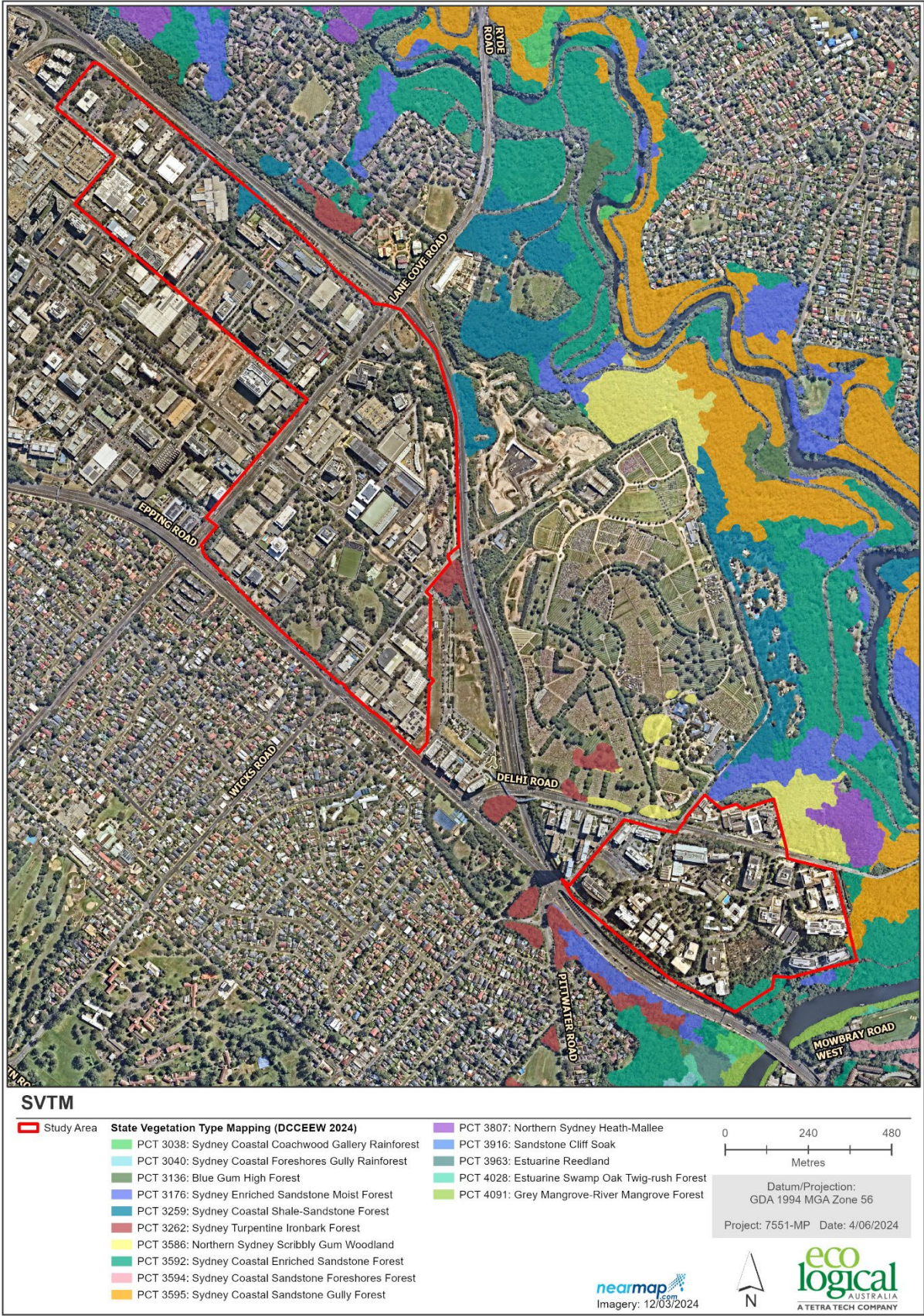| PCT	Description of remnant vegetation within Study Area	Description of modified (potentially planted) vegetation within Study Area	Associated TEC
PCT 3262: Sydney Turpentine Ironbark Forest	Remnant vegetation with the following canopy species: • *Allocasuarina torulosa* (Forest Oak) • *Angophora costata* (Sydney Red Gum) • *Eucalyptus pilularis* (Blackbutt) • *Eucalyptus punctata* (Blackbutt) • *Notelaea longifolia* (Large Mock-olive) • *Syncarpia glomulifera* (Turpentine)	N/A	BC Act: Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (CEEC) EPBC Act: Turpentine-Ironbark Forest of the Sydney Basin Bioregion (CEEC)
PCT 3592: Sydney Coastal Enriched Sandstone Forest	Remnant vegetation with the following canopy species: • *Allocasuarina littoralis* (Black She-oak) • *Angophora costata* (Sydney Red Gum) • *Banksia serrata* (Old-man Banksia) • *Corymbia gummifera* (Red Bloodwood) • *Eucalyptus piperita* (Sydney Peppermint)	Remnant, potentially planted or regrown native canopy species: • *Allocasuarina littoralis* (Black She-oak) • *Corymbia gummifera* (Red Bloodwood) • *Corymbia maculata* (Spotted Gum) • *Eucalyptus pilularis* (Blackbutt) • *Eucalyptus punctata* (Grey Gum) • *Syncarpia glomulifera* (Turpentine) Additional canopy species identified include species not native to the area or exotic species: • *Brachychiton acerifolius* (Illawarra Flame Tree) • *Cinnamomum camphora* (Camphor Laurel) • *Grevillea robusta* (Silky Oak) • *Lophostemon confertus* (Brush Box)	N/A
PCT 3595: Sydney Coastal Sandstone Gully Forest	Remnant vegetation with the following canopy species: • *Allocasuarina littoralis* (Black She-oak) • *Angophora costata* (Sydney Red Gum) • *Ceratopetalum gummiferum* (Christmas Bush) • *Corymbia gummifera* (Red Bloodwood) • *Eucalyptus piperita* (Sydney Peppermint) • *Eucalyptus sieberi* (Silvertop Ash) One patch of regrowth was identified within the Study Area, limited to sprouting *Eucalyptus* spp. and *Allocasuarina littoralis*.	Remnant, potentially planted or regrown native canopy species: • *Allocasuarina littoralis* (Black She-oak) • *Angophora costata* (Sydney Red Gum) • *Corymbia gummifera* (Red Bloodwood)	N/A

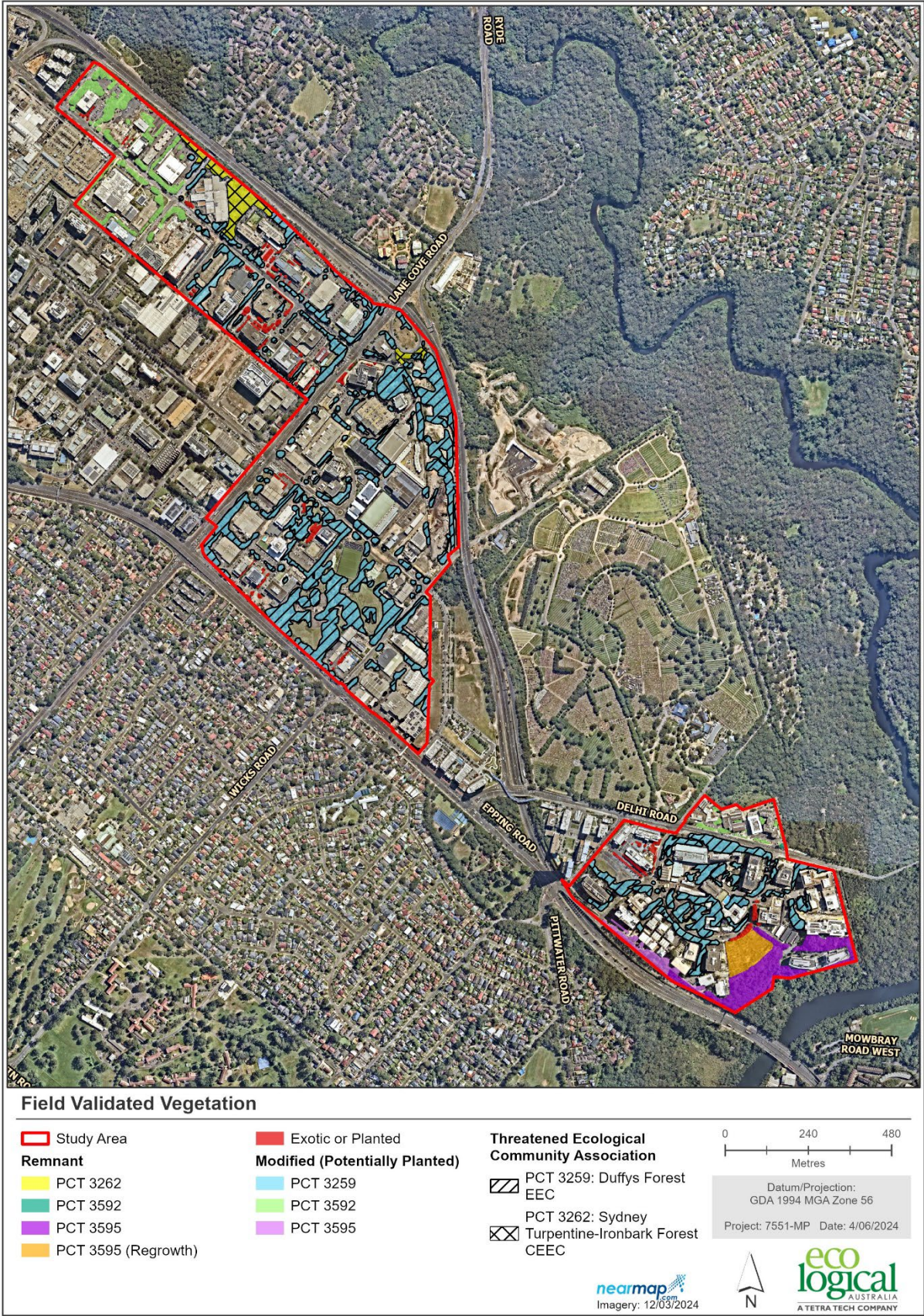**Figure 8: State Vegetation Type Map (DPE 2022)**

Figure 9: Vegetation categories, PCTs and associated TECs

3.2.3. Threatened Ecological Communities

3.2.3.1. Duffys Forest EEC

Plant Community Type 3259 is associated with the BC Act listed EEC, Duffys Forest Ecological Community in the Sydney Basin Bioregion. This EEC occurs on the ridgetops, plateaus, upper slopes and occasionally mid slopes on Hawkesbury sandstone geology, typically in association with laterite soils and soils derived from shale and laminite lenses. It has the structural form predominantly of open forest to woodland. The Duffys Forest Ecological Community has been reported from the Warringah, Pittwater, Ku-ring-gai, Hornsby and Manly Local Government Areas, although it may occur elsewhere in the Sydney Basin Bioregion (NSW TSSC 2011).

Although the Study Area occurs outside of the known LGAs for this community, appropriate geology, landscape position and species may exist within the Study Area. Confirmation of TEC conformity will be required during future detailed surveys at the Development Application stage.

3.2.3.2. Sydney Turpentine-Ironbark Forest CEEC

Plant Community Type 3262 is associated with the BC Act listed CEEC, Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion and EPBC Act listed CEEC, Turpentine-Ironbark Forest of the Sydney Basin Bioregion. This CEEC occurs on soils derived either from Wianamatta Shale or from Wianamatta Shale interbedded with Hawkesbury Sandstone. In most locations, this community occurs up to approximately 100 m above sea level (asl) although it is found as high as 200 m asl. It has the structural form of open forest with a tree canopy ranging in height from the mid to upper range for this form (10-30 m) and with projected foliage cover at the mid to lower end of the range (30-50%; NSW TSSC 2019). Patches of vegetation within the Study Area likely conform to these CEEC listings, however formal assessment will be required during future detailed surveys at the Development Application stage.

3.3. Flora

One threatened flora species was incidentally recorded at two locations within the Study Area (**Figure 10**), *Syzygium paniculatum* (Magenta Lilly Pilly), listed as Endangered under the BC Act and Vulnerable under the EPBC Act. This species is largely restricted to remnant stands of Littoral Rainforest which do not occur within the Study Area. This species is commonly cultivated as an ornamental plant and is unlikely to exist in a remnant (protected) state within the Study Area.

An additional threatened flora species, *Darwinia biflora* listed as Vulnerable under the BC and EPBC Act, has been historically recorded at two locations within the Study Area (**Figure 10**), with the most recent record from 2008. Formal assessment of threatened flora species will be required at the Development Application stage, including targeted threatened flora surveys.

3.4. Fauna

The vegetation of the Study Area is likely to provide important habitat for a variety of local fauna including birds, bats, amphibians, invertebrates and reptiles. A number of threatened species have been historically recorded within and surrounding the Study Area as displayed in **Figure 10**, including the following species recorded directly within:

- Black-necked Stork (*Ephippiorhynchus asiaticus*) – Endangered under the BC Act;

- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable under the BC and EPBC Act;
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) – Vulnerable under the BC Act;
- Powerful Owl (*Ninox strenua*) – Vulnerable under the BC Act;
- Red-crowned Toadlet (*Pseudophryne australis*) – Vulnerable under the BC Act;
- Regent Honeyeater (*Anthochaera phrygia*) – Endangered under the BC Act and Critically Endangered under the EPBC Act; and
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) – Vulnerable under the BC and EPBC Act.

Whilst some records are greater than 10 years old, they demonstrate that urban environments provide habitat for threatened species as well as more urban-adapted common species. Threatened fauna habitats (i.e., hollow and nest-bearing trees, flowering trees and shrubs, course woody debris) are likely to occur, especially within remnant vegetation identified within the Study Area. Formal assessment of threatened fauna species and their habitats will be required at the Development Application stage.

No known critical breeding habitat such as Powerful Owl roosts or Grey-headed Flying-fox Camps occur within the Study Area. Powerful Owls, including fledglings, have been recorded in the neighbouring Lane Cove National Park and there is potential for known breeding sites to occur there. The National Flying-fox Monitoring Viewer (Cth DCCEEW 2024b) identifies the nearest camp in Gordon NSW, approximately 4 km north-east of the Study Area.

3.5. Connectivity

Fauna move through habitats to obtain food, shelter and breeding resources in response to seasonal resource ability and habitat conditions. Large tracts of habitat are generally required for successful dispersal away from natal areas or seasonal migrations. The vegetation of the Study Area shares connectivity with Lane Cove National Park occurring to the north-east (**Figure 11**). Uninterrupted connectivity exists between Neighbourhood 7 in particular with vegetation leading into Lane Cove National Park to the east. The remainder of the Study Area is separated from Lane Cove National Park by the M2 Hills Motorway (approximately 35-85 m wide) and residential land.
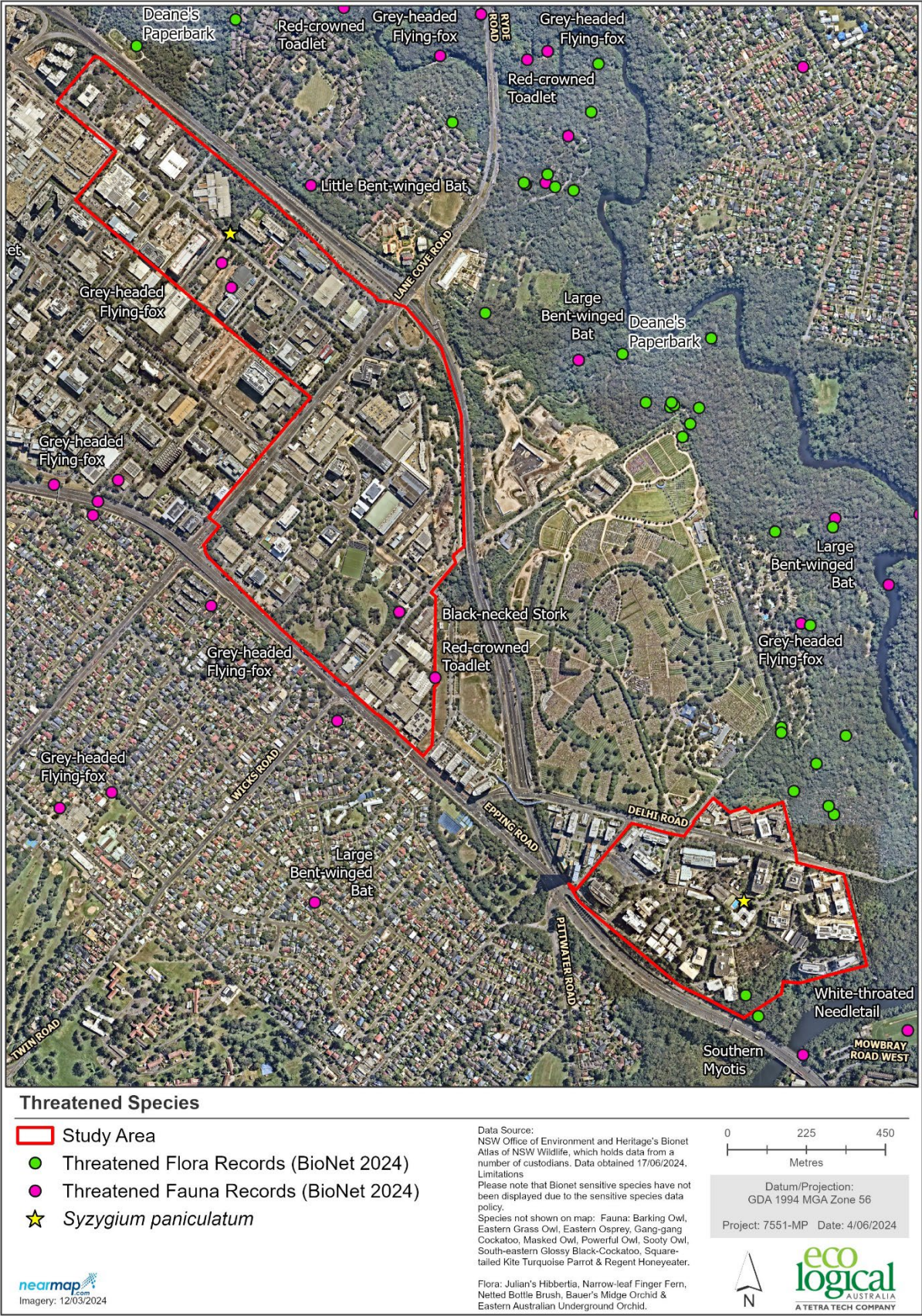
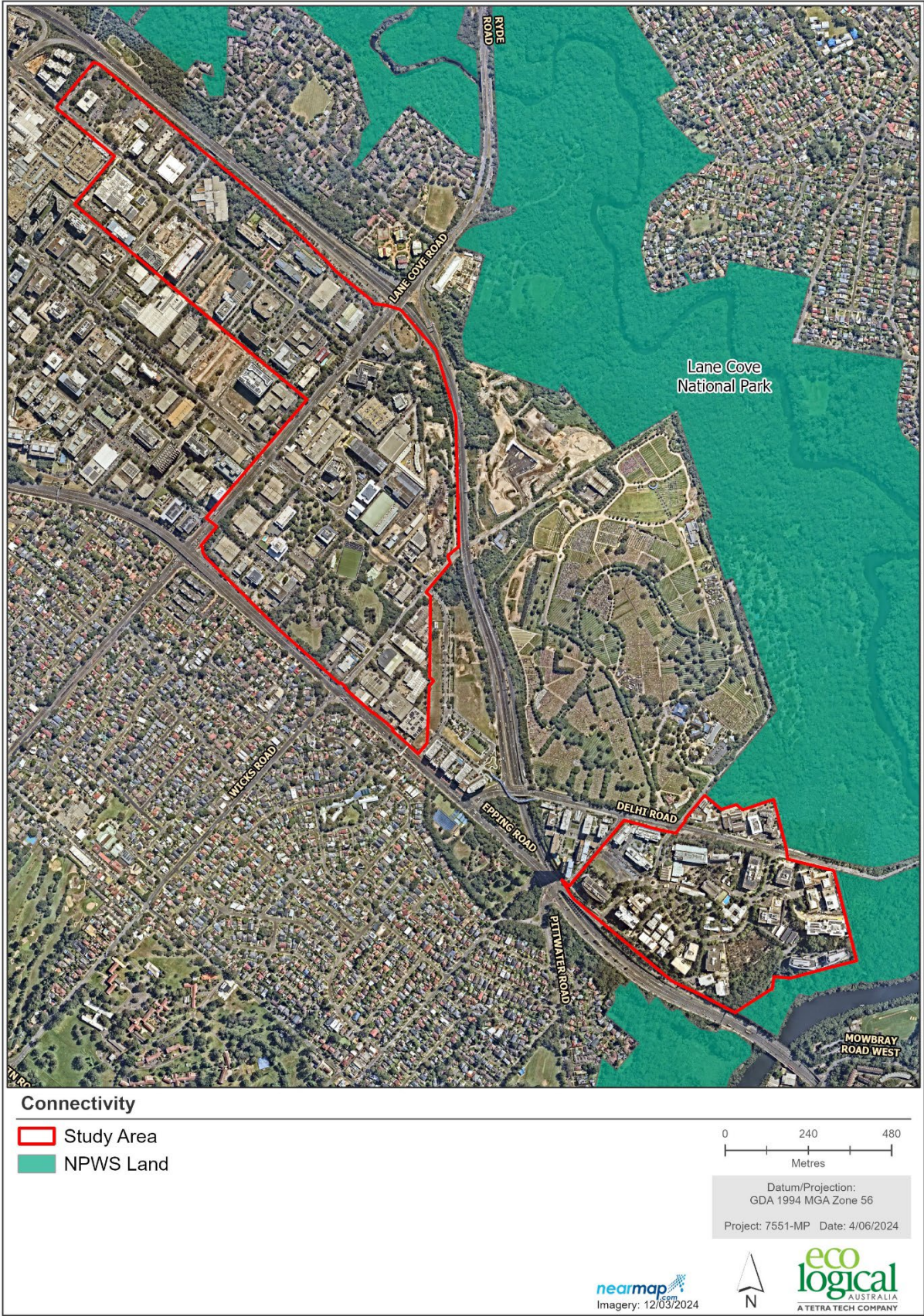Figure 10: Threatened species recorded within and surrounding the Study Area

Figure 11: Connectivity to Lane Cove National Park

4. Discussion

4.1. Vegetation

Urban development within the region has led to the ongoing clearing, modification and fragmentation of native vegetation communities. The Study Area has undergone historical disturbance since at least 1943, with the clearing of remnant patches of vegetation and planting of urban street trees and landscaping visible in historical imagery. However, few patches of remnant vegetation remain with the most significant patches identified within neighbourhood 7.

Plant Community Types 3592 and 3595 are not associated with any TECs and are well represented in the region (mostly protected by their abundance within the adjoining Lane Cove National Park), while two TECs may occur within the Study Area: Duffys Forest EEC and Sydney Turpentine-Ironbark Forest CEEC. These communities have undergone significant reductions in extent, composition and structure as a result of urban development. While these TECs (if occurring) exist in modified states, they may represent important patches of vegetation critical for threatened community persistence.

Urban areas such as the Study Area are subject to the urban heat island effect, directly associated with the reduction of vegetation cover. Vegetation helps to naturally cool land by shading, blocking sun radiation, and releasing moisture into the atmosphere. However, as temperatures increase, plants can become stressed and lose their cooling ability. As the climate changes, certain plants may die as they are no longer suited to conditions. Less vegetation results in less natural cooling, leading to higher temperatures (NSW Government 2024). As such, the urban heat island effect impacts people's health and wellbeing, economic productivity, as well as ecological values. The vegetation of the Study Area, albeit fragmented in many parts, likely plays an important role in reducing the urban heat island effect and may be important in response to climatic changes such as heatwaves and drought.

4.2. Threatened species

The vegetation of the Study Area, including remnant and modified vegetation, likely provides suitable habitat for a variety of common and threatened flora and fauna species. Fauna habitats such as hollow and nest-bearing trees are likely to occur in patches of remnant native vegetation and may provide important habitat features for resident fauna. Similarly, local threatened flora species such as *Darwinia biflora* may be reliant on suitable habitat within patches of remnant vegetation.

The modified vegetation identified within the Study Area likely provides habitat for a variety of urban-adapted species such as Sulphur-crested Cockatoos, Noisy Miners and common possums. These species are considered likely to outcompete local threatened species for foraging or breeding resources. However, several threatened species recorded within and surrounding the Study Area are relatively urban-adapted, including the Grey-headed Flying-fox and Powerful Owl. Although the Study Area is not known to, and is unlikely to, contain critical habitat for these species, they may frequent the area for foraging resources such as prey-items and fruiting trees/shrubs.

Given the significant connectivity between Lane Cove National Park and remnant vegetation within neighbourhood 7, this area is considered to provide the best-quality potential habitat for threatened species. The remainder of the Study Area is highly urbanised and fragmented by significant barriers such as the M2 Motorway. Such barriers can inhibit the movement of fauna (i.e., terrestrial species) while

facilitating the movement of predators such as raptors and interfere with the dispersal of threatened flora. Fragmented patches of vegetation are important stepping stones for fauna, inhibiting movement for various bird and bat species.

Residential rezoning of the Study Area would result in the construction of high-density buildings which will likely be taller than the industrial buildings currently present. Neighbourhoods 1, 4, 5 and 6 occur adjacent to existing tall buildings varying from 7-20 stories and are therefore unlikely to be significantly impacted by the Proposal. Neighbourhood 7, however, contains much shorter industrial/office buildings and occurs directly adjacent to the intact vegetation of Lane Cove National Park. As a result, residential development of this area may result in increased collision risk for aerial fauna such as birds and bats, as well as indirect impacts on ecological communities and threatened flora as a result of shading.

4.3. Biodiversity constraints

The Study Area has been designated to the following preliminary biodiversity constraint classes to guide planning, rezoning and future development proposed for the Stage 2 sites: low, moderate, high and very high (**Figure 12**). Descriptions of these constraint classes are provided in **Table 3**. Limitations apply to the biodiversity constraints displayed below (refer to **Section 2.3**).

Table 3: Biodiversity constraint classes designated within the Study Area

| Class	Area (approximate)	Biodiversity features
Low	87.90 ha	- Exotic vegetation - Existing cleared land - Existing development/infrastructure
Moderate	27.47 ha	- Modified (potentially planted) vegetation. Largely limited to planted exotic canopy species mixed with native canopy species which may be remnant, planted or regrown - May provide habitat for common and threatened fauna - May conform to a TEC, however exist in a highly modified and fragmented state
High	1.60 ha	- Remnant vegetation. Represents patches of vegetation which have remained untouched from development or modification and may contain native vegetation in all strata layers - May conform to a TEC, however exist in a modified and/or fragmented state - May provide potential threatened species habitat such as hollow-bearing trees, potential nest trees, etc. - May provide suitable habitat for threatened flora
Very High	2.93 ha	- Exhibits high connectivity to Lane Cove National Park - Remnant vegetation. Represents patches of vegetation which have remained untouched from development or modification and may contain native vegetation in all strata layers - May conform to a TEC - Likely to provide potential threatened species habitat such as hollow-bearing trees, nest trees, etc. - Likely to provide suitable habitat for threatened flora
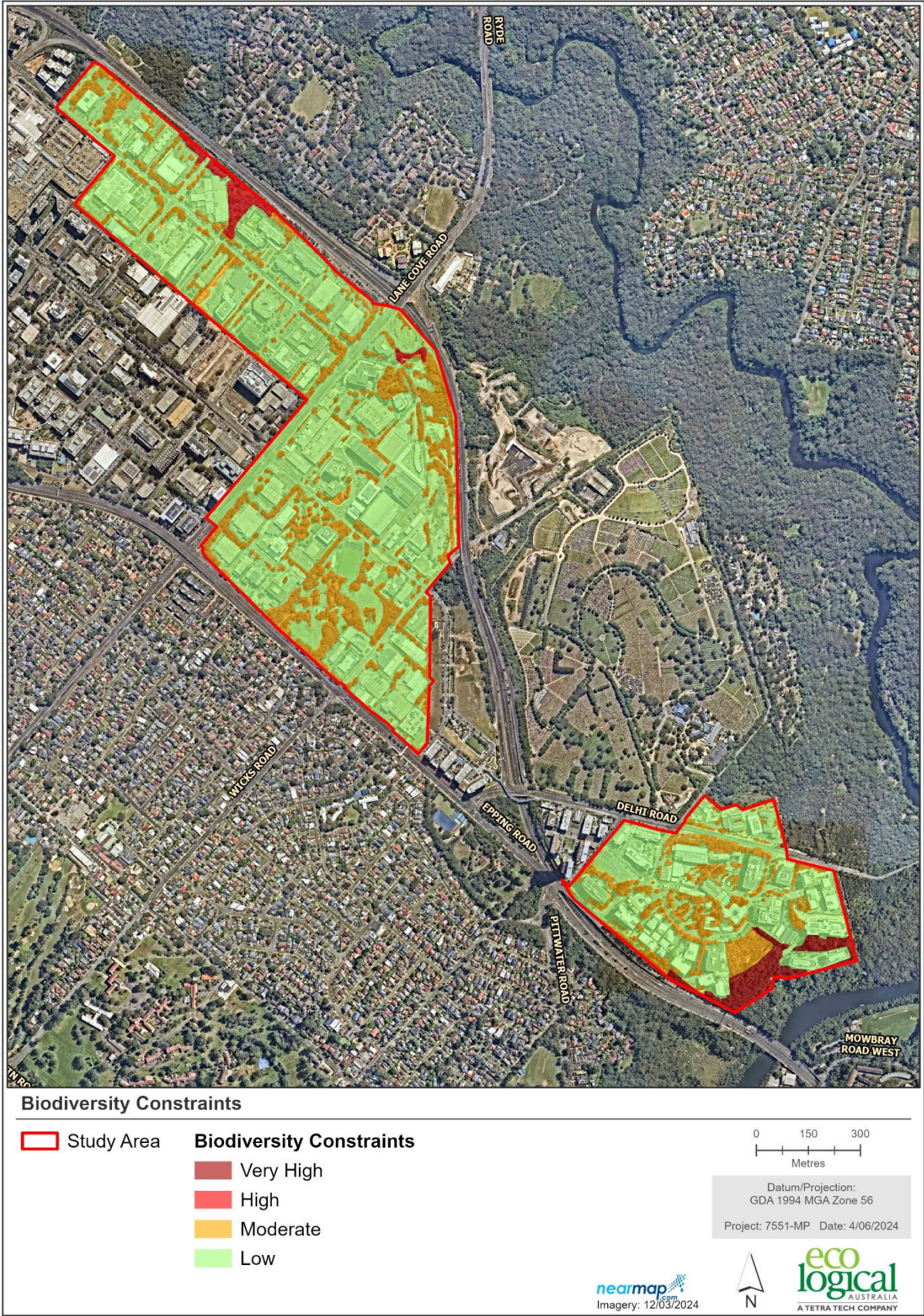
Figure 12: Biodiversity constraints

5. Recommendations

Future development applications will require detailed, site-specific assessment of biodiversity values and formal assessment under the BC and EPBC Act. This should include the classification of vegetation type and condition, detailed fauna habitat surveys and targeted surveys for threatened flora and fauna. The Study Area contains vegetation associated with TECs, therefore assessment per the BC and EPBC Act will be required to confirm presence/absence. Following site-based assessments, future developments should implement an avoid and minimise hierarchy for biodiversity values.

5.1. Avoid

Avoidance of both very high and high biodiversity constraints areas within the Study Area should be prioritised. These areas contain mature and regenerating canopy species as well as native shrub and groundcover vegetation which likely contain important vegetation attributes for ongoing ecological function. Additionally, these areas may provide suitable habitat for common and threatened species. The retention of very high biodiversity constraint areas may provide a suitable buffer from the vegetation of Lane Cove National Park, reducing the likelihood of direct impacts associated with collision risk and indirect impacts associated with shading.

Retention of moderate biodiversity constraint areas should be prioritised where possible to maintain potential fauna habitats, retain stepping stones for fauna movements and reduce the urban heat island effect. Overall, avoidance of these areas will result in reduced direct impacts on vegetation communities and threatened species habitats associated with future developments within the Study Area.

5.2. Minimise

As previously mentioned, collision risk and shading may pose direct and indirect impacts on local and threatened species and ecological communities. Reduced building heights should be considered for neighbourhood 7 given the occurrence of remnant native communities and connectivity with Lane Cove National Park.

Open spaces may be situated within areas of moderate and high biodiversity constraint, however native vegetation should be retained.

5.3. Design considerations

Controls for biodiversity suitable design will be incorporated into the Macquarie Park Innovation Precinct (MPIP) Design Guide. Recommendations associated with this report are similar to those provided for Stage 1 of the MPIP, as follows:

- Avoid biodiversity impacts, particularly to native vegetation and habitat trees containing hollows, when designing private and public domain;
- Contribute to habitat enhancement in new buildings and infrastructure, such as through the inclusion of green roofs, green walls and artificial hollows;
- Ensure surface water runoff is filtered prior to discharging into waterways;
- Utilise native species representative of the local ecological communities in private and public landscaping. Recommended planting lists are provided in **Appendix A**;

- The Development Application stage must include detailed, site-specific assessment of biodiversity values and formal assessment under the BC and EPBC Act; and
- Retain mature trees and habitat trees wherever possible to help reach the canopy coverage targets. If plantings are recommended to achieve canopy coverage targets, utilise native species representative of the local ecological communities (as provided in **Appendix A**).

6. References

Commonwealth Department of Climate Change, Energy, the Environment and Water [Cth DCCEEW] (2012). Interim Biogeographic Regionalisation for Australia (IBRA) Region and Subregion Mapping

Cth DCCEEW (2024a). EPBC Protected Matters Search Tool. Retrieved from: http://www.environment.gov.au/epbc/pmst/index.html

Cth DCCEEW (2024b). National Flying-fox monitoring viewer. Retrieved from: https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf

Department of Planning and Environment [DPE] (2022). NSW State Vegetation Type Map. Retrieved from https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map

DPE (2023). *Macquarie Park Innovation Precinct Map*

Department of Planning, Housing and Infrastructure [DPHI] (2024). *PROC8354 Scope of Works*

National Parks and Wildlife Service [NPWS] (2002). *Descriptions for NSW (Mitchell) Landscapes Version 2*. National Parks and Wildlife Service, Hurstville

Nearmap (2024). Aerial imagery of the Study Area

New South Wales Department of Climate Change, Energy, the Environment and Water [NSW DCCEEW] (2024a). Biodiversity Values Map and Threshold Tool. Retrieved from: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

NSW DCCEEW (2024b). BioNet Atlas of NSW Wildlife. Retrieved from: http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx?who=ddb86a5f-2881-40ec-b09d-5b2c6ce0d614.

NSW DCCEEW (2024c). BioNet Vegetation Classification. Retrieved from: https://www.environment.nsw.gov.au/research/Visclassification.htm

NSW DCCEEW (2024d). eSPADE. NSW Soil and Land Information. Retrieved from: https://www.environment.nsw.gov.au/eSpade2WebApp#

NSW DCCEEW (2024e). Threatened species profile search. Retrieved from: https://www.environment.nsw.gov.au/threatenedspeciesapp/

Department of Customer Service [DCS] Spatial Services (2024a). Cadastral and topographic mapping of the Ryde Local Government Area

DCS Spatial Services (2024b). Historical imagery viewer. Retrieved from: https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=f7c215b873864d44bccddda8075238cb

NSW Government (2024). *Climate change impacts on urban heat*. Retrieved from: https://www.climatechange.environment.nsw.gov.au/impacts-climate-change/built-environment/urban-heat#:~:text=Research%20in%205%20major%20Australian,greater%20impacts%20on%20human%20health.&text=Urban%20heat%20and%20the%20urban%20heat%20island%20effect%20.

Office of Environment and Heritage [OEH] (2016). NSW (Mitchell) Landscapes - version 3.1

New South Wales Threatened Species Scientific Committee [NSW TSSC] (2011). *Duffys Forest Ecological Community in the Sydney Basin Bioregion - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act*

NSW TSSC (2019). *Final Determination to list the Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion as a Critically Endangered Ecological Community*

Appendix A Recommended planting list

Growth form	Species	Associated PCT*			
		PCT 3259	PCT 3262	PCT 3592	PCT 3595
Tree	*Allocasuarina littoralis*	x		x	x
	Angophora costata	x	x	x	x
	Banksia serrata	x		x	x
	Ceratopetalum gummiferum	x		x	x
	Corymbia gummifera	x		x	x
	Eucalyptus globoidea	x	x		
	Eucalyptus pilularis		x	x	
	Eucalyptus piperita			x	x
	Eucalyptus sieberi	x			x
	Syncarpia glomulifera	x	x	x	
Shrub	*Acacia linifolia*	x		x	
	Banksia spinulosa	x			x
	Breynia oblongifolia		x		
	Dodonaea triquetra		x	x	
	Leptospermum trinervium			x	x
	Lomatia silaifolia	x		x	x
	Persoonia levis	x		x	x
	Phyllanthus hirtellus	x		x	
	Pittosporum undulatum		x	x	
	Polyscias sambucifolia		x	x	
Fern	*Adiantum aethiopicum*	x	x		
	Cheilanthes sieberi subsp. *sieberi*		x	x	
	Lindsaea linearis	x		x	x
	Lindsaea microphylla	x	x	x	x
Grass and grasslike	*Austrostipa pubescens*	x		x	
	Entolasia marginata		x	x	
	Entolasia stricta	x	x	x	x
	Imperata cylindrica	x	x	x	
	Lepidosperma laterale	x	x	x	x
	Lomandra filiformis		x	x	x
	Lomandra longifolia	x	x	x	x
	Lomandra obliqua	x		x	x
	Microlaena stipoides	x	x	x	
	Themeda triandra	x	x	x	
Forb	*Dampiera stricta*	x			x
	Dianella caerulea	x	x	x	x
	Dianella revoluta	x	x	x	
	Gonocarpus teucrioides	x		x	x
	Goodenia hederacea	x		x	
	Lobelia purpurascens	x	x	x	
	Patersonia glabrata	x		x	x

Growth form	Species	Associated PCT*			
		PCT 3259	PCT 3262	PCT 3592	PCT 3595
	Patersonia sericea	x			x
	Pomax umbellata		x	x	
	Xanthosia tridentata	x		x	x
Other	*Billardiera scandens*	x	x	x	x
	Cassytha pubescens	x		x	x
	Clematis aristata	x	x		
	Doryanthes excelsa	x			x
	Eustrephus latifolius		x	x	
	Glycine clandestina	x	x	x	
	Hardenbergia violacea	x	x	x	x
	Pandorea pandorana subsp. *pandorana*		x	x	
	Smilax glyciphylla	x		x	x
	Xanthorrhoea media	x		x	x

* As listed in top 10 frequently occurring species within the PCT BioNet Vegetation Classification listing (NSW DCCEEW 2024c)