Ryde Hospital Redevelopment
Biodiversity Development Assessment Report

Health Infrastructure NSW

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DOCUMENT TRACKING

Project Name	Ryde Hospital Redevelopment Biodiversity development Assessment Report
Project Number	21WOL_19654
Project Manager	Meredith Henderson
Accredited Assessor Certification	 **Nicole McVicar (BAAS18007)** S. 6.15(1) of the *Biodiversity Conservation Act 2016* states that: *A biodiversity assessment report cannot be submitted in connection with a relevant application unless the accredited person certifies in the report that the report has been prepared on the basis of the requirements of (and information provided under) the biodiversity assessment method as at a specified date and that date is within 14 days of the date the report is so submitted*. This Biodiversity Development Assessment Report has been prepared by Nicole McVicar on the basis of the requirements of (and information provided under) the biodiversity assessment method (BAM 2020). The BAM calculations or outputs from the calculator (BAM-C) pertaining to the development application were drafted on 24 November 2021 and this BDAR was completed on 14 March 2022, revised in July 2022 and the calculations finalised on 22 July 2022. No actual, perceived, or potential conflict of interest exists between it or between any one or more of the author's employees, consultants or agents and the project client, or is likely to arise in relation to the report that is submitted for this project.
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Template 2.8.1

Executive Summary

Eco Logical Australia was commissioned by Health Infrastructure NSW to prepare this Biodiversity Development Assessment Report (BDAR) to support a State Significant Development (SSD) application (application number SSD-36778089) for the proposed redevelopment of Ryde Hospital at 1 Denistone Road, Denistone NSW. The Secretary's Environmental Assessment Requirements (SEARs) have been issued and required the preparation of a BDAR in accordance with the Biodiversity Assessment Method 2020 (BAM).

The subject land is currently operating as Ryde Hospital with associated buildings, landscaping and infrastructure and health services located in the northern section of the **development site**. Native vegetation includes remnant woodland in the southern section of the development site that is heavily weed affected. There are no mapped watercourses on the development site. The topography has been levelled in the developed northern section and the vegetated areas in the southern section are on a steep slope.

The **development footprint** would encompass the existing buildings for hospital infrastructure and would extend into the forest for an asset protection zone (APZ). The project has responded to feedback and the ecological constraints, mostly being the presence of the critically endangered ecological community (CEEC), Blue Gum High Forest. This ecological community is listed under the *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). By using existing hardstand, the project has largely avoided clearing of the CEEC. The proposed APZ has been developed to avoid and minimise impacts to the CEEC. The project has largely avoided clearing of the CEEC which would be required to meet bushfire protection standards. The proposed performance solution has avoided about 2.76 ha of the community. Further, use of a sympathetic APZ design has minimised impacts on that community by retaining tree canopy and some elements of the understorey.

Despite the efforts to avoid and minimise impacts, the project will have residual unavoidable impacts on native vegetation and fauna habitats. These impacts would result in the requirement to seek and retire biodiversity offsets. The PCT affected is *PCT 1237 Blue Gum High Forest*. In addition to impacts on the CEEC, the presence of Powerful Owl has been assumed. There are numerous records of the Owl using the site, however no known breeding trees would be removed. Despite this, the vegetation modification for the APZ has been assumed to affect about 0.85 ha of Powerful Owl breeding habitat Several discussions with Bird Life Australia reveal that Powerful Owl have been using the development site for many years, however it is unclear whether breeding is occurring, but is likely.

The proposed development includes the removal of weeds and planted vegetation. Therefore, no ecosystem credits would be required to offset as it is anticipated that no impacts on the native remnant vegetation and ecosystem credit species. No species credits would be required to offset the residual unavoidable impacts on the Powerful Owl. This is because no trees that would be breeding habitat are to be removed from within the APZ, and the BAMC returned a credit obligation of zero for the managed APZ area that would be affected.

One additional species listed under the EPBC Act may be potentially affected. The Grey-headed Flying Fox is assumed to potentially use the forest on occasion for foraging. No camps were present on or near the development site. The closest nationally important camps are at Gordon and Parramatta. The project would not remove foraging habitat for this species nor would it affect any breeding habitat.

Measures to mitigate impacts of the proposed development have been considered and include:

- Carrying out site inductions to explain the ecological significance of the remnant vegetation
- Instigating clearing protocols for affected vegetation and habitat
- Erection of barriers to prevent inadvertent clearing
- Implementation of an erosion and sediment control plan
- Limiting the use of dispersive light into the retained remnant CEEC
- Managing pathogens
- Implementing a vegetation management plan across the APZ and retained CEEC to manage the current weed infestations and to mitigate against potential edge effects arising from the development.

Detailed mitigation measures are outlined in Section 6.5.

A referral to the then Department of Agriculture, Water and the Environment was made (EPBC 2022/09219). The Minister, or their delegate, decided on EPBC 2022/09219 - Ryde Hospital Redevelopment. The outcome was Not Controlled Action, therefore the project does not require further assessment or approval regarding the EPBC Act.

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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method 2020
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DPE	NSW Department of Planning and Environment
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
PCT	Plant Community Type
SEARS	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TEC	Threatened Ecological Community
VMP	Vegetation Management Plan
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*

1. Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Nicole McVicar, an Accredited Person (18077) to apply the Biodiversity Assessment Method (BAM) under the NSW *Biodiversity Conservation Act 2016* (BC Act). All credit calculations have been undertaken using the BAM Calculator (BAMC) version 1.4.0.00 in case number 00031140/BAAS18077/22/00031143. The tool and calculations were finalised on 22 July 2022.

The BDAR is a requirement of the NSW Secretary's Environmental Assessment Requirements (SEARS) for the State Significant Development (application number SSD-36778089) and assessment under the BC Act. This report was prepared in accordance with Part 7 of the BC Act. Specifically:

- under Section 7.9 of the BC Act, State Significant Developments (SSD) must be accompanied by a BDAR
- under Section 7.14 of the BC Act, for SSD, a BDAR must assess the likely impact of the proposed development on biodiversity values. The conditions of the consent or approval may require the applicant to retire biodiversity credits to offset the residual impact on biodiversity values.

The contents of this BDAR were prepared in accordance with BAM 2020. This BDAR accompanies a State Significant Development Application that seeks approval for the establishment of a maximum building envelope and gross floor area for the future new hospital buildings, and physical Stage 1 Early Works to prepare the site for the future development. Secretary's Environmental Assessment Requirements have been issued and require assessment of biodiversity:

- Assess any biodiversity impacts associated with the concept development in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method 2020, including preparation of a Biodiversity Development Assessment Report (BDAR), unless a waiver is granted, or the development is on biodiversity certified land.
- As the site includes a number of records of the Powerful Owl (*Ninox strenua*), which is listed as a vulnerable species, the BDAR must include evidence of consultation with Birdlife Australia's Powerful Owl Coordinator to confirm whether any trees on site are currently being used as breeding habitat for the species.
- If the concept development is on biodiversity certified land, provide information to identify the site (using associated mapping) and demonstrate the proposed concept development is consistent with the relevant biodiversity measure conferred by the biodiversity certification.

Definitions of terminology used throughout this report are presented in Appendix A. However, it is important to note these key definitions which are used throughout this report:

- **development site**: an area of land that is subject to a proposed development that is under the EP&A Act – for this project it includes the area subject to the development and the area of vegetation proposed for retention
- **development footprint**: the area directly affected by the project, this includes the built form, landscaping, roads, ancillary facilities and the proposed bushfire Asset Protection Zone (APZ).

1.1. General description of the development site

The Ryde Hospital development site is located approximately 14 km north west of the Sydney Central Business District at 1 Denistone Road, Denistone NSW (Lot 11, DP 1183279, Lots A and B DP 323458) within the City of Ryde Local Government Area (LGA). The site is bounded by Denistone Road, Florence Avenue, Ryedale Road and Fourth Avenue. The development site is 7.69 ha. Ryde hospital buildings and associated infrastructure (including carparks and internal access roads) are located in the northern section of the development site and is about 2.8 ha (hardstand areas and gardens). The southern section is vegetated along a steep slope, comprising native woodland that is heavily weed affected, and is approximately 3.8 ha. The weed infested vegetated land on the southern section of the site is proposed to be managed under a Vegetation Management Plan (VMP). The site has historically been operating as Ryde Hospital since it opened to the public in 1934. There are no mapped watercourses within the study area. The study area is surrounded by urban development. The *development site* refers to areas shown in Figure 1.

The *development footprint* refers to the proposed redevelopment of Ryde Hospital and the associated managed Asset Protection Zone (APZ) and is approximately 4.53ha.

The existing land use is Ryde hospital, SP2 Infrastructure (Health Services Facilities) under the Ryde Local Environmental Plan (LEP) 2014. This zoning covers the entire development site, including the remnant forest.

This report includes two base maps, the Location Map (Figure 1) and the Site Map (Figure 2).

1.2. Brief description of the proposal

The Northern Sydney Local Health District (NSLHD) has identified the need for works to be undertaken at Ryde Hospital to accommodate future demand and improve hospital efficiency. Specifically, it was identified that the hospital currently does not have sufficient built infrastructure to accommodate the projected inpatient and ambulatory requirements to the future need. There is also aging infrastructure on site that will not be suited to the future needs of the hospital. To achieve greater efficiency, integration and to reduce demand, it has been identified that the hospital will likely require the following additional facilities and services:

- Acute and sub-acute beds for medicine, surgery, rehabilitation and geriatric evaluation
- Beds within the paediatric wards
- Ambulatory based treatment wards (including day surgery and observation)
- Resuscitation and emergency department bays; and
- Expanded and enhanced surgical facilities.

The proposed redevelopment will provide these facilities and services in line with the temporary standards of care.

The project will reduce the pressure on the existing facilities at Ryde Hospital and within the wider NSLHD. Overall, the project will provide an efficient work environment for staff and a high standard of amenity for patients.

1.3. Development site footprint

Proposed APZs associated with the development are included the construction and operation footprint. Existing buildings located outside of the construction footprint will remain and are not considered part of the proposal. Vehicles and machinery will access the site using existing roads. The subject land boundary and final development footprint, including the construction footprint, are presented in Figure 2.

For the purposes of this BDAR, the proposal construction footprint and operational footprint will be considered as the same boundary and will be referred to as the 'Development Footprint'. This approach allows the worst-case scenario to be considered when assessing the impacts of the proposal. The development site therefore comprises the buildings and infrastructure to be demolished, buildings and infrastructure to be constructed and the managed APZ.

1.4. Sources of information used

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

- BioNet Vegetation Classification (January 2022)
- Bionet Atlas Database (December 2021)
- Threatened Biodiversity Data Collection (2022)
- NSW Environment, Energy and Science (EES) NSW BioNet Atlas search using a 5 km radius
- Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool using a10 km radius (February 2022)
- Biodiversity Values Map (Land Management and Biodiversity Conservation (LMBC); accessed 24 January 2022)
- Umwelt Pty Ltd (2021) Briefing Note – Desktop Ecological Assessment Report for the Ryde Hospital Redevelopment Site
- Umwelt Pty Ltd (2021) Briefing Note – Ecological Assessment Report for the Ryde Hospital Redevelopment Site
- Eco Logical Australia (ELA) Pty Ltd (2021) Ryde Hospital Ecology Peer Review and Advice.

Species searches from both the NSW BioNet database and the Commonwealth Protected Matters Search Tool (PMST) were performed around the co-ordinates, UTM Zone 55, 323139 m E, 6258735 m S on 22 February 2022. The results of these searches were combined to produce a list of threatened species, populations and communities either previously recorded or considered likely to occur within the study area. The likelihood of occurrences for threatened species, populations and communities in the study area was then determined based on location of database records, the likely presence or absence of suitable habitat in the study area, and knowledge of the species' ecology. This information informed the subsequent field assessment.

After the field inspection had been completed, the likelihood of occurrence of each species, population or communities was re-assessed. This was based on the increase in knowledge about the extent and type of habitats and which species were present within the study area. The likelihood of occurrence for threatened species populations and communities within the study area is present in Appendix F.

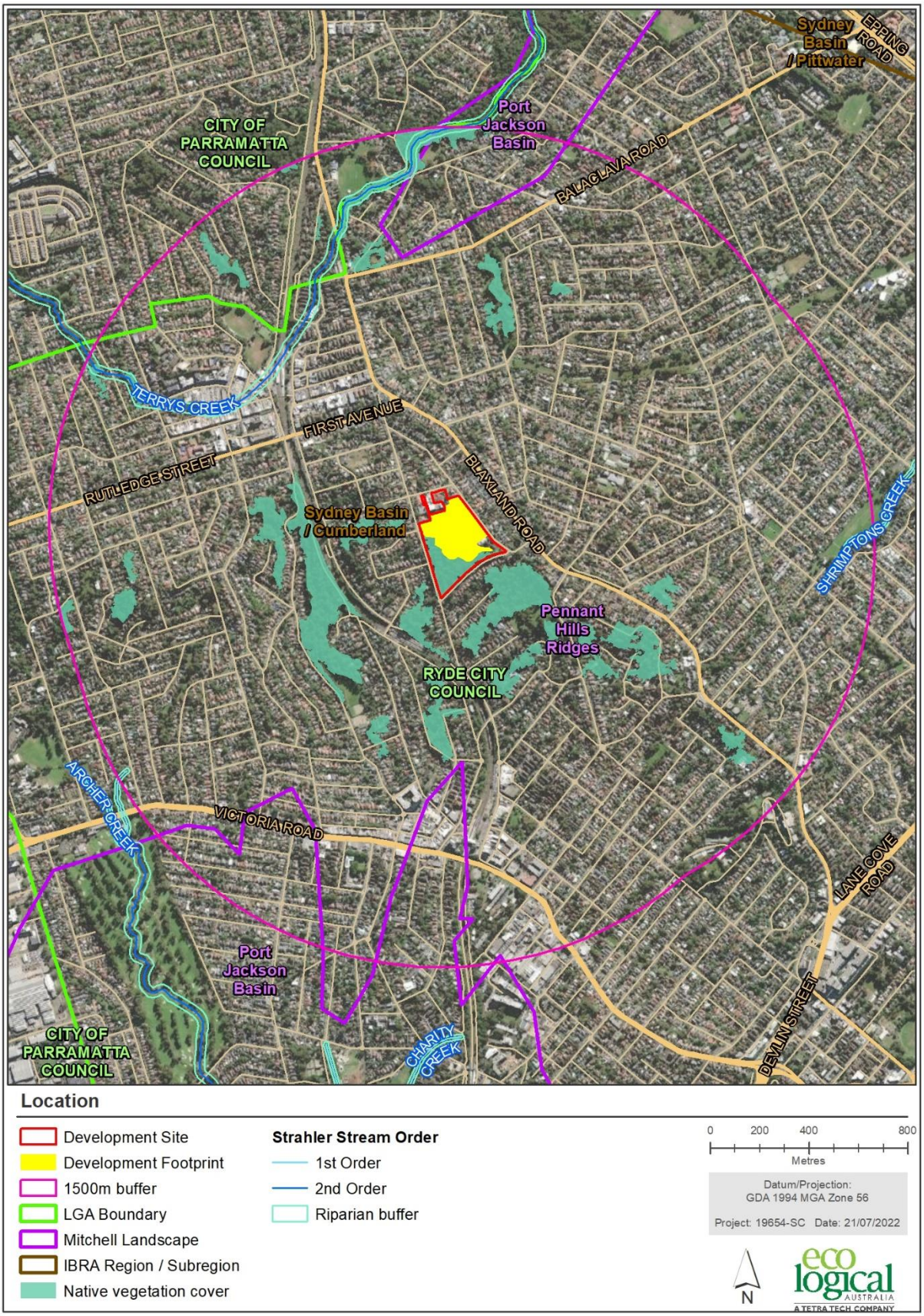

Figure 1: Location Map

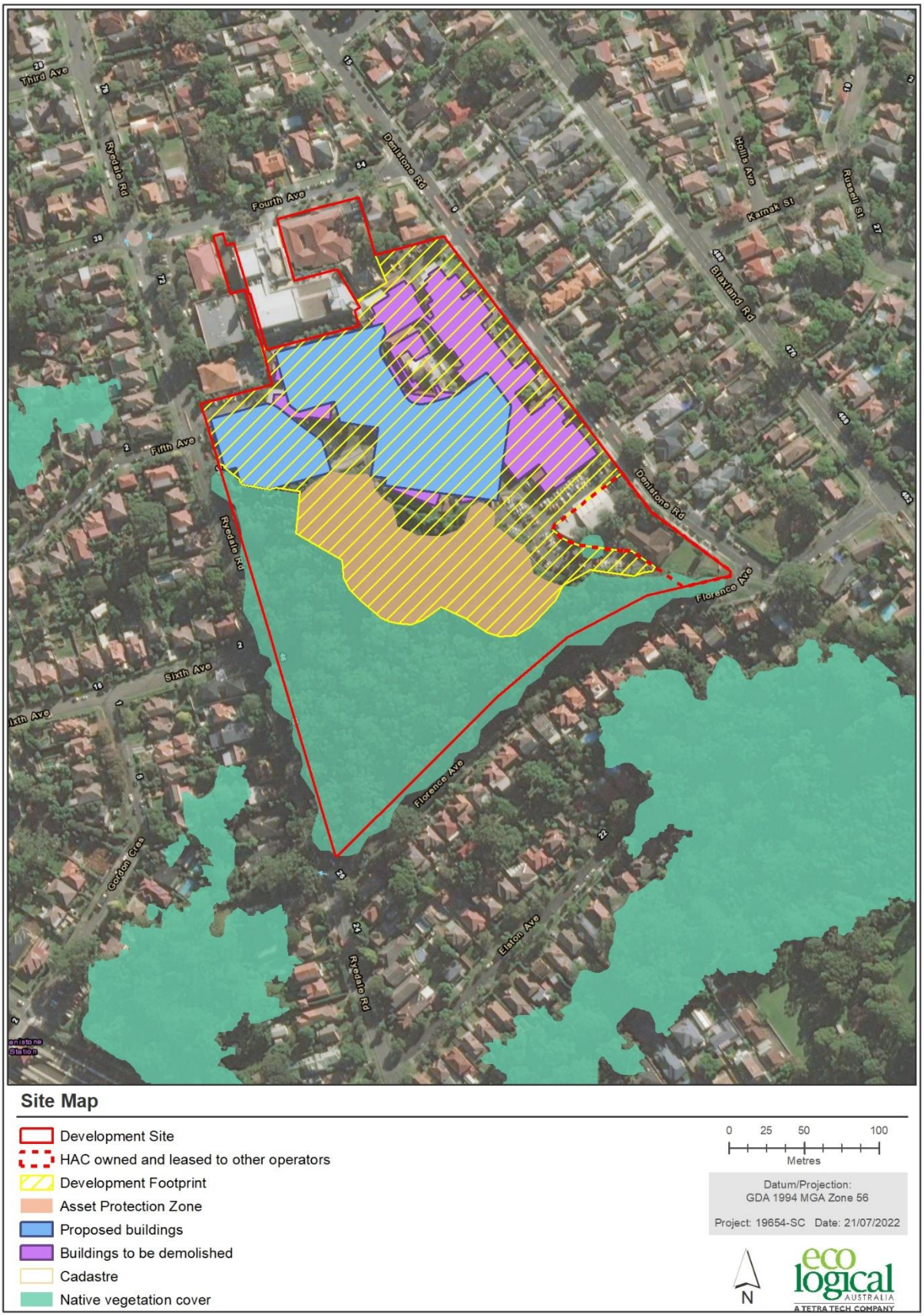

Figure 2: Site Map

1.5. Legislative context

Legislation relevant to the development site is outlined in Table 1.

Table 1: Legislative context

Name	Relevance to the project
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Matters of National Environmental Significance (MNES) have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES (Chapter 8). A referral to the Commonwealth was made and a Not Controlled Action decision received on 28 June 2022. Therefore no further assessment of impacts on MNES is required, nor is any approval required for this action.
State	
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development proposals. The proposed development is State Significant Development and is to be assessed under Part 4.1 of the EP&A Act. **Secretary's Environmental Assessment Requirements** have been issued and require assessment of biodiversity: • Assess any biodiversity impacts associated with the concept development in accordance with the *Biodiversity Conservation Act 2016* and the *Biodiversity Assessment method 2020*, including preparation of a Biodiversity Development Assessment Report (BDAR), unless a waiver is granted, or the development is on biodiversity certified land. • As the site includes a number of records of the Powerful Owl (*Ninox strenua*), which is listed as a vulnerable species, the BDAR must include evidence of consultation with Birdlife Australia's Powerful Owl Coordinator to confirm whether any trees on site are currently being used as breeding habitat for the species. • If the concept development is on biodiversity certified land, provide information to identify the site (using associated mapping) and demonstrate the proposed concept development is consistent with the relevant biodiversity measure conferred by the biodiversity certification.
Biodiversity Conservation Act 2016 (BC Act)	The proposed development would involve modification of 1.04 ha of vegetation within a native woodland ecological community. The proposal is a State Significant Development Application and therefore requires submission of a Biodiversity Development Assessment Report.
Local Land Services Amendment Act 2016 (LLS Act)	The *Local Land Services Act 2013* (LLS Act) regulates the clearing of native vegetation on Rural land but only when the activity is permitted without Council consent. Under Section 60O of the LLS Act, the clearing of vegetation is authorised by other legislation if it is authorised by a development consent under Part 4 of the EP&A Act. Thus, the LLS Act is not applicable to this proposal.
Fisheries Management Act 1994 (FM Act)	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.
Water Management Act 2000 (WM Act)	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.
Environmental Planning Instruments	
State Environmental Planning Policy (SEPP) *(Coastal Management) 2018*	The proposed development is not located on land subject to this SEPP.
State Environmental Planning Policy	This SEPP applies to development that does not require consent. As this project requires consent under the EP&A Act, application of the Vegetation SEPP is not required.

Name	Relevance to the project
(Vegetation in Non-Rural Areas) 2017	
State Environmental Planning Policy (Koala Habitat Protection) 2020 OR *2021*	The proposed development is not located within a Local Government Area to which the SEPP (Koala Habitat Protection) 2020 or 2021 applies.
Ryde Local Environment Plan (LEP) *2014*	The subject site is zoned SP2 Infrastructure under the Ryde LEP 2014. Objectives under the SP2 land zone are as follows: • To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure. • To ensure the orderly development of land so as to minimise any adverse effect of development on other land uses.
City of Ryde Development Control Plan (DCP) 2014	The City of Ryde DCP 2014 contains provisions relating to tree preservation. Section 9.5 outlines requirements for the pruning/removal of trees within the City of Ryde.

2. Landscape features

The development site has been highly disturbed due to historic development of Ryde Hospital infrastructure and heavy weed invasion. The topography and soil profile in the northern section of the subject land has been modified during previous earthworks for levelling and landscaping. The topography of vegetated land to the south of levelled built areas within the development site is steeply sloped from north to south. The vegetation within the southern section of the development site comprises native woodland with an understorey that is heavily weed affected. The elevation of the development site is 57 – 98 metres above sea level.

The site-based method was applied for this assessment; therefore the assessment area is the 1,500 m buffer surrounding the outside edge of the boundary of the subject land.

The landscape features considered for this assessment are presented in Table 2, Figure 1 and Figure 2.

Table 2: Landscape features

Landscape feature	Subject Land/Development Site	Data source
IBRA Region(s)	Sydney Basin	Interim Biogeographic Regionalisation for Australia (IBRA), Version 7
IBRA subregion(s)	Cumberland	IBRA, Version 7
Rivers and streams	The development site does not contain any rivers or streams.	NSW LPI Waterway mapping
Estuaries and wetlands	The development site does not contain any mapped important or local wetlands.	NSW directory of important wetlands
Connectivity of different areas of habitat	The development site contains limited connectivity features shown in Figure 1. Connectivity to large tracts of habitat has been disconnected by residential development and roads surrounding the development site. Some fragmented connectivity may remain for highly mobile species such as birds and bats. This may include flyways for migratory birds and bat species moving through the landscape.	Aerial imagery
Geological features of significance and soil hazard features	The development site does not contain areas of geological significance (i.e. karst, caves, crevices, cliffs) and soil hazard features.	Aerial imagery. Field surveys
Areas of Outstanding Biodiversity Value	As there are not AOBV on site, this trigger does not apply.	Register of Declared Areas of Outstanding Biodiversity Value (DPIE 2020)
NSW (Mitchell) Landscapes	Pennant Hills Ridges (88% cleared)	NSW (Mitchell) Landscapes - version 3.1 (DPIE 2016)

Landscape feature	Subject Land/Development Site	Data source
Percent (%) native vegetation extent	There are / are no differences between the mapped vegetation extent and the aerial imagery. The development footprint is approximately 4.53 ha and contains approximately 1.04 ha of native vegetation. The BAM assessment area is approximately 883.6 ha and contains approximately 46.5 ha of native vegetation (5.27%).	Calculated using aerial imagery and ArcGIS software

3. Native Vegetation

The vegetation within the development site contains native woodland with an exotic dominated understorey. The extent of native vegetation on the development site and immediate surrounds was mapped using the vegetation mapping data produced by the NSW Department of Industry and the Environment (DPIE 2016) for the Sydney Metropolitan, with edits made to the layer where obvious changes to vegetation extent had occurred. Areas within the project area that have been approved for removal and have been developed were excised from the vegetation map and therefore the calculations.

3.1. Survey Effort

Initial vegetation validation survey was undertaken within the development site by Nicole McVicar, Senior Ecologist and Accredited Assessor on 1 September 2021 (Figure 4). The development site was re-visited on 15 February 2022 by Nicole McVicar and Alice Ridyard to collect full floristic and vegetation integrity plots data.

A total of one full-floristic vegetation plot was surveyed to identify Plant Community Types (PCTs) and Threatened Ecological Communities (TECs) on the development site (Table 3). A total of one vegetation integrity survey plots was undertaken on the development site to assess the composition, structure and function components of each vegetation zone in accordance with the BAM.

All field data collected at full-floristic and vegetation integrity plots is included in Appendix B and Appendix C.

Table 3: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots surveyed
1237	Blue Gum high forest	1

3.2. Native vegetation extent on the subject land

Approximately 1.04 ha of native vegetation *PCT 1235 Blue Gum high forest* was identified within the subject land. About 0.23 ha of vegetation within the development site was identified to be planted exotic / native vegetation.

The 0.23 ha of planted vegetation has been assessed against *Appendix D: Streamlined assessment module - planted native vegetation* of BAM 2020. The decision-making process for this module is presented below. The remaining vegetation within the development site has been assessed using the standard BAM.

3.2.1. Decision-making key for planted native vegetation (Appendix D BAM 2020)

NB: text in italics is copied directly from Appendix D (BAM 2020)

1: ***Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?***

i. ~~Yes …. The planted native vegetation must be allocated to the best fit PCT and the BAM must be applied.~~

ii. No..... Go to 2.

Justification:

Planted vegetation is located largely in landscaped, cut and fill areas amongst health infrastructure buildings. The planted vegetation comprised exotic, weed and native species (Appendix D). The composition of native planted species was not characteristic of species that would occur within neighbouring PCT 1237 vegetation. *Lomandra longifolia* and *Dianella caerulea* (Blue Flax-lily) was present in the planted vegetation, however these are common garden species and were located in landscaped areas that appear to have been previously levelled using cut and fill therefore, not considered to be remnant vegetation of neighbouring PCT 1237.

2: ***Is the planted native vegetation:***

a*. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and*

b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?

i. ~~Yes …. The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.~~

ii. No..... Go to 3.

Justification:

The vegetation within the subject site was planted for landscaping purposes, visual amenity, shading and screening. These plantings were not undertaken to fulfill an existing conservation obligation, neither were the plantings used to regenerate a plant community type or a threatened plant species population or its habitat. The species used do not form any recognised PCT that would occur within the surrounding region.

3. ***Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:***

a*. a species recovery project*

b. Saving our Species project

c. other types of government funded restoration project

d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat

e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)

f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or

g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?

i. ~~Yes .... The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.~~

ii. No..... Go to 4.

Justification:

Planted native vegetation within the development site does not include any individuals of threatened species nor are the plantings associated with any of the above conservation projects.

4. *Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?*

i. ~~Yes..... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied~~).

ii. No..... Go to 5.

Justification:

No. The primary purpose of the plantings was for landscaping purposes. The planted native species are not consistent with a PCT from the locality.

5. *Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?*

i. Yes .... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. ~~No..... Go to 6.~~

Justification:

The native planted native vegetation within the development site was planted for the purposes of landscaping. The choice of species was chosen based on personal preference by the landowner, for the visual appeal or screening within the development site.

3.3. Plant Community Types present

A single PCT was identified within the development site and is presented in Table 4.

The development site also contained vegetation 0.23 ha of planted vegetation for landscaping purposes which does not conform to a native PCT.

Table 4: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared
1237	Blue Gum high forest	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	1.04	90

3.3.1. Plant Community Type selection justification

In determining the PCT for the development site, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum and relative abundance, community composition, soils and landscape position. Reference was made to the PCT descriptions in the BioNet Vegetation Classification and the final scientific determinations for TECs. Possible PCT options are provided in Table 5.

PCT 1237 was chosen due to the following attributes observed during the vegetation validation and during a desktop analysis:

- The vegetation formation was a tall, wet sclerophyll forest
- The soil was a clay-loam texture, derived from Wianamatta Shale.
- the canopy vegetation was almost 100% dominated by *Eucalyptus saligna.* *Eucalyptus paniculata* and *Syncarpia glomulifera* comprised minor components of the canopy.
- groundcover species observed, where dense weeds were not present, comprised of ferns, and relatively mesic herbaceous species such as *Pellaea falcata*, *Dianella caerulea* var. *producta, Glycine clandestina, Dichondra repens* and *Sticherus flabellatus.*

The landscape position of the vegetation comprised a steep upper slope tapering to a gentle decline in a SSE direction. It was evident that the shale soils supporting PCT 1237 at the top of the slope dispersed downslope and supported a tall wet sclerophyll forest vegetation formation throughout the entire patch of vegetation.

Table 5: Potential PCTs

Selected PCT ID	PCT Name	Other PCT options
1237	Blue Gum high forest	1281 Sydney Turpentine – Ironbark forest. Also a wet sclerophyll forest formation and found in the Ryde area in small patches. Dominated by *Syncarpia glomulifera*, with *E. saligna* occurring only in transitional areas and only becoming a dominant canopy species in very high rainfall areas (DPIE 2022). Due to the pure dominance of *E. saligna* in the patch, it is considered that PCT 1237 is the best fit PCT, despite its presence in PCT 1281. Before clearing for urban development, it is highly likely that the

Selected PCT ID	PCT Name	Other PCT options
		transitional areas adjacent to this community in the locality may transition to Sydney Turpentine Ironbark Forest. 1841 Coastal enriched sandstone moist forest. This is another likely alternative, being a wet sclerophyll forest vegetation formation found commonly in the area with the same landscape position and shale influence in the soils. However, the patch did not comprise the diversity of species listed in this PCT: PCT 1841 in this part of Sydney is dominated by *Angophora costata, Syncarpia glomulifera and Eucalyptus pilularis,* with *Eucalyptus saligna* occurring as a sub-dominant species in this PCT. Therefore, the dominance of *E saligna,* combined with landscape position and soils resulted in PCT1237 being the best fit PCT.

3.4. Threatened Ecological Communities

The PCT present in the remnant forest in the southern portion of the development site corresponds with the critically endangered ecological community, Blue Gum High Forest in the Sydney Basin Bioregion, under the BC Act, and the community listed under the EPBC Act (Table 6). The entire patch is about 3.79 ha.

The remnant present meets the definition identified in the Final Determination for the community under the BC Act because:

- It is a forest dominated by a canopy of tall eucalypts
- It as a canopy dominated by either *Eucalyptus pilularis* (Blackbutt) or *E. saligna* (Sydney Blue Gum)
- It is on soils derived from Wianamatta Shale
- It is an area with greater than 1,050 mm of rain per year (Chatswood Bowling Club has an annual rainfall average of 1,191 mm (BoM 2022)
- It occurs in the LGA of Ryde.

The remnant also meets the definition of the community identified in the Conservation Advice listed under the EPBC Act because:

- It is greater than 1 ha in size
- It has a canopy cover of more than 10%
- It has typical characteristic species in all structural layers.

Table 6: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
1237	Critically endangered	Blue Gum High Forest in the Sydney Basin Bioregion	3.79	Critically endangered	Blue Gum High Forest of the Sydney Basin Bioregion	3.79

3.5. Vegetation integrity assessment

3.5.1. Vegetation zones

A total of one vegetation zone was identified on the development site based on the broad condition state of each PCT. A total of one vegetation integrity survey plot was collected on the development site consistent with the BAM (Table 7). Descriptions of the vegetation zone is provided in Table 8.

Table 7: Vegetation zones and vegetation integrity survey plots collected on the development site

Vegetation Zone	PCT ID	PCT Name	Condition	Area (ha)	Patch Size	Vegetation Integrity Survey Plots required	Vegetation Integrity Survey Plots collected
1	1237	Blue gum high forest	Poor	1.04	30	1	1

3.5.2. Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. Patch size was assigned to one of four classes (<5 ha, 5-24 ha, 25-100 ha or ≥100 ha). A patch size 30 ha was determined for the development site.

Table 8: Zone 1 PCT 1237 Disturbed Condition

1237 – *Sydney Blue Gum – Blackbutt – Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney basin Bioregion*	
Vegetation formation/class	North Coast Wet Sclerophyll Forest
Conservation status	NSW BC Act CEEC: *Blue Gum High Forest in the Sydney basin Bioregion*
	EPBC Act CEEC: *Blue Gum High Forest of the Sydney basin Bioregion*
Description	Blue Gum High Forest (Benson and Howell 1990) is a tall wet sclerophyll forest found on fertile shale soils in the high rainfall districts of Sydney's north shore. It is dominated by Sydney blue gum (Eucalyptus saligna), blackbutt (Eucalyptus pilularis) and turpentine (Syncarpia glomulifera) with a number of other eucalypts occurring patchily. A sparse to open cover of small trees is found at most sites and includes a variety of sclerophyllous and mesophyllous species. The ground layer is variable in both composition and cover. It may be ferny, grassy or herbaceous depending on topographic situation and disturbance history. At some sites vines and climbers are prolific.
Characteristic canopy trees	At the development site canopy vegetation was almost 100% dominated by *Eucalyptus saligna*. *Eucalyptus paniculata* and *Syncarpia glomulifera* comprised minor components of the canopy.
Characteristic mid-storey	No characteristic native mid-storey species were observed during the field survey, due to the previous disturbance that has occurred within the subject land. Elsewhere in the vegetation zone, *Pittosporum undulatum* was present.
Characteristic groundcovers	Groundcover species were observed where dense weeds were not present and comprised of ferns, and relatively mesic herbaceous species such as *Pellaea falcata, Dianella caerulea* var. *producta, Glycine clandestina, Dichondra repens* and *Sticherus flabellatus.*
Mean native richness	NA since only one plot carried out
Exotic species / HTW cover	*Lantana camara, Ligustrum lucidum, Ipomoea indica, Ochna serrulata, Cardiospermum grandiflorum, Olea europaea subsp. cuspidata, Tradescantia fluminensis, Asparagus aethiopicus, Dolichandra unguis-cati* (70.6% High threat weed cover).
Condition	Poor condition

1237 – *Sydney Blue Gum – Blackbutt – Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney basin Bioregion*			
Variation and disturbance	There was a high level of disturbance within the BAM plot and wider patch of remnant forest. This disturbance was largely due to the high number of exotic species within the subject land due to surrounding development and historic clearing.		
No. sites sampled	1		
Threatened flora species	No threatened flora species were identified during the field survey.		
Fauna habitats	Dense weedy understorey providing habitat for peri-urban birds. Some hollows present which may provide potential habitat for microbats, Powerful Owl and prey items. Low occurrence of *Allocasuarina* species mean it is unlikely to be suitable foraging habitat for Glossy Black Cockatoo. Some woody debris on-site which may provide habitat for small native mammals.		
Composition	**Structure**	**Function**	**Vegetation Integrity Score**
1.9	12.5	49.2	10.6

3.5.3. Assessing vegetation integrity

A vegetation integrity assessment using the BAM Calculator (BAMC) was undertaken and the results are outlined in Table 9.

Table 9: Vegetation integrity scores

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
1	1237	Disturbed	1.04	1.9	12.5	49.2	1	10.6

3.6. Use of local data

No local data is proposed for this assessment.

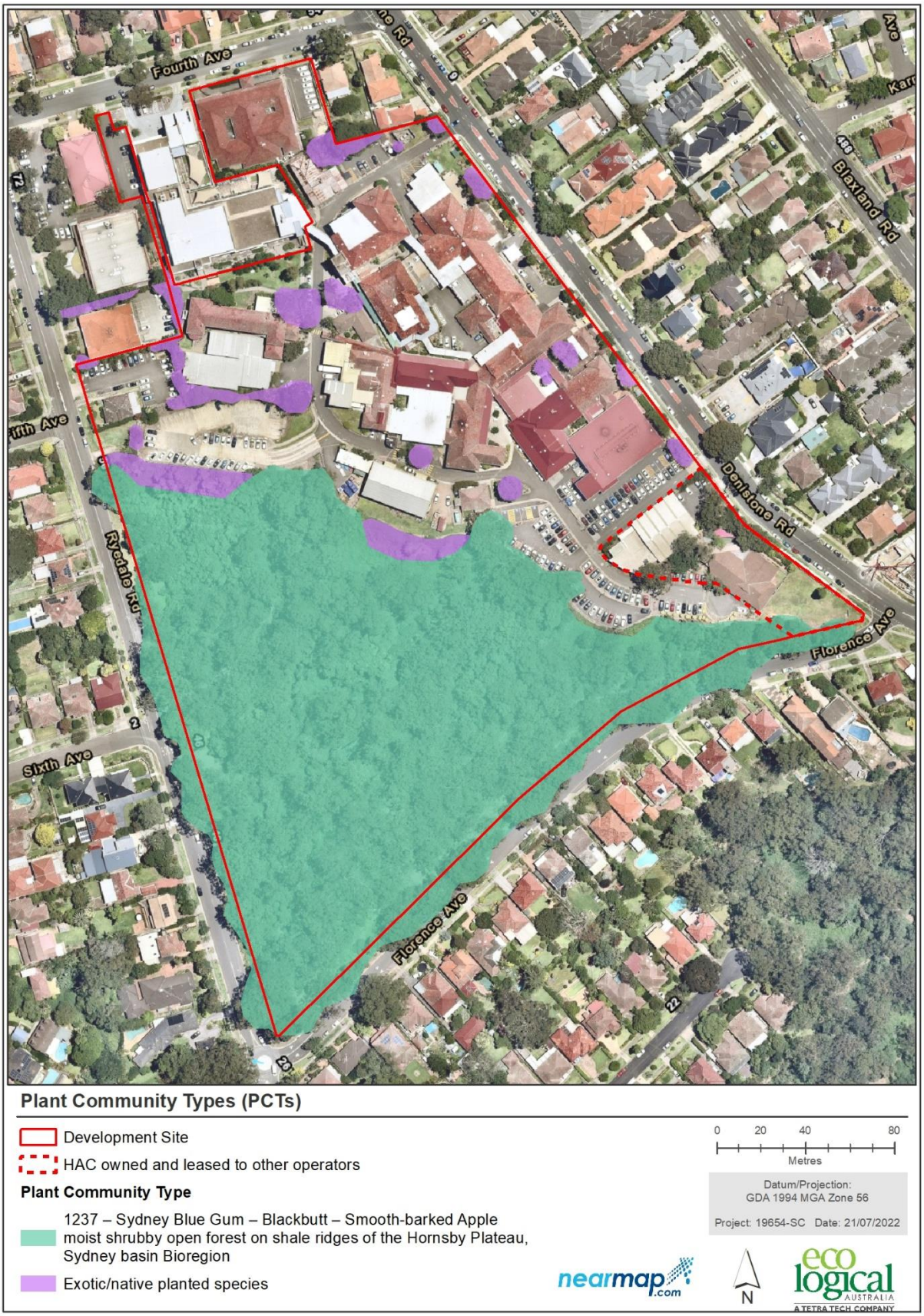

Figure 3: Plant Community Types

Figure 4: Threatened Ecological Communities

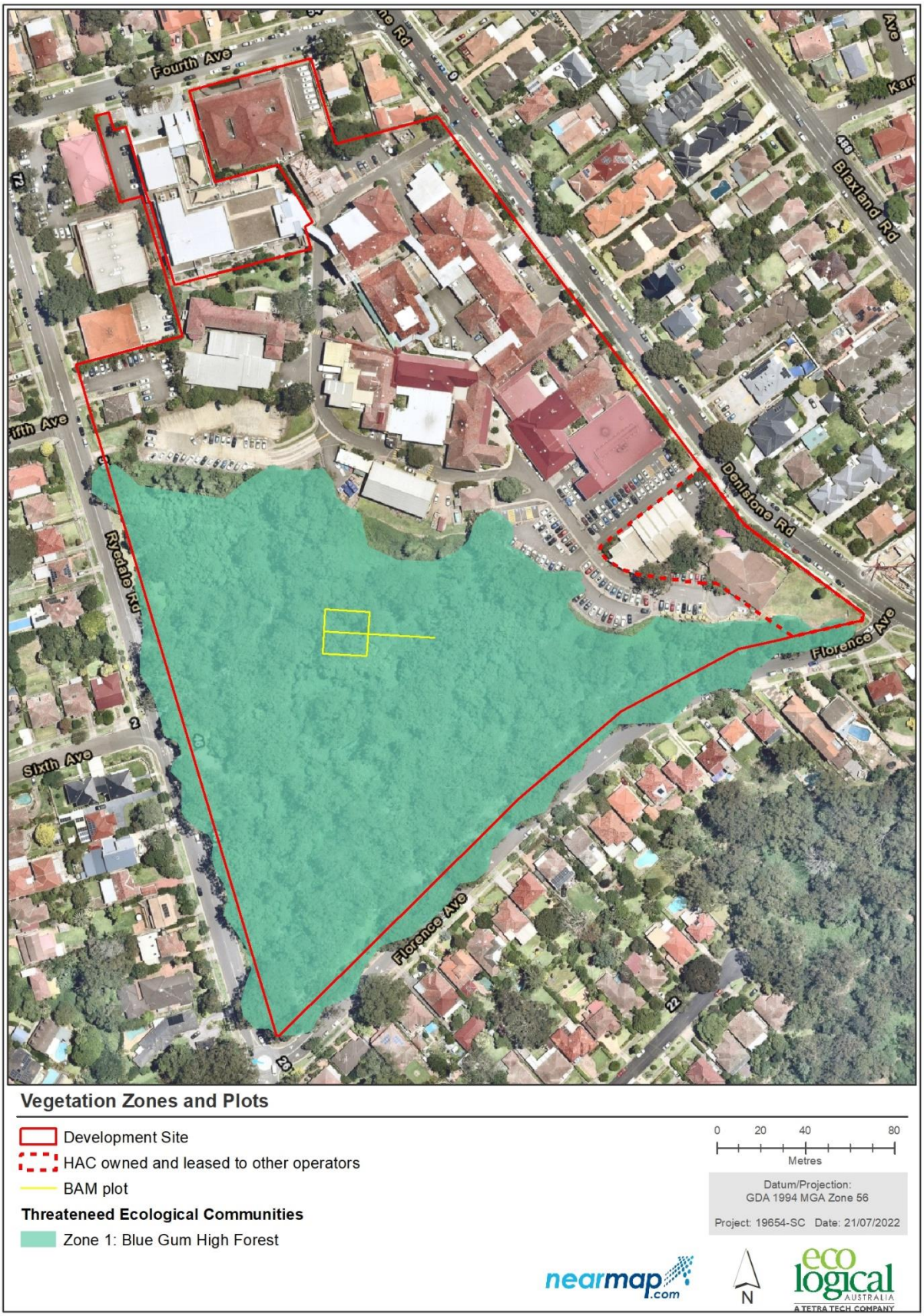

Figure 5: Vegetation Zone and Plot

4. Threatened species

4.1. Ecosystem credit species

Ecosystem credit species predicted to occur within the development site are generated by the BAMC following the input of VI data and the PCTs identified within Chapter 3. Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 10.

Table 10: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Anthochaera phrygia	Regent Honeyeater	-	-	High sensitivity to potential gain	Critically Endangered	Critically Endangered
Artamus cyanopterus	Dusky Woodswallow	-	-	Moderate sensitivity to potential gain	Vulnerable	Not listed
Calyptorhynchus lathami	Glossy Black Cockatoo (Foraging)	1237 Poor	-	High sensitivity to potential gain	Vulnerable	Not listed
Dasyurus maculatus	Spotted-tailed quoll	-	-	High sensitivity to potential gain	Vulnerable	Endangered
Glossopsitta pusilla	Little Lorikeet	-	-	High sensitivity to potential gain	Vulnerable	Not listed
Hirundapus caudacutus	White-throated Needletail	-	-	High sensitivity to potential gain	Not listed	Vulnerable
Lathamus discolor	Swift Parrot (Foraging)	-	-	Moderate sensitivity to potential gain	Endangered	Critically Endangered
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	-	-	High sensitivity to potential gain	Vulnerable	Not listed
Miniopterus australis	Little Bent-winged Bat	-	-	High sensitivity to potential gain	Vulnerable	Not listed
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	-	-	High sensitivity to potential gain	Vulnerable	Not listed
Ninox strenua	Powerful Owl (Foraging)	-	-	High sensitivity to potential gain	Vulnerable	Not listed

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Pteropus poliocephalus	Grey-headed Flying Fox	-	-	High sensitivity to potential gain	Vulnerable	Vulnerable
Ptilinopus superbus	Superb Fruit-Dove	-	-	Moderate sensitivity to potential gain	Vulnerable	Not listed

Ecosystem credit species which have been excluded from the assessment and relevant justification is included in Table 11.

Table 11: Justification for exclusion of predicted ecosystem credit species

Species	Common Name	BC Act listing status	EPBC Act Listing status	Justification for exclusion of species
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered	Species is vagrant

4.2. Species credit species

4.2.1. Identification of species credit species

Species credit species that require further assessment on the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 12.

Table 12: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Calyptorhynchus lathami	Glossy Black Cockatoo	Hollow bearing trees. Living of dead tree with hollows >15cm diameter and >8m above the ground	-	High sensitivity to potential gain	Vulnerable	Not listed
Myotis macropus	Southern myotis	Hollow bearing trees. Bridges caves or artificial structures within 200m of riparian zone/waterbodies		High sensitivity to potential gain	Vulnerable	Not listed
Ninox strenua	Powerful Owl (Breeding)	Hollow bearing trees. Living or dead trees with hollows >20cm diameter	-	High sensitivity to potential gain	Vulnerable	Not listed
Phascolarctos cinerus	Koala	-	-	High sensitivity to potential gain	Vulnerable	Vulnerable

Table 13: Justification for the exclusion of species credit species

Species	Common Name	BC Act listing status	EPBC Act Listing status	Justification for exclusion of species
Anthochaera phrygia	Regent Honeyeater	Critically endangered	Critically endangered	Not within mapped areas.
Galium australe	Tangled Bedstraw	Endangered	Not listed	Habitat degraded
Grammitis stenophylla	Narrow-leaf Finger Fern	Endangered	Not listed	Habitat degraded
Hibbertia spanantha	Julian's Hibbertia	Critically endangered	Critically endangered	Habitat degraded
Lathamus discolor	Swift parrot (Breeding)	Endangered	Critically endangered	Not within mapped areas.
Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable	Habitat constraints not present on the site, being water bodies
Miniopterus australis	Little Bent-winged Bat (Breeding)	Vulnerable	Not listed	Habitat constraints not present on the site
Miniopterus orianae oceanensis	Large bent-winged Bat (Breeding)	Vulnerable	Not listed	Habitat constraints not present on the site
Pommerhelix duralensis	Dural land Snail	Endangered	Endangered	Habitat degraded
Pteropus poliocephalus	Grey-headed Flying Fox (Breeding)	Vulnerable	Vulnerable	No camps present
Rhodamnia rubescens	Scrub Turpentine	Critically endangered	Not listed	Habitat degraded
Syzygium paniculatum	Magenta Lilly Pilly	Endangered	Vulnerable	Habitat degraded
Tetratheca glandulosa	Tetratheca glandulosa	Vulnerable	Not listed	Habitat degraded

4.2.2. Assessment of habitat constraints and vagrant species

Candidate species derived by the BAM C listed in Table 13 are not considered likely to occur within the development site based on the lack of habitat and long-term habitat degradation throughout the development site. The native vegetation within the study area was highly modified and heavily weed invaded (70.6% high threat weeds coverage) from historic clearing a surrounding urban development.

The condition of the native vegetation, PCT 1237 is poor, according to the vegetation integrity score of 10.6. This score is low when compared to the benchmarks for PCT 1237 (Bionet Vegetation Classification, 2021). For example, the grass richness and cover were both zero, but the benchmark is 6 and 7 respectively. Shrub richness was 1 but, the benchmark is 15. Tree richness was 2, but the benchmark is 9. Shrub cover was 0.2 but, the benchmark is 51. Tree cover was 25 but, the benchmark is 69. In summary, the Blue Gum high forest is a simplified patch of large, dispersed trees lacking structure and floral diversity with a high level of weed invasion (High threat weed cover was 70.6). The

poor condition of the vegetation reflects poor habitat opportunity for native fauna and candidate species derived by the BAM C.

There were no water bodies, either permanent or ephemeral, no caves, cliffs, karst or rocky ledges within the development site or adjacent forest. This excludes the presence of species such as Green and Golden Bell Frog and breeding for the Large- and Little-bentwing Bats. For the Dural Land Snail and the threatened plants, the habitat is sufficiently degraded to rule these species out. This rationale is based on the structural and compositional simplicity of the development site and the high cover of weed species.

4.2.3. Candidate species requiring further assessment

Further assessment for candidate species was required for all candidate species credit species listed in Table 12.

Due to the project timing, targeted surveys for *Ninox strenua* (Powerful Owl) were not able to be undertaken. This species was not filtered into the BAMC tool as a species credit, however it is known from the development site and was manually added to the species list. The Powerful Owl was assumed to be present and a species polygon determined consistent with the requirements in the threatened biodiversity data collection.

4.2.4. Targeted surveys

Targeted surveys for species credit species were undertaken at the development site on the dates outlined in Table 14. The locations of targeted surveys are shown on Figure 6, with the results of the surveys shown as individual species polygons on Figure 7. Relevant experience of staff undertaking surveys are provided in Appendix E.

Table 14: Targeted surveys

Date	Surveyors	Target species
16 – 20 December 2021 (12 detector nights) 27 – 31 January 2022 (4 detector nights)	Leura Kowald Alice Ridyard Alex Gorey Julia Ryeland (call analyst)	Little Bentwing-Bat, Southern Myotis
16 December 2021 20 December 2021	Leura Kowald Alice Ridyard Alex Gorey	Glossy Black Cockatoo
27 January 2022 31 January 2022	Leura Kowald Kara Tuck	Koala, Greater Glider

Weather conditions during the targeted surveys are outlined in Table 15. Weather was taken from the Parramatta automatic weather station (Station ID 066124; BoM 2022). It appears that the weather station was not recording minima for the December 2021 or the maximum for the 31 January 2022 survey dates.

Table 15: Weather conditions

Date	Rainfall (mm)	Minimum temperature °C	Maximum temperature °C
16 December 2021	2.8	Not recorded	25.8
20 December 2021	0.4	Not recorded	30.0
27 January 2022	0	19.2	28.5
31 January 2022	0	19.2	Not recorded

Survey effort undertaken at the development is outlined in Table 16. Survey comprised several approaches to detect potential threatened species. The surveys included area-based searches, habitat searches, call detection for bats, spotlighting and random meanders. Due to the density of understorey, survey was confined to the perimeters and proposed APZ area.

Table 16: Survey effort

Method	Habitat (ha)	Stratification units	Total effort	Target species
Area search	4	1	4 hours	Glossy Black Cockatoo,
Bat Call recording	4	1	16 detector nights	Little Bentwing Bat, Southern Myotis
Habitat search (day)	4	1	4 hours	Koala, Gliders
Habitat search (night)	4	1	4 hours	Koala, Gliders
Parallel transects	1	1	8 hours	Flora
Random meander	1	1	8 hours	Flora
Spotlighting on foot	4	1	4 hours	Koala, Gliders

4.2.5. Results of targeted surveys

Following completion of targeted surveys, the species credit species that are present on the development site are outlined in Table 17.

Table 17: Species credit species included in the assessment

Species	Common Name	Species presence	Geographic limitations	Number of individuals / Habitat (ha)	Biodiversity Risk Weighting
Miniopterus australis	Little Bentwing Bat	yes (survey)	-	1.04 ha	High
Ninox strenua	Powerful Owl	yes (assumed present)	-	0.85 ha	High

LITTLE BENTWING BAT

The Little Bentwing Bat was detected within the development site during the echolocation surveys. This species is a dual credit species whose breeding habitat requires avoidance, and offsetting if impacts are unavoidable. Breeding habitat is very specific and includes caves, culverts, mines, tunnels or other structures known to be used for breeding. Only five maternity colonies are known in Australia, and none are known on or near the development site.

The species is known to have a wide foraging range, and typically forages in densely vegetated areas. The species was detected by the acoustic detectors deployed in December 2021. The species is most likely either foraging in or commuting through the site. The development site comprises a forest structure with a dense understorey mostly of *Lantana camara*. It is possible that the species is foraging for prey items in the space between the canopy and the dense understorey.

Given there is no breeding habitat present on or near the development site, there is no requirement to prepare a species polygon consistent with the 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH 2018). No species credits are required for the Little Bentwing Bat.

POWERFUL OWL

There are numerous contemporaneous records of the Powerful Owl using part of the development site. These records are concentrated on the Blue Gum High Forest in the southern portion of the development site. It is not known whether any of the trees present provide breeding habitat for the Powerful Owl, however some or all of the forested area is used by this species. Prey items such as Ring-tailed Possums were detected during targeted survey for Koala and other arboreal mammals. Therefore, it is likely that the Powerful Owl hunts across the forested parts of the development site.

The timeframes for the project did not allow for targeted survey of the Powerful Owl during the approved months for survey to detect breeding. These survey months are May to August. Since the species is using the site, it is assumed as being present, and all forested areas in the proposed asset protection zone are assumed to be part of a species polygon. No trees are to be removed as part of the asset protection zone where it intersects with the Blue Gum High Forest.

The Threatened Biodiversity Data Collection provides this direction on the preparation of a species polygon for the Powerful Owl:

> '…the species polygons should be drawn around those trees (i.e the identified potential nest trees where any owl of this species is observed using, or focussing behaviour around the tree). The species polygons should be circular in shape and must include a buffer RADIUS of 100 m around each tree. The purpose of the buffer is to minimise disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding.'

Discussion with Bird Life Australia's Powerful Owl Project revealed that Powerful Owl have been using the development site for roosting. There is no clear evidence that breeding has occurred, although chicks and juveniles have been observed within the Blue Gum High Forest in several years. No juveniles have been detected since 2019, however no targeted surveys were carried in the intervening years. The evidence provided by the Powerful Owl Project indicates that this species may be breeding in the southern portion of the forest, with roosting habitat closer to the proposed managed APZ. Since no survey was carried out, all vegetation subject to the asset protection zone has been assumed to be habitat essential for breeding.

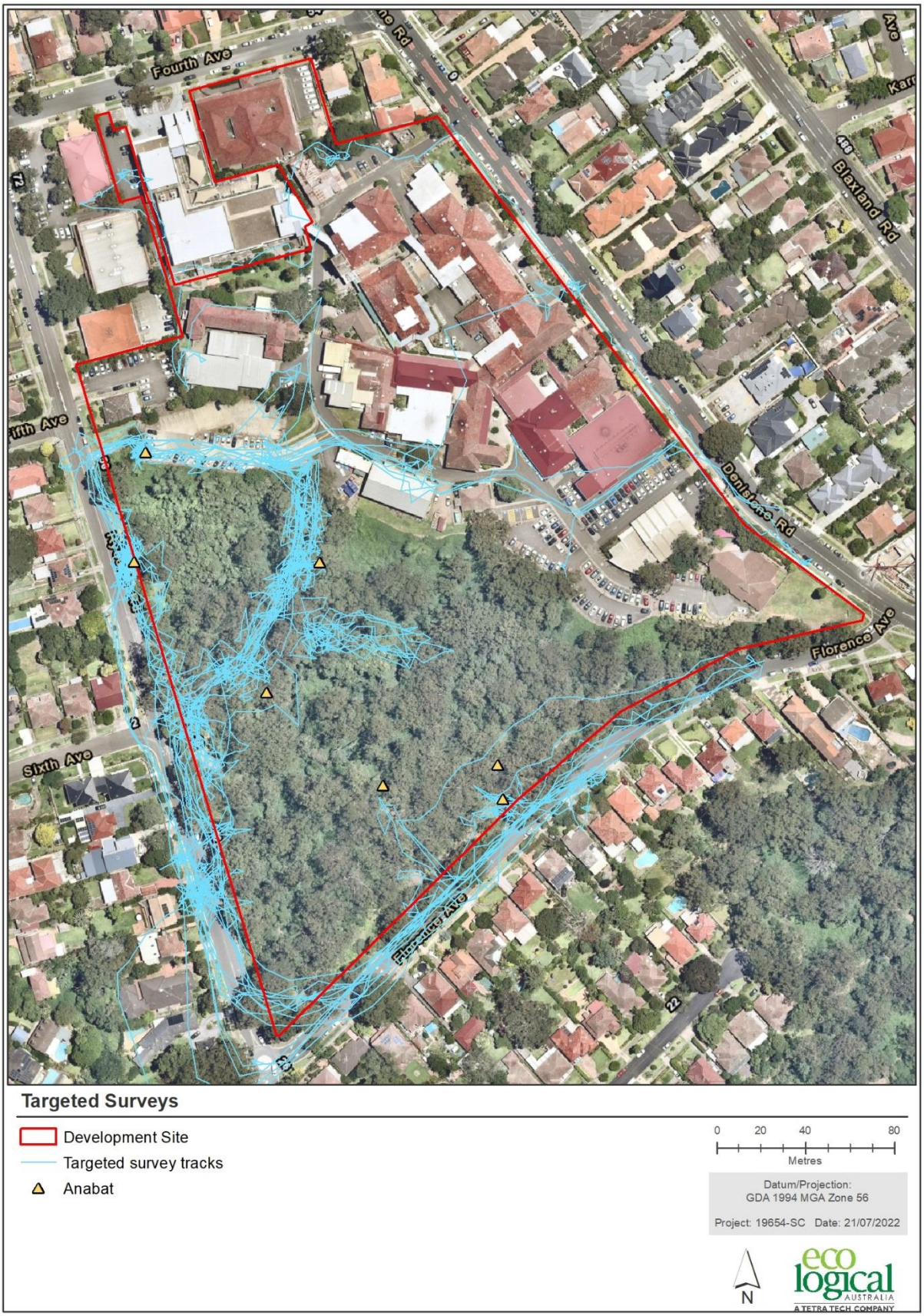

Figure 6: Targeted surveys

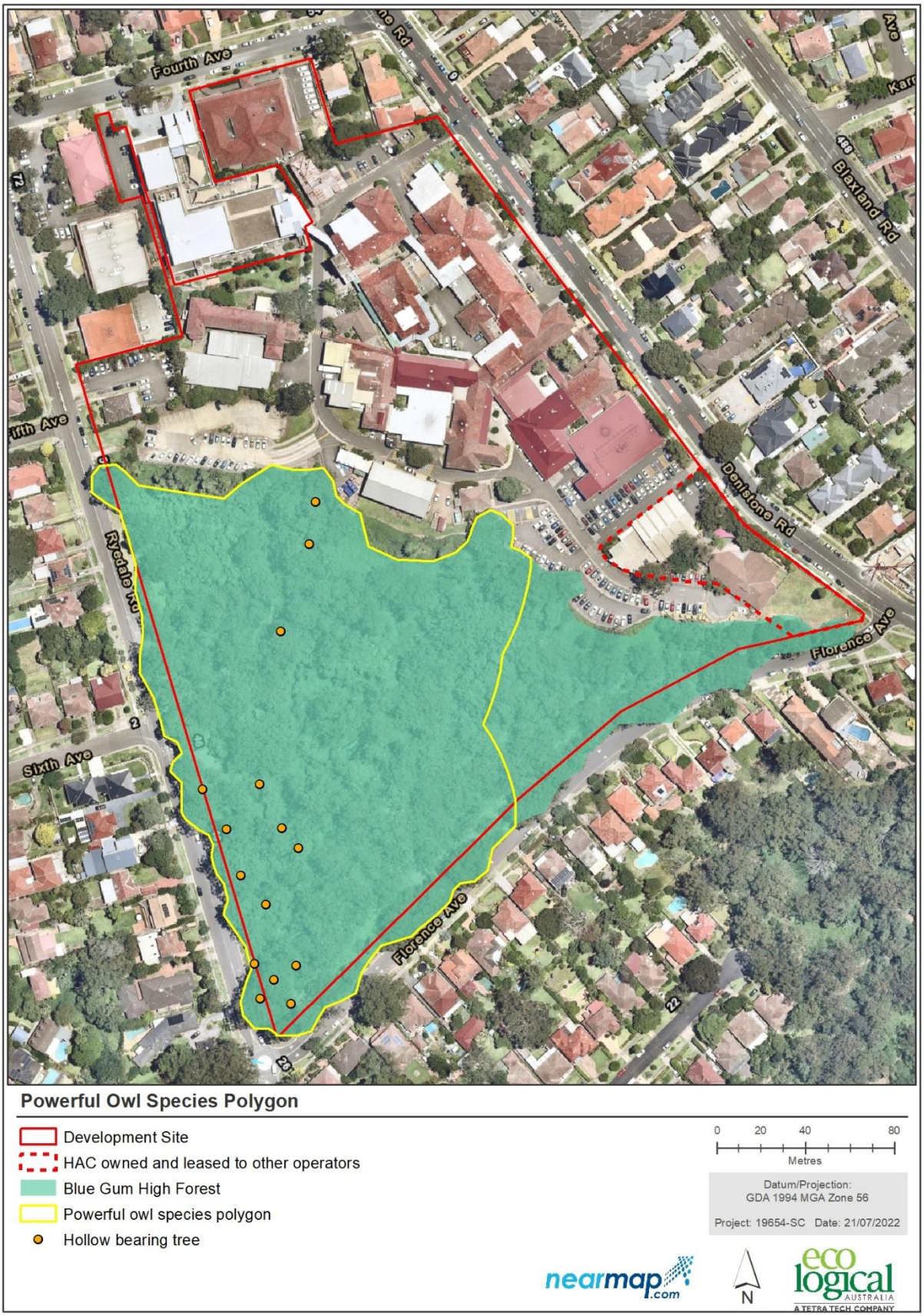

Figure 7: Powerful Owl Species polygon

4.3. Identification of prescribed additional biodiversity impact entities

The development site does not contain any additional prescribed impact entity.

4.3.1. Karst, caves, crevices, cliffs, rocks and other geological features of significance

The development site does not contain karst, caves, crevices, cliffs, rocks and other geological significance as outlined in Chapter 6.1.1 of the BAM 2020.

4.3.2. Human-made structures and non-native vegetation

Structures within the development site does not contain any human-made structures or non-native vegetation that is considered as potential habitat for threatened entities as outlined in 6.1.2 of the BAM 2020. The existing buildings on the site are still operational buildings of the Ryde Hospital and associated health services. The non-native vegetation is present as maintained garden beds, with little prospect of threatened species using it for foraging or breeding.

4.3.3. Habitat connectivity

The development site contains limited connectivity features for threatened entities as outlined in 6.1.3 of the BAM 2020.

Connectivity to large tracts of habitat has been disconnected by vast areas of residential development and roads surrounding the development site. Smaller tracts of bushland (generally <5 ha) are present in the locality. Some fragmented connectivity between these small patches may remain for highly mobile species such as birds and bats. This may include flyways for migratory birds and bat species moving through the landscape.

4.3.4. Water bodies, water quality and hydrological processes

The development site does not contain any waterbodies, water quality and hydrological processes as outlined in 6.1.4 of the BAM 2020.

4.3.5. Wind farm developments

This is not a wind farm development.

4.3.6. Vehicle strikes

The development would not likely result in an increase of vehicle strike. The project would include additional capacity for cars and the continued ability for vehicles to traverse the existing hardstand area. It is unlikely that the potential increase in vehicles on the development site would increase the risk of vehicle strike.

5. Avoiding and Minimising Impacts on Biodiversity Values

5.1. Locating a project to avoid and minimise impacts on biodiversity values

5.1.1. Direct and indirect impacts

The BC Act and BAM 2020 requires proponents to avoid and minimise impacts on biodiversity values (refer to Section 7.1.1 of the BAM 2020).

The proposed construction footprint has been designed and located outside of existing areas of native vegetation to minimise impacts on biodiversity. The project will take advantage of the existing hardstand areas as well as the current hospital infrastructure and ancillary features. Some gardens and planted native vegetation may be removed to facilitate the construction and operation.

The associated APZ required for the proposed development encroaches the adjacent native vegetation and will therefore involve modification of the vegetation. However, to achieve APZ standards in accordance with the *Planning for Bushfire Protection 2019* document, only the understorey exotic vegetation within development site is required for removal.

The understorey is heavily weed infested, and works would involve the removal of exotic weed species. The native canopy species will not be removed.

A comparative analysis of the potential APZ options was also undertaken for the proposed development (ELA 2021). This analysis resulted in the recommendation of a managed APZ that minimised the impact to vegetation within the study area while providing adequate bushfire protection for the proposed development (see further discussion below for 'designing a project to avoid and minimise impacts').

It has been assumed that the remnant trees present on the development site provides potential breeding and foraging habitat for the Powerful Owl. These trees will be retained as APZ clearing works only involves hand clearing of groundstorey exotic species to achieve the required managed APZ for the proposed development. Biodiversity impacts would be minimised as weed species will be targeted for removal and the implementation of a VMP would facilitate the ecological restoration of the remnant woodland within the development site.

A vegetation management plan (VMP) will be implemented to ensure the effective management and eradication of weeds and replanting native groundstorey species that align with the existing PCT 1237. Therefore, the poor condition of the existing vegetation within the subject land is expected to be improved following the proposed development and thus impacts to local biodiversity would be minimised.

5.1.2. Prescribed biodiversity impacts

There are no prescribed biodiversity impacts which need to be avoided or minimised.

5.2. Designing a project to avoid and minimise impacts on biodiversity values

5.2.1. Direct and indirect impacts

The project has been designed to avoid and minimise impacts on biodiversity as far as practical. The major impact on biodiversity would be through the modification of Blue Gum High Forest CEEC to achieve a compliant APZ. Significant site analyses by Bushfire Consultants in ELA, along with discussion with the RFS and Health Infrastructure has enabled the design of the APZ to be minimised to avoid biodiversity. The current proposal for vegetation management within the proposed APZ is:

- retain all existing CEEC trees and allow for further recruitment
- retain up to 10% ground cover of CEEC shrubs within the Inner Protection Area (IPA) and 20% in the Outer Protection Area (OPA)
- retain up to 75% - 90% CEEC ground cover plants, but only those with lower above-ground biomass.

The alternate 'acceptable solution' would have resulted in removal of canopy trees, as well as the modification of shrubs and the ground cover. Further, an acceptable solution would have resulted in a larger APZ, up to 2 ha in size. A key design feature being considered was to place the multi-deck carpark between the remnant forest and habitable buildings. By doing this, the need for a larger APZ was eliminated. The carpark effectively provides a 'buffer' between the forest and one part of the proposed hospital buildings. A detailed analysis on the design features of the APZ and its relation to fire risk on the site is provided in the bushfire assessment report (ELA 2022).

Indirect impacts to adjacent habitat are unlikely to result from the proposed development given the adjacent land is highly disturbed. Measures outlined in Section 6.5 and implementation of a CEMP will ensure they are minimised. For example, the site-specific CEMP should include:

- Locations of vegetation that would be retained and not disturbed
- Instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES).

5.2.2. Prescribed biodiversity impacts

There are no prescribed biodiversity impacts that would need to be considered in the design of the project.

6. Assessment of Impacts

6.1. Direct impacts

The direct impacts of the development on:

- native vegetation and threatened ecological communities are outlined in Table 18
- threatened species and threatened species habitat is outlined in Table 19
- prescribed biodiversity impacts is outlined in Section 6.4.

Direct impacts including the final project footprint (construction and operation) are shown on Figure 8.

Table 18: Direct impacts to native vegetation

PCT ID	PCT Name	BC Act listing	EPBC Act listing	Direct impact (ha)
1237	*Sydney Blue Gum – Blackbutt – Smooth-barked Apple moist shrubby open forest on shake ridges of the Hornsby Plateau, Sydney basin Bioregion*	CEEC	CEEC	1.04

Table 19: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact habitat (ha)	BC Act listing status	EPBC Act Listing status
Ninox strenua	Powerful Owl	0.85 ha	Vulnerable	-

6.2. Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 20. The future integrity score of 10.6 was retained in the assessment. This is because the understorey containing exotic plants will be removed and there is no intention to remove native plants. Therefore the composition, structure and function scores were retained and no future loss attributed to the proposed development.

Table 20: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	1237	Disturbed	1.04	10.6	10.6	0

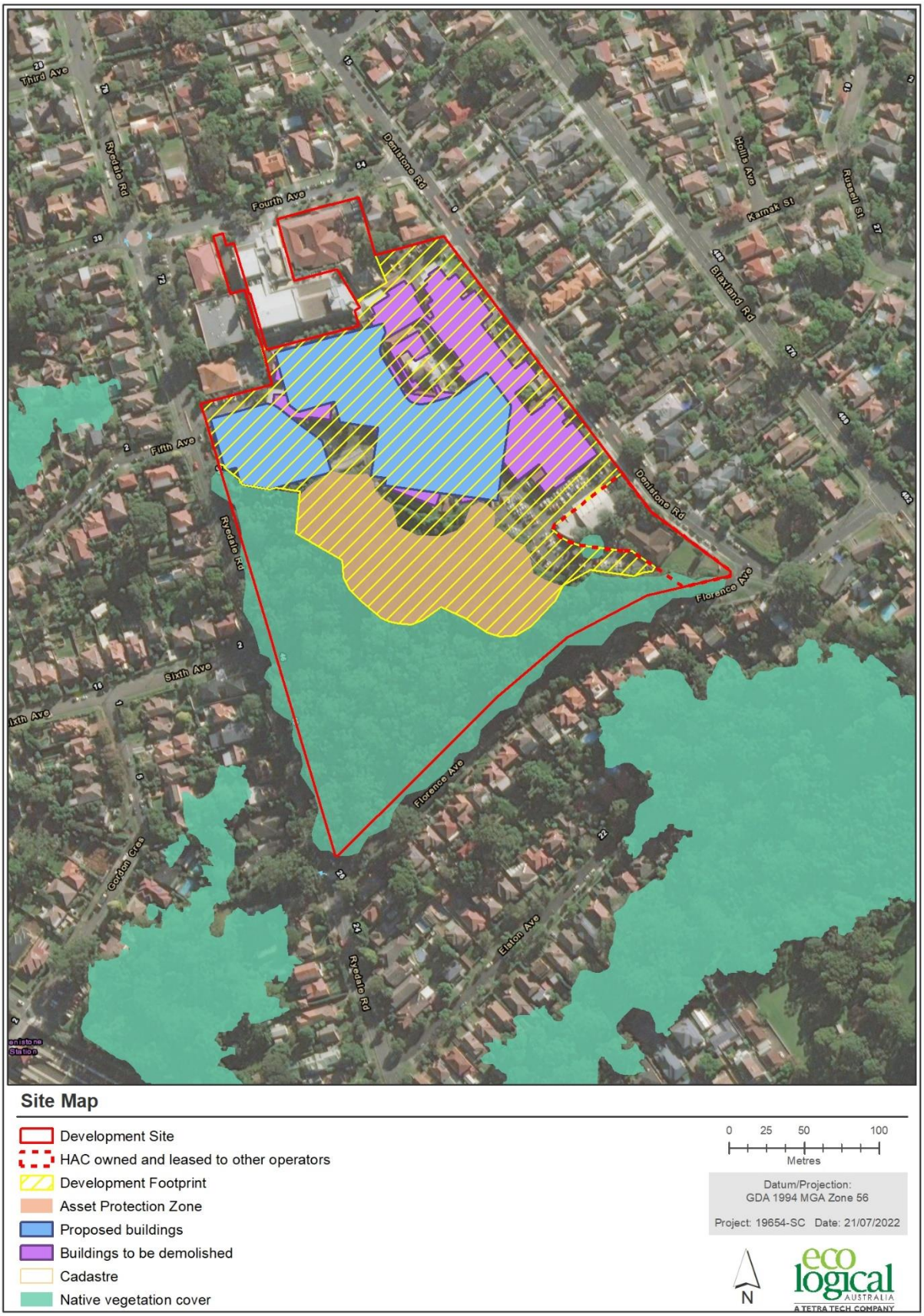

Figure 8: Final project footprint including construction and operation

6.3. Indirect impacts

The indirect impacts of the development are outlined in Table 21. Indirect impact zones are shown on Figure 9.

Table 21: Indirect impacts

Indirect impact	Description (nature, extent and frequency)	Biodiversity affected	Duration/ Timing	Consequence
inadvertent impacts on adjacent habitat or vegetation	Damage during construction to existing native vegetation marked for retention including native trees within the proposed APZ. Vegetation and habitats outside the footprint.	PCT 1237 and habitat for common species and also Powerful Owl.	Short term and during bulk earthworks	Loss of habitat and vegetation communities
Reduced viability of adjacent habitat due to edge effects	Changing light and soil moisture from exposure	PCT 1237 and habitat for common species and also Powerful Owl.	Long term during construction and operation	Changes to soil conditions
Reduced viability of adjacent habitat due to noise, dust or light spill	Noise and dust from machinery movement No night works proposed - light spill unlikely	PCT 1237 and habitat for common species and also Powerful Owl.	Daily during bulk earthworks. Intermittently after vegetation removal, during truck movement, dry periods or heavy winds	Temporary loss of habitat quality
transport of weeds and pathogens from the site to adjacent vegetation	Spread of weeds from adjacent areas. Minor impacts as vegetation in adjacent areas already contain high cover of exotic species.	PCT 1237	During bulk earthworks daily due to vehicle movement and dust and water movement	Minor increases in weed cover
Increased risk of starvation or exposure and loss of shade or shelter	Potential loss of habitat due to the removal of groundstorey vegetation. Minor impact due to the existing canopy that will stay intact.	Common species	Long term during construction and operation	Loss of individuals
loss of breeding habitat	Negligible loss of breeding habitat since only exotic species are proposed for removal.	Common species	Long term during construction and operation	Loss of individuals
trampling of threatened flora species	Negligible chance of trampling since no threatened flora was observed on the subject site	Not likely to be any	During construction	Temporary crushing of plants

Indirect impact	Description (nature, extent and frequency)	Biodiversity affected	Duration/ Timing	Consequence
Inhibition of nitrogen fixation and increased soil salinity	Not likely to occur	NA	NA	NA
Fertiliser drift	Not likely to occur, not part of development	NA	NA	NA
rubbish dumping	Rubbish dumping from construction workers, public during bulk earthworks	PCT 1237	Intermittently when contractors are on site	Shading of plants
wood collection	Not likely to occur or be increased as a result of the development	NA	NA	NA
removal and disturbance of rocks including bush rock	Not likely to occur as no substantial surface rock is present	NA	NA	NA
increase in predators	Increase presence of exotic fauna species such as feral cats and foxes is not likely to occur as a result of the development	NA	NA	NA
increase in pest animal populations	Increased presence of exotic fauna species such as *Acridotheres tristis* (Common Myna), is not likely to occur as a result of the development since they already are present in the surrounding areas due to existing urbanisation and loss of predators	NA	NA	NA
changed fire regimes	Not likely to occur	NA	NA	NA
disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	No beach foraging habitats are present, hollow loss is dealt with in other indirect impact categories	NA	NA	NA
sedimentation and contaminated and/or nutrient rich run-off	Runoff during construction resulting in changes to water chemistry and habitat	Adjacent soils and waterways and groundcover vegetation.	During construction	Contaminated waterways

Figure 9: Indirect impact zones

6.4. Prescribed biodiversity impacts

The development does not have any prescribed biodiversity impacts.

6.5. Mitigating and managing direct and indirect impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 22.

Table 22: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
timing works to avoid critical life cycle events such as breeding or nursing	Moderate. No hollow bearing trees to be removed	Low	Avoid breeding trees or nursing events Powerful Owl (May – August).	Risk to Powerful Owl impact reduced	During construction	Contractor
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Moderate	Low	Clearing protocols to manage wildlife	Risk to wildlife reduced	During construction	Project Ecologist
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Negligible	Negligible	No critical habitat is proposed for removal. No nest boxes or other artificial structures are proposed.	-	-	-
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	High	Low	Instigate clearing protocols to limit inadvertent clearing Retain dam and minimise dewatering	Clearing limited to only the areas approved for clearing. Foraging habitat retained in situ	Prior to construction and during operation	Contractor
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	High	Low	Erect and maintain erosion and sediment fence	Accidental incursions minimised	Before construction	Contractor
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Moderate	Low	No noise barriers proposed as noise will be limited to the current operational areas of the site and would be temporary (during construction). Only conduct clearing and operation of	Minimise noise disturbance to fauna and neighbouring communities.	During construction	Contractor

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			machinery inside of typical work hours			
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Low	Low	Consideration of directional and fauna sensitive lighting in the design of the building for use during operation. Conduct works during daylight hours.	Avoid light disturbance to nocturnal fauna	At design and during construction and operation	Architect Contractor
adaptive dust monitoring programs to control air quality	Moderate	Low	Implement industry practice controls of dust at bulk earth works sites	Dust impacts on adjacent habitats is minimised	Construction	Contractor
programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting	Moderate	Low	Avoid breeding trees for Powerful Owl (May – August).	Risk to Powerful Owl impact reduced	During construction and maintenance of APZ	Contractor
temporary fencing to protect significant environmental features such as riparian zones	High	Low	Erect and maintain construction fence	Accidental incursions minimised	Before and during construction	Contractor
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Low	Carry out site inductions to explain environmental significance of the study area	Accidental incursions minimised	Before and during construction	Contractor
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Moderate	Low	Carry out site inductions to explain environmental significance of the study area	Accidental incursions minimised	Before and during construction	Contractor
development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood	Moderate	Low	Relevant DCP conditions apply to the site to limit vegetation clearance	Reduce unnecessary clearing of vegetation post construction	Operation	Council Contractor

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
collection, fire management and disturbance to nests and other niche habitats			Implementation of a VMP to control activities such as rubbish dumping in the remnant forest			
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Moderate	Low	Implement ecological restoration, rehabilitation and ongoing maintenance compliant with the VMP proposed for the vegetation to be retained within and adjacent to the development site.	Ongoing commitment for restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat	Ongoing	Contractor

6.6. Mitigating prescribed impacts

The development does not have any prescribed biodiversity impacts.

6.7. Adaptive management strategy

No adaptive management strategy is proposed. The development would be subject to an industry standard Construction Environment Management Plan, Vegetation Management Plan and consent conditions regarding the removal of native vegetation.

7. Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

7.1. Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 23. Detailed consideration of whether impacts on TECs that are serious and irreversible is included in Table 24. Blue Gum High Forest has been identified as an SAII entity in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017) and within the BioNet database as an entity at risk of a serious and irreversible impact.

Table 23: Serious and Irreversible Impacts Summary

Species / Community	Principle	Direct impact individuals / area (ha)	Threshold
Blue Gum High Forest in the Sydney basin Bioregion	1, 2 and 3	1.04 ha	Not published.

Table 24: Evaluation of an impact on a TEC consistent with 9.1.1 of the BAM

Impact Assessment Provisions	Assessment
1. the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	Section 5 of this BDAR outlines actions taken to avoid and minimise impacts on these TECs. In general, the APZ for the proposed development will directly affect Blue Gum High Forest. However, to achieve APZ standards only the removal of exotic species in the understorey is proposed. No native vegetation is proposed for removal. The project has employed design features to reduce the size of the APZ from 2 to 1.04 ha and also to limit the clearing to the exotic understorey. An area of about 2.74 ha of Blue Gum High Forest in the development site has been avoided.
2a. evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	There is no clear data set that enables the analysis of extent reduction since 1970. The final determination for Blue Gum High Forest estimates that approximately 200 hectares of remnant Blue Gum High Forest remains (Tozer 2003). The distribution of the TEC is severely fragmented and comprises a series of small remnant patches all surrounded by urban development, the largest of which is 20 ha. The ecological community had a naturally restricted distribution, estimated as approximately 3,720 ha (NSW NPWS 2002). Its current extent amounts to less than 5 % of its original distribution.
2b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: **i. change in community structure** **ii. change in species composition** **iii. disruption of ecological processes**	The Final Determination for Blue Gum High Forest describes the reduction in extent, the loss of function due to fragmentation and reduced sizes of patches. The TEC in the IBRA sub-region and on the development site are subject to ongoing invasion by the manageable high threat weed *Lantana camara*. This species can suppress biotic processes such as seedling establishment, which in turn affects structural and species diversity.

Impact Assessment Provisions	Assessment
iv. invasion and establishment of exotic species **v. degradation of habitat, and** **vi. fragmentation of habitat**	The proposal would remove *Lantana camara* and other exotic species in the understorey and promote the re-establishment of native understorey species that align with the TEC as part of a VMP. The project would not further degrade or fragment the CEEC, and there is significant opportunity for the existing remnant to be improved via the implementation of the VMP.
2c. evidence of restricted geographic distribution (Principle 3, clause 6.7 (2) (c) BC Regulation), based on the TECs geographic range in NSW according to the: **i. extent of occurrence** **ii. area of occupancy, and** **iii. number of threat-defined locations.**	The Final Determination outlines that Blue Gum High Forest has a very highly restricted distribution with records of occurrence from LGAs of Lane Cove, Willoughby, Ku-ring-gai, Hornsby, Baulkham Hills, Ryde and Parramatta. The document does not describe threat defined locations. It is assumed given the fragmented and small patches that all locations are subject to threats.
2d. evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7 (2) (d) BC Regulation).	There is no evidence to suggest the CEEC cannot respond to active management.
3. Where the TBDC indicated that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in subsection 9.1.1(2), the assessor must record this in the BDAR or BCAR.	The TEC is not listed as data deficient.
4a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: **i. in hectares, and** **ii. as a percentage of the current geographic extent of the TEC in NSW.**	The area affected by this project is 1.04 ha. The extent of this community according to the Final Determination is approximately 200 ha. Therefore, this proposal affects about 0.52 % of the extent of the TEC in NSW. This community is only present in the Sydney Basin IBRA subregion.
4b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: **i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals** **ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:** **• distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and** **• estimated maximum dispersal distance for native flora species characteristic of the TEC, and** **• other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development** **iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the**	Within 500 m and in the study area 26.14 ha of Blue Gum High Forest remains. These patches are isolated and highly fragmented, surrounded by urban development. The proposed development would not affect the extent, connectivity of the community as only the weedy understorey of the existing community will be modified. Canopy species would be retained, and future recruitment of the canopy would be possible. Therefore, the average distances between patches would remain the same. The proposed development is unlikely to affect the dispersal of fauna species present or the plants. Pollen and seed would still be able to move from patch to patch, as would the likely bird and bat assemblage. There is not likely to be any resident fauna that would rely only on the understorey exotic vegetation to be removed. There was no known sedentary resident fauna. The vegetation integrity score for PCT 1237_poor Blue Gum high forest within the development site is 10.6. This score is derived from a composition score of 1.9, a structure score of 12.5 and a function score of 49.2. A breakdown of these scores is contained in Appendix C. These scores are low when compared to the benchmarks for PCT 1237 (Bionet Vegetation Classification, 2021). For example, the grass richness and cover were both zero, but the benchmark is 6

Impact Assessment Provisions	Assessment
relevant composition, structure and function condition scores for each vegetation zone.	and 7 respectively. Shrub richness was 1 but, the benchmark is 15. Tree richness was 2, but the benchmark is 9. Shrub cover was 0.2 but, the benchmark is 51. Tree cover was 25 but, the benchmark is 69. In summary, the Blue Gum High Forest is a simplified patch of large, dispersed trees lacking structure and floral diversity with a high level of weed invasion (High threat weed cover was 70.6).

7.2. Impacts requiring offsets

There are no impacts of the development that require offsets.

7.3. Impacts not requiring offsets

The impacts of the development not requiring offset for threatened species are outlined in Table 25, and native vegetation are outlined in Table 26 and shown on Figure 11.

Table 25: Impacts on threatened species and threatened species habitat that require offsets

Species	Common Name	Direct impact habitat (ha)	Rationale
Ninox strenua	Powerful Owl	0.85 ha	The VI score in the affected habitat was not reduced to zero and therefore no offset obligation was determined. All canopy species would be retained in the managed APZ.

Table 26: Impacts to native vegetation that do not require offsets

Vegetation Zone	PCT ID	PCT Name	Direct impact (ha)	Rationale
1	1237	*Sydney Blue Gum – Blackbutt – Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby plateau, Sydney Basin Bioregion*	1.04	The VI score was below the threshold requiring an offset. The threshold for a CEEC is greater than or equal to 15; the VI score for this vegetation zone was 10.6. Further, the implementation of a managed APZ results in the native species composition, structure and function not being adversely affected by the project.
Planted exotic/native Vegetation	N/A	N/A	0.23	The decision-making key for planted native vegetation outlined in Appendix D of BAM 2020 was reviewed and determined that the removal of planted native vegetation does not require offsets (see Section 3.2.1 of this BDAR)

7.4. Areas not requiring assessment

Areas not requiring assessment are shown on Figure 11. These are generally the hardstand areas, lawns and existing buildings.

7.5. Credit summary

The number of ecosystem credits required for the development are outlined in Table 27. The number of species credits required for the development are outlined in Table 28. A biodiversity credit report is included in Appendix G.

Table 27: Ecosystem credits required

Vegetation Zone	PCT ID	PCT Name	Credit Class	Direct impact (ha)	Credits required
1	1237	*Sydney Blue Gum – Blackbutt – Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby plateau, Sydney Basin Bioregion*	Blue Gum High Forest in the Sydney Basin Bioregion. This includes PCT 1237.	1.04 ha	0

Table 28: Species credit summary

Species	Common Name	Direct impact habitat (ha)	Credits required
Ninox strenua	Powerful Owl	0.85 ha	0

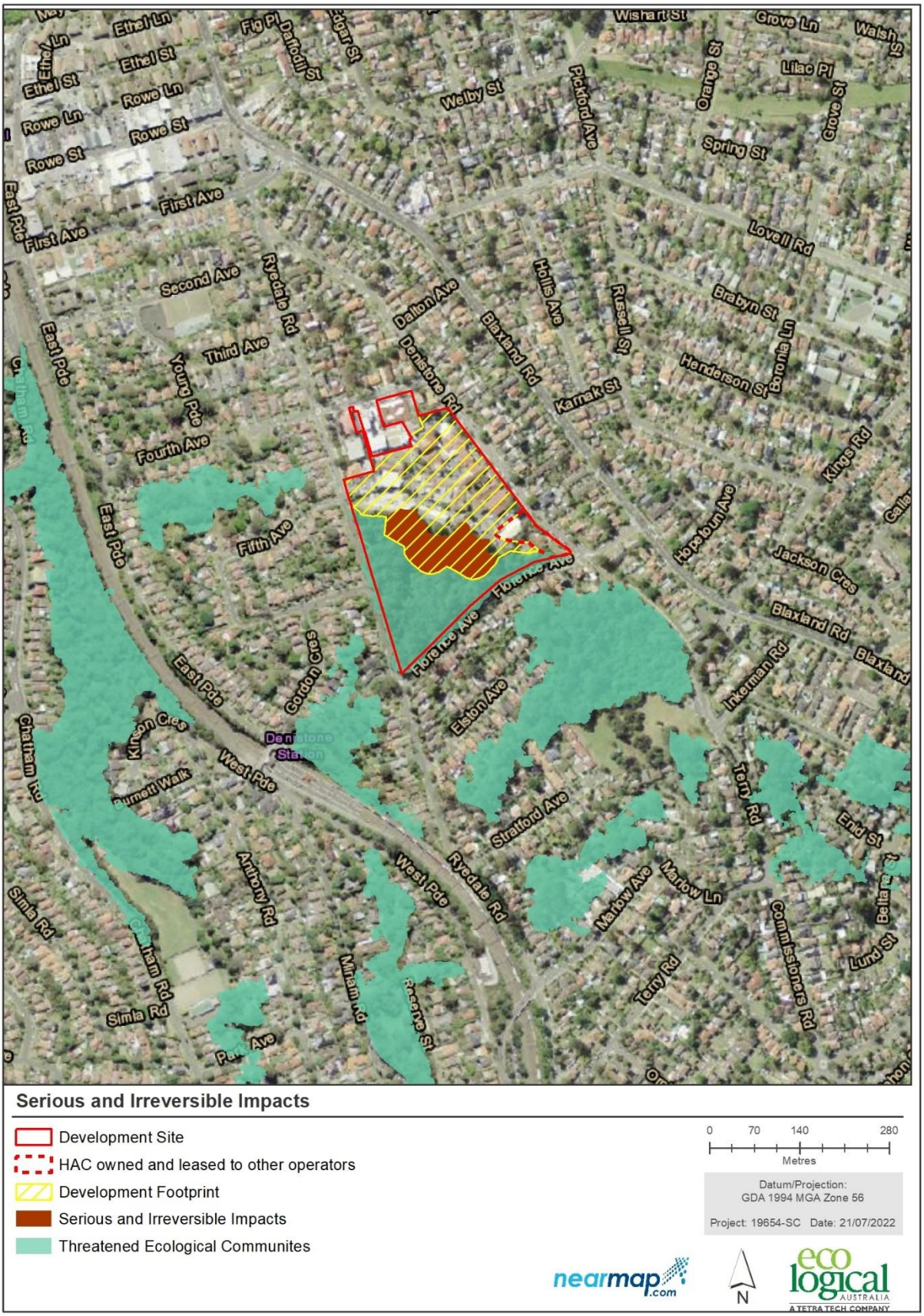

Figure 10: Serious and Irreversible Impacts

Figure 11: Impacts not requiring offset for impacts on the PCT, Powerful Owl habitat and planted native vegetation

Figure 12: Areas of exotic vegetation and hardstand not requiring assessment

8. Consistency with legislation and policy

8.1. Matters of National Environmental Significance

The critically endangered ecological community *Blue Gum High Forest in the Sydney Basin Bioregion* is a Matter of National Environmental Significance (MNES) that was present within the development site. The development site was also considered to contain foraging habitat for *Pteropus poliocephalus*, Grey-headed Flying Fox. The significant impact criteria were applied to these MNES and it was concluded that the project was unlikely to constitute a significant impact (Appendix G). A referral to the Commonwealth has been made and is number 2022/9191. A decision on the referral received on 28 June 2022 was that the proposed action is not controlled, therefore the Minister or their delegate considered the impacts to not be significant. There is no requirement to further assess the proposed action under the EPBC Act.

9. Conclusion

The proposed development involves the redevelopment of Ryde hospital and the implementation of associated APZs.

The development site comprised buildings of Ryde hospital and associated infrastructure and other health services. The southern section of the development site comprised of remnant native woodland that is heavily weed affected.

The development footprint would encompass the existing buildings for hospital infrastructure and would extend into the forest for the associated APZ. The project has responded to feedback and the ecological constraints, mostly being the presence of the critically endangered ecological community (CEEC), Blue Gum High Forest. This ecological community is listed under the BC Act and the EPBC Act. The proposed APZ has been developed to avoid and minimise impacts to the CEEC. By using existing hardstand, the project has largely avoided clearing of the CEEC, while the use of a performance solution to the fire hazard has reduced impacts to the community through avoidance of the community. Further, use of a sympathetic APZ design has minimised impacts on that community by retaining tree canopy and some elements of the understorey.

The project has avoided and minimised impacts as far as practical given the purpose and the position of the infrastructure in relation to the fire hazard. However, there is the requirement to prepare and maintain an APZ to protect patients, staff and other people using the facilities. These are unavoidable impacts, and therefore require offsetting. No ecosystem credits are required to offset these for unavoidable residual impacts to PCT 1237 Blue Gum High Forest.

It was assumed that the threatened Powerful Owl was present on the basis of numerous recent records, the presence of suitable habitat and prey items. This was supported by consultation with the Powerful Owl Project at Bird Life Australia. A species polygon was prepared and covers 0.85 ha of the managed APZ. Potential impacts to this species have been minimised by retaining all species in the canopy within the APZ. This has eliminated the requirement to provide offsets for the Powerful Owl.

The forested part of the development site would be subject to a VMP, which would also manage the APZ. The VMP would aim to improve the composition and structure of the retained forest.

10. References

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Appendix A Definitions

The following terminology has been used throughout this report for the purposes of describing the impacts of the proposal in the context of a biodiversity assessment in accordance with the NSW Biodiversity Assessment Method 2020. This terminology may or may not align with other technical documents associated with the proposed development.

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
Extent of occurrence (EOO)	Measures the spatial spread of a taxon to determine the degree to which risks from threatening factors could impact an entire population, and is not intended to be an estimate of the amount of occupied or potential habitat.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by DPIE, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site..
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Residual impact	An impact on biodiversity values after all reasonable measures have been taken to avoid, minimise or mitigate the impacts of development. Under the BAM, an offset requirement is determined for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by DPIE and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B Vegetation Floristic Plot Data

Family	Species	Common Name	Listing Status		ROTAP	Exotic	High Threat Weed	Growth Form Group	Plot 1		
									Stratum & Layer	Cover	Abundance
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum	,					Tree (TG)	U	25	7
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	,			*	1		M	60	50
Convolvulaceae	*Ipomoea indica*	Morning Glory	,			*	1		G	0.1	5
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	,			*	1		G	0.2	20
Verbenaceae	*Lantana camara*	Lantana	,			*	1		M	5	50
Sapindaceae	*Cardiospermum grandiflorum*	Balloon Vine	,			*	1		M	5	100
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	,					Shrub (SG)	M	0.2	5
Oleaceae	*Olea europaea subsp. cuspidata*	African Olive	,			*			G	0.1	1
Commelinaceae	*Tradescantia fluminensis*	Wandering Jew	,			*	1		G	0.1	1
Proteaceae	*Macadamia spp.*		,					Tree (TG)	G	0.1	1
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	,			*	1		G	0.1	1
Bignoniaceae	*Dolichandra unguis-cati*		,			*	1		G	0.1	20

Appendix C Vegetation Integrity Plot Data

Plot location

Plot	PCT	Condition	Zone	Easting	Northing	Orientation
1	1237	Poor	56	323125	6258739	78 °

Composition

Growth form groups	Total number of species	Total Cover				
Tree (TG)	2	25.1				
Forb (FG)	0	0.0				
Shrub (SG)	1	0.2				
Grass & grasslike (GG)	0	0.0				
Other (OG)	0	0.0				
Fern (EG)	0	0.0				
High Threat Weeds	8	70.6				
Litter sub plots		**5 m**	**15 m**	**25 m**	**35 m**	**45 m**
Litter cover %	74	90	50	40	90	100
Bare ground cover % (OPTIONAL)	0					
Cryptogam cover % (OPTIONAL)	0					
Rock cover % (OPTIONAL)	0					

Stem size classes	Number
5-6 cm	0
10-19 cm	1
20-29 cm	1
30-49 cm	1
50-79 cm	1
80 cm +	0
Number of large trees	0

Other Integrity Attributes	
Number of trees with hollows	1
Regeneration (stems <5 cm)	0
Total length fallen logs >10 cm width (m)	35

Appendix D Planted vegetation list

Species Name	Common Name	Weed	Urban Exotic Planting	Urban Native Planting
Acacia longifolia subsp. l*ongifolia*	Sydney Golden Wattle			x
Agapanthus praecox	African Lily		x	
Agave sp.	Agave		x	
Alstroemeria pulchella	Peruvian Lily	x		
Anredera cordifolia	Madeira Vine	x		
Archontophoenix cunninghamiana	Bangalow Palm			x
Banksia marginata	Silver Banksia			x
Banksia serrata	Old Man Banksia			x
Bidens pilosa	Cobbler's Pegs	x		
Bromus catharticus	Prairie Grass	x		
Buddleja davidii	Butterfly Bush		x	
Callistemon citrinus	Crimson Bottlebrush			x
Callistemon viminalis	Weeping Bottlebrush			x
Camellia sp.	Camellia		x	
Casuarina cunninghamiana subsp. *Cunningamhiana*	River Oak			x
Casuarina glauca	Swamp Oak			x
Cenchrus purpurascens	Swamp Foxtail			x
Cinnamomum camphora	Camphor Laurel		x	
Cirsium vulgare	Spear-thistle	x		
Conyza bonariensis	Flax-leaf Fleabane	x		
Cordyline sp.	Cordyline			x
Corymbia maculata	Spotted Gum			x
Cuppressus sp.			x	
Cyathea australis	Rough Tree-fern			x
Cyperus gracilis	Slende Flat-sedge			x
Dianella caerulea var. *producta*				x
Dichondra repens	Kidney Weed			x
Dietes sp.			x	
Digitaria sp.				x
Ehrharta erecta	Vasey Grass	x		
Elaeocarpus reticulatus	Blueberry Ash			x

Species Name	Common Name	Weed	Urban Exotic Planting	Urban Native Planting
Erigeron glaucus	Seaside Daisy		x	
Fraxinus sp.	Ash			x
Gardenia sp.	Gardenia			x
Grevillea robusta	Silky Oak			x
Hedera helix	English Ivy		x	
Hedychium gardnerianum	Ginger Lily		x	
Hydrangea sp.	Hydrangea		x	
Jacaranda mimosifolia	Jacaranda		x	
Lagerstroemia indica	Crepe Myrtle			x
Ligustrum lucidum	Large-leaf Privet	x		
Livistona australis	Cabbage Tree Palm			x
Lomandra longifolia	Spiny-headed Mat-rush			x
Lophostemon confertus	Brush Box			x
Macrozamia sp.	Marcozamia			x
Melaleuca quinquenervia	Broad-leaved Paperbark			x
Melaleuca stypheloides	Prickly-leaved Tea Tree			x
Monstera deliciosa	Fruit Salad Plant		x	
Murraya paniculata	Mock Orange			x
Nandina domestica	Japanese Sacred Bamboo		x	
Olea europaea subsp. Europaea	Olive		x	
Parsonsia straminea	Common Silkpod			x
Passiflora suberosa	Cork Passionflower	x		
Phoenix canariensis	Canary Island Date Palm		x	
Plumeria sp.	Frangipani		x	
Populus sp.	Populus		x	
Rhododendron sp.	Azalia		x	
Robinia pseudoacacia	Black Locust			x
Rosa sp.	Rose		x	
Salvia rosmarinus	Rosemary		x	
Schefflera actinophylla	Umbrella Tree			x
Solanum americanum	Glossy Nightshade			x
Solanum nigrum	Black-berry Nightshade			
Sonchus oleraceus	Common Sowthistle	x		
Stenocarpus sinuatus	Firewheel Tree			x

Species Name	Common Name	Weed	Urban Exotic Planting	Urban Native Planting
Stenotaphrum secundatum	Buffalo Grass		x	
Strelitzia sp.	Bird of Paradise		x	
Syncarpia glomulifera	Turpentine			x
Taraxacum officinale	Dandelion	x		
Westringia fruticosa	Coastal Rosemary			x
Wisteria sp.	Wisteria		x	

Appendix E Staff CVs

Alice Ridyard **GRADUATE ECOLOGIST**

Alice is a graduate ecologist who joined Eco Logical Australia in 2018. She completed a Bachelor of Science (Biology) at the University of Sydney and a Graduate Certificate in Ecologically Sustainable Development at TAFE NSW, gaining skills and knowledge in the areas of terrestrial ecology, zoology, environmental reporting and education.

Alice has been involved in a range of field-based projects, including and targeted flora and fauna surveys, on ground bush regeneration works and in contract management. Alice also has experience in community gardening/education, including designing and facilitating a curriculum-linked school garden sustainability program.

QUALIFICATIONS

- Graduate Certificate in Ecologically Sustainable Development
- Bachelor of Science (Biology)
- Statement of Attainment in Bush Regeneration
- White Card (General Construction Induction Card)
- First Aid Certificate (HLTAID009, HLTAID010, HLTAID011)
- Working with Children Check WWC1999280E

PROJECT EXPERIENCE

Targeted Fauna

- Pink-tailed Legless Lizard, Striped Legless Lizard, Booroolong Frog (Gundagai NSW)
- Dural Land Snail (Kenthurst NSW)
- Koala, Cumberland Land Snail (Hurlstone Agricultural High School NSW)
- Large Bent-winged Bat (Summer Hill and Ryde, NSW)
- Gang-gang Cockatoo and Glossy Black Cockatoo (Ryde Hospital NSW)

Targeted Flora

- *Hibbertia puberula* (Kenthurst NSW)
- *Prasophyllum fuscum, P. pallens, Boronia deanei, Caesium parviflora var. minor and Callistemon megalongensis* (Lawson NSW)

FFA/BAM

- Flora and fauna assessment (Cottage Point NSW)
- BAM Vegetation Integrity plots (Kenthurst NSW)
- BAM Vegetation Integrity plots (Hurlstone Agricultural High School NSW)
- Hollow bearing tree assessment (Mudgee NSW)

Bush Regeneration

- VMP implementation works in Cumberland Plain Woodland sites (primary and secondary weed control, maintenance works, seed collection and revegetation) (Greater Western Sydney, NSW)
- VMP implementation works in an Elderslie Banksia Scrub Forest biodiversity offset site (primary and secondary weed control, maintenance works, seed collection and revegetation) (Greater Western Sydney, NSW)

PREVIOUS EXPERIENCE

- Bird surveys (Wolli Creek, NSW)
- Grey-headed Flying-fox surveys (Wolli Creek, NSW)
- Bush regeneration (Wolli Creek, NSW)
- School Garden Environment and Sustainability Program, Term 2 2021, targeting stage 1 level (Canterbury Public School, NSW)

MEMBERSHIPS

- Wolli Creek Preservation Society

Nicole McVicar **SENIOR ECOLOGIST**

Nicole has worked as an ecologist for 15 years for both government and private industry. Nicole presently leads Biodiversity Assessment Method (BAM) projects within the Sydney metropolitan region and regional NSW. She has recently been the lead ecologist for the Humelink project, a 600 km high voltage transmission line extending from the Snowy Mountains, to Wagga Wagga, Yass and Taralga. Nicole has managing intensive remote botanical work, completing full floristic surveys for McArthur River Mine in the Northern Territory. Nicole is also commissioned annually as the lead botanist to undertake floristic survey and monitoring assessments in the Narrabri area for biodiversity offset and revegetation lands for Whitehaven Coal. Prior to working at ELA, Nicole worked for 7 years as a Senior Environmental Officer – Bushland at Warringah Council. In this role she has managed a range environmental projects with consultants, state government agencies and other stakeholders to produce and improve standards and procedures for bushland management across the region. She has also worked for the Northern Territory Parks and Wildlife Service and Manly Dam Reserve as a Park Ranger with experience ranging from remote landscape bush fire hazard reduction works, broad scale weed control, infrastructure maintenance, management of contractors and water quality management and track and trail management and construction

QUALIFICATIONS

- Accredited BAM Assessor BAAS 18077
- Bachelor of Environmental Science, Macquarie University
- Bush Regeneration Certificate II, Ryde TAFE

PROJECT EXPERIENCE

- 2021 – 2022 773 Putty Valley Road Biodiversity Stewardship Site Assessment – project manager, accredited BAM assessor and lead botanist
- 2019-2021 Humelink – lead botanist of transmission line BAM survey between Wagga, Tumbarumba, Tumut, Gundagai, Goulburn and Bannaby
- 2021 – Saddletop Wind Farm BAM Assessment – lead botanist
- 2021 – Berrigan Wind Farm BAM Assessment – lead botanist
- 2019-2021 – Maroota Sands Biodiversity Development Assessment Report - – project manager, accredited BAM assessor and lead botanist
- 2018- McArthur River Mine – Northern Territory – lead botanist annual long-term revegetation monitoring, rapid revegetation assessments and salinity monitoring
- 2017-2020 - Canyon Mine Monitoring – Boggabri – lead botanist
- 2017-2019 Tarrawonga Mine Monitoring - Boggabri – lead botanist
- 2017 – 2019 RocGlen Mine Monitoring Gunnedah - lead botanist
- 2017 - Kenna Offset Mine Monitoring - Narrabri South - lead botanist
- 2017 - Narrabri South Mine BAM assessment – lead botanist
- 2015-2017- Taralga Wind Farm Biobanking Assessment - lead botanist -Biobanking plot collection, management actions fieldwork and reporting

- 2016-2021- Biobank field assessment and reporting Jervis Bay Biocertification and Biobanking projects – lead botanist
- Northern Beaches Council Development Application Assessment – secondment to undertake assessment of biodiversity components of part 4 development applications
- Flora and Fauna Statement including Biobanking Feasibility Study – Belrose TAFE - lead ecologist
- Land and Environment Court Malnic vs Northern Beaches Council Case Number 2016/00383520 – Expert Witness researching, reporting and court attendance
- Biobank field assessment and reporting Jervis Bay Biocertification and Biobanking projects
- Glenhaven Retirement Village Expansion – Biobanking Assessment, Flora and Fauna Assessment and Vegetation Management Plan - lead ecologist
- Old Northern Road Maroota - Flora and Fauna Assessment (Sydney Turpentine Ironbark Forest Critically Endangered Ecological Community) - lead ecologist
- Targeted threatened species survey - *Acacia pubescens* and vegetation community validation – M5 Motorway
- Melrose Park South Structure Plan – Preliminary Ecological Assessment
- Targeted threatened species surveys – *Prostanthera marifolia* – OEH Saving Our Species program
- Biobank field assessment and management actions-Taralga Wind Farm
- Bexley Cable Bridge remediation Flora and Fauna Assessment
- Castle Hill Flora and Fauna Assessment – Sydney Turpentine Ironbark Forest in the Sydney Basin
- Assessment of proposed Biobank sites with Waitara Creek Bushland and Arcadia Park, Hornsby local government area – Biobank assessment fieldwork, condition mapping and costing
- Development and project management of Warringah Council's Bush Regeneration Costing Methodology project; a new council procedure to allow staff to use a standardised method of estimating costs/effort of bush regeneration projects
- Management of Warringah Council bushland restoration contracts and threatened species projects. This included management of an annual $1.2 million budget
- Co-ordination of Warringah Council's bush fire management program. This entailed all operational and strategic bush fire mitigation and planning works under the Bush Fire Risk Management Plan and NSW Rural Fires Act (RF Act)
- Project management, data collection and ecological monitoring of soil and threatened plant translocation projects, specifically Duffys Forest Endangered Ecological Community and *Grevillea caleyi*

Alex Gorey **SENIOR ECOLOGIST**

Alex is a Senior Ecologist who joined Eco Logical in 2016. Alex has 6 years' experience in ecological impact assessments, Biodiversity Certification, Biodiversity Assessment Method, EPBC Act approvals and compliance and ecological surveys. She has also completed the Biodiversity Assessment Method (BAM) training and is due to obtain her accreditation under the *Biodiversity Conservation Act 2016* (BC Act) within the coming weeks. Alex has experience in completing field survey consistent with the BAM and other survey guidelines, including vegetation stratification, full vegetation integrity plots and targeted survey for threatened fauna and flora.

Alex has extensive experience in liaising with a range of stakeholders and clients, and providing risk based and ecological advice for a range of projects, including assessments under the EPBC Act, Biodiversity Assessment Reports (Biodiversity Certification, Biodiversity Development Assessment Reports and Biodiversity Stewardship Agreement Sites). Alex is passionate about using technical field skills and knowledge to keep her clients well informed to encourage positive environmental outcomes.

QUALIFICATIONS

- Master of Sustainability: University of Sydney – 2015.
- Bachelor of Science: Double major in Environmental Science and Geography, University of Sydney – 2012.
- National OHS Construction Induction Training (White Card) – 2016.
- Lyssavirus Vaccinated December 2016.

PROJECT EXPERIENCE

IMPACT ASSESSMENTS AND BIODIVERSITY STEWARDSHIP AGREEMENT SITES

- Bingara Gorge Residential Subdivision – EPBC Act Assessment, BDAR and ongoing post approvals work including management of offset areas (Lendlease)
- Sussex Inlet Golf Village Residential Subdivision – Biodiversity Certification, Proposed Biodiversity Stewardship Agreement Site and numerous BDARs (Sheargold)
- Callala Bay Residential Subdivision – Biodiversity Certification Assessment (Sealark)
- Calderwood Valley Residential Subdivision – EPBC Act approval (Lendlease)
- Mt Gilead Residential Subdivision – EPBC Act approval, Biodiversity Certification Assessment, Biodiversity Stewardship Agreement (Lendlease)
- Berrigan Windfarm – EPBC referral and BDAR (CWP Renewables)
- Jeremiah Windfarm – EPBC referral (CWP renewables)
- Woodlands Estate Residential Subdivision – EPBC Referral, BDAR and Biodiversity Stewardship Agreement site (Jojeni Investment)
- Eastern Creek Business Hub – EPBC Referral, State Significant Development, post approvals management and VMP implementation (Frasers Property)
- Kellyville State Significant Development – EPBC Act referral (Landcom)
- Horsley Park Biodiversity Stewardship Agreement Site (CSR Building Products)

- Barkers Mill - Biodiversity and Riparian Assessment (Macarthur Developments)
- Canyonleigh – Flora and Fauna Assessment (Highlands Heavy Industries)
- Coalcliff - Flora and Fauna Assessment (Ingham Planning)
- Cromer – Flora and Fauna Assessment (Brewster Murray Architects)
- Elizabeth Macarthur Creek – Flora and Fauna Assessment (AECOM)
- Freemans Reach – Vegetation validation and targeted flora and fauna surveys (Celestino)
- Kingswood – Ecological Constraints Analysis
- Delhi Road Upgrade – Flora and Fauna Assessment
- Jacaranda Ponds – Rezoning Planning Proposal
- Oakdale – Constraints Analysis (Michael Brown Planning)
- Quakers Hill – Constraints Analysis (AECOM)
- Western Sydney Parklands Trust – Ecological Constraints Analysis
- Wollongong LGA– Review of Environmental Factors (Wollongong City Council)
- Calderwood Valley – Flora and Fauna Assessments and Ecological Constraints Analysis (Lendlease)
- Gregory Hills Sewer Pipeline - REF (Dart West Developments)
- Kogarah Sewer Pipeline - REF (Rose Atkins Rimmer Infrastructure)
- Camden Road Sewer Pipeline - REF (Rose Atkins Rimmer Infrastructure)
- Riverstone Sewer Pipeline – REF (Rose Atkins Rimmer Infrastructure)

FAUNA HANDLING AND CLEARANCE SUPERVISION

- Kellyville Residential subdivision – Dam Dewatering
- Mt Carmel – Hollow bearing tree clearance supervision (Western Earthmoving)
- Schofields – Hollow bearing tree clearance supervision (North Western Surveys)
- El Cabello Blanco Cumberland Plain Land Snail clearance survey (Cardno)
- Glenmore Park Cumberland Plain Land Snail clearance survey (CCL Developments)

THREATENED FAUNA MANAGEMENT PLANS

- Manooka Valley – Hollow Bearing Tree Assessment and Nest Box Installation Plan (Green Fields Development Company)
- Warrawong Green and Golden Bell Frog Management Plan (Kennards Self Storage)
- Riverstone Green and Golden Bell Frog Management Plan (Rose Atkins Rimmer Infrastructure)

TARGETED FAUNA SURVEY

- Mt Gilead – Targeted Microchiropteran bat surveys, frog surveys and squirrel glider surveys (Lend Lease)
- Glenarra - Targeted Squirrel Glider surveys
- Helensburgh – Targeted microbat surveys
- Jacaranda Ponds – Targeted Koala, microbat and forest owl survey
- Sydney Science Park – targeted migratory bird survey

PLOT DATA COLLECTION AND VEGETATION MONITORING

- Mt Gilead BioBanking Assessment

- Mt Brown BioBanking Assessment
- South Campbelltown Residential Subdivision
- Cawdor BioBanking Assessment
- Wambo Coalmine Peabody – Hunter Valley
- Rickards Road, Castlereagh – BioBanking Assessment

OTHER RELEVANT SKILLS

- Participated in 4-day Advanced Plant Identification Skills for Research and Environmental Assessment Course run by Belinda Pellow and David Keith, 2016.

Dr Julia Ryeland **ECOLOGICAL CONSULTANT**

Julia is an ecologist with 7 years' experience in ecological management and research. She has worked in both the public and private sector in NSW and VIC, with 4 years' experience leading ecological research and monitoring projects. Julia has primarily worked on fauna-based projects but has also undertaken floral community surveys, monitoring and restoration projects. Julia's main areas of expertise are:

- Planning and implementation of native and pest fauna management including surveys, distribution modelling and population size management for threatened species and vertebrate pests.
- Collection and analysis of genetic and animal movement data, for use in measures of abundance, population viability, population genetic structuring, parentage/relatedness and dispersal patterns.
- Stakeholder and community education and engagement.

Julia's strengths include strong interdisciplinary communication and engagement in ecological research and management, a high level of independent project planning, implementation and technical reporting and a sound scientific knowledge of ecological processes and communities.

QUALIFICATIONS

- PhD (Behavioural ecology and reproductive success of the emu in eastern Australia) - Western Sydney University (2021)
- BA of Environ. Science (Wildlife and Conservation Biology) (1st Class Hons) - Deakin University (2014)

PROJECT EXPERIENCE

PLANS OF MANAGMENT FOR DECLINING POPULATIONS

- Population genetics and management of northern rivers threatened emu population - Office of Environment and Heritage Save Our Species/ Wettenhall Environmental trust funded, NSW
- Feasibility study of establishing a captive breeding and population supplementation program for the emu population in the NSW North Coast Bioregion and Port Stephens Local Government Area - Report for Department Planning, Industry and Environment, NSW
- Species distribution modelling, projections of future range and population viability of emus across eastern Australia - Western Sydney University and Office of Environment and Heritage, NSW
- Experimental trials on the effects of light disturbance, noise disturbance and physical barriers on a Large Bent-winged Bat (*Miniopterus orianae oceanensis*) roost – Inner West Council, NSW
- Shorebird wetland usage and micro habitat requirements for thermoregulation – Deakin University, VIC

- Construction Microbat Management Plan – Inner West Council
- Microbat Surveys, Management Plan and Exclusion – Sydney Swans, NSW

FAUNA POPULATION CONTROL AND MONITORING

- Fox control program: design, implementation and program assessment (1080 baiting and trapping with follow up camera trapping) - Dandenong Ranges National Park and Yarra Ranges Shire Council, VIC
- Management plan for an isolated Eastern Grey Kangaroo population, including mapping of habitat use and potential dispersal pathways – Western Sydney University, NSW
- Urban macrofauna management, population control and health assessments - Eurofins Veterinary Research, NSW
- Planning and contractor supervision of rabbit warren removal in Lysterfield National Park - Parks Victoria
- Monitoring of multi-species mammal occurrence across a coastal habitat mosaic (inc. small and medium mammal trapping and spotlight surveys) - Deakin University

ECOLOGICAL VEGETATION MANAGEMENT AND RESTORATION

- Environmental constraints and Flora and Fauna Assessments, Blacktown City Council
- Bush regeneration and mapping of invasive plant species for local council and national parks - Forest to Foreshore and Parks Victoria, VIC
- Powerful owl habitat restoration and call-playback surveying throughout south eastern Victoria - Deakin University and Forest to Foreshore
- Ecological and fuel reduction burn implementation throughout Victoria - Parks Victoria

EDUCATION AND FACILITATION

- Lecturing and practical demonstration in ecology and environmental science undergraduate degrees - Western Sydney University
- Citizen science 'Emusat' program construction, volunteer induction and project supervision – Western Sydney University

OTHER RELEVANT TRAINING AND REQUIREMENTS

- Tranquilizer firearms, blow pipes and darts for the control of animals and feral pest certificate – Firearms Safety and Training Council, NSW
- Firearms licence NSW – NSW Firearms Registry
- Agricultural chemical users permit – Smith and Georg
- 1080 Pest bait licence – Federation Training
- Four-wheel drive operation – Advance Tafe
- Trim and cross-cutting chainsaw operation – Advance Tafe
- Basic wildfire awareness and fire-fighter accreditation – Dep. of Sustainability and Environment, VIC
- Construction induction training (white card) – Hazcon
- First aid, level two – CBD college
- Lyssavirus vaccination (2019)

SCIENTIFIC PUBLICATIONS

- **Ryeland, J.,** Magrath, M. and Weston, M. A. Interactions between time and temperature influence incubation in male Hooded Plovers *Thinornis rubricollis, Ibis.* In press

- **Ryeland, J.,** House, C.M., Umbers, K.D.L. and Spencer, R-J. Optimal clutch size and male incubation investment in the male only incubating emu, *Dromaius novaehollandiae. Behavioural Ecology and Sociobiology.* In press

- **Ryeland, J.,** Derham, T.D. and Spencer, R.J (2021). Past and future potential range changes in one of the last large vertebrates of the Australian continent, the emu *Dromaius novaehollandiae*. *Scientific Reports.*

- **Ryeland, J.,** Weston, M.A. and Symonds, M.R. (2020). The importance of wetland margin microhabitat mosaics; the case of shorebirds and thermoregulation. *Journal of Applied Ecology.* doi:10.1111/1365-2664.13769

- Rendall, A.R., *et al.* **Ryeland, J.,** and Weston, M.A. (2020). Taking the bait: The influence of bait type and microhabitat on detections of fauna by remote-sensing cameras in a coastal habitat mosaic. *Ecological Management & Restoration*

- **Ryeland, J**., Weston, M. A. and Symonds, M.R.E. (2019). Leg length and temperature determine the use of unipedal roosting in birds. *Avian Biology.* doi:10.1111/jav.02008

- Umbers, K. D., White, T. E., De Bona, S., Haff, T., **Ryeland, J**., Drinkwater, E., & Mappes, J. (2019). The protective value of a defensive display varies with the experience of wild predators. *Scientific Reports*, *9* (1), 463, doi:10.1038/s41598-018-36995-9

- **Ryeland, J.,** Weston, M.A. and Symonds, M.R. (2017) Bill size mediates behavioural thermoregulation in birds. *Functional Ecology*, *31* (4), pp.885-893. doi:10.1111/1365-2435.12814

- **Ryeland, J.,** Symonds, M.R. and Weston, M.A. (2017). Measurement techniques for curved shorebird bills: a comparison of low-tech and high-tech methods. *Wader Study*, *124* (1), pp.49-54. doi:10.18194/ws.00065

- Drinkwater, E., **Ryeland, J.,** Haff, T. and Umbers, K.D. (2017). A novel observation of food dunking in the Australian Magpie *Gymnorhina tibicen. Australian Field Ornithology*, *34*, p.95, doi.org/10.20938/afo34095097

Leura Kowald **ECOLOGIST**

Leura is an ecologist with over four years' experience in environmental consulting throughout NSW, joining the ELA team in early 2021. Leura is experienced providing support for a wide array of ecological projects and is competent undertaking various aspects such as background research, eco constraints mapping, field survey planning for biodiversity impact assessments and ecological reporting. She has also assisted in several field surveys undertaken to meet requirements under the Biodiversity Assessment Method (BAM) and the NSW Framework for Biodiversity Assessment (FBA), from which she has gained experience in data collection and data management for reporting.

Leura has experience across a variety of different project types, including major projects for state significant infrastructure, as well as linear rail and road projects. For these projects Leura has used her botanical knowledge to assist in undertaking BAM plots, identify Plant Community Types (PCT) and participate in threatened flora species surveys and threatened fauna species surveys.

Leura has assisted in the preparation of projects covering Environmental Impact Assessments, Environmental Impact Statements, Reviews of Environmental Factors, Preliminary Environmental Investigations, Preliminary Environmental Assessments, and biodiversity technical reports.

Key Skills:

- Project management
- Ecological impact assessments incl BDARs; Ecological Impact and Constraints Assessments
- Threatened species survey and monitoring
- Data management

QUALIFICATIONS

Bachelor of Arts and Science (Biodiversity and Physical Geography), University of New England, 2019

Certificate III Horticulture (Landscape), Ryde School of Horticulture, Northern Sydney Institute TAFE, 2010

CERTIFICATES AND LICENCES

- Work safely in the construction industry (White Card)
- First Aid (HLTAID009, HLTAID010, HLTAID011)
- Vaccinated (Lyssavirus, COVID-19, Influenza, Tetanus and Whooping Cough)
- Railway Industry workers card (RIW card)
- Chainsaw Safety / Chainsaw Operation (Maintain chainsaws, Trim and cut felled trees)
- Drivers Licence (Manual)
- Working With Children Check (WWCC)

PROJECT EXPERIENCE

FBA ASSESSMENTS

- Warragamba Dam Raising Proposal EIS (Environmental Impact Statement), Water NSW (2017-2020)

BAM ASSESSMENTS

- Lawson Residential Development BDAR, Deerubbin Aboriginal Land Council (2021)
- Humelink Biodiversity surveys, Aurecon on behalf of TransGrid (2021)
- Elysian Wind Farm EIS, Nimmitabel, Alinta Energy (2019-2020)
- Bathurst Second Circuit EIS, Bathurst Regional Council (2018-2020)
- Eurobodalla Southern Storage EIS, Eurobodalla Shire Council (2018)

REVIEW OF ENVIRONMENTAL FACTORS

- Detailed Design Four Bridges, Review of Environmental Factors, NSW Hilltops Council (2020)
- Wyee Track Drainage, Review of Environmental Factors, NSW Sydney Trains (2020)
- Garfield Road East Upgrades, Review of Environmental Factors, NSW TfNSW (2020)
- Port Waratah Reconfiguration, Review of Environmental Factors, NSW ARTC (2019-2020)
- Nowra Bridge Preferred Option, NSW Roads and Maritime Services (2018-2019)
- Austral-Leppington Stormwater Infrastructure, Review of Environmental Factors, NSW Liverpool City Council (2018)

BIODIVERSITY TECHNICAL REPORTS AND FLORA AND FAUNA ASSESSMENTS

- Jilliby Housing Development FFA, Wales and Associates (2022)
- Bungendore Oz Tag and Amenities FFA, Hindmarsh (2021)
- Bingara Gorge, New Oval Road Koala surveys, Bingara Gorge Developments (2021)
- Deerubbin Strategic Biocert Assessment, DLALC (2021)
- Liverpool School NLPS Upgrades, ADCO Constructions (2021)
- Lilyfield Skate Park, Leichardt, SJB Planning (2021)
- Perry Park Upgrades, Aspect Studios (2021)
- Four Bridges Road Upgrade, Hilltops Council (2020)
- Manns Road Upgrade, TfNSW (2020)
- Bywong Subdivision, confidential client (2020)
- Wyee Rail Upgrade, TfNSW (2019)
- Heathcote Road upgrade, NSW Roads and Maritime Services (2018-2019)
- Golden Highway Upgrade, NSW Roads and Maritime Services (2018-2019)

PRELIMINARY ENVIRONMENTAL INVESTIGATION AND CONSTRAINT'S ASSESSMENTS

- Argylle Estate, LAHC (2022)
- Macquarie Park TARP Talavera Road, TfNSW (2021)
- Malabar Headland Walking Track upgrade, Tests of Significance, NPWS (2021)
- West Gables feasibility study, Stockland (2021)
- Werombi subdivision DA, private client (2021)
- Hungry Point Cliff Top Walk, Cronulla, Sutherland Shire Council (2021)

- FutureRail MTMS – multiple projects across Georges River Council LGA; Sutherland Shire Council LGA; Liverpool Council LGA; City of Shoalhaven LGA and Kiama Council LGA, TfNSW (2019-2020)
- Elysian Wind Energy, Preliminary Environmental Assessment, NSW Elysian Wind Farm Holdings Pty Ltd (2019)
- Outer Newcastle Study, NSW Roads and Maritime Services (2018)

SITE SERVICES MONITORING PROGRAMS

- Googong Recycled Water Program, Queanbeyan-Palerang Regional Council (2020)
- Eurobodalla Southern Storage (Baseline), Eurobodalla Shire Council (2019-2020)
- Bargo and Warragamba Waste Management Centres (Licence), Wollondilly Shire (2017 & 2020)

ECOLOGICAL MONITORING

- Dargues Gold Mine, Braidwood (2022)
- Microbat survey and exclusion; Sydney Fish Markets (2021)
- Floristic surveys and population monitoring of long-term monitoring plots within upland swamps and riparian communities, Metropolitan Colliery, Helensburgh (2021)
- Little Tern Monitoring, Towra Point, NPWS (2021)
- Ecological Research, Aquatic Ecology, Flora Surveys, Camera Trap, UWICER, Bhumtang Bhutan (2017)
- Turtle Monitoring Cemetery Beach, Port Hedland WA. Care for Hedland (2016)
- Fire Ecology in Namadgi National Park, ACT, ANU (2017)
- Noisy Minor research, Kyogle, NSW. UNE (2017)

CONSTRUCTION ENVIRONMENTAL MANAGEMENT

- Cabramatta Rail Upgrades Pre-clearence survey, Fulton Hogan (2022)
- Chatswood High School Powerful Owl supervision (2021)
- Aldenham Road, Warnervale subdivision pre-clearance and clearance supervision (2021)
- Newnes Plateau Pre-clearance supervision & preliminary assessment, Milsearch (2021)
- Prospect Highway Upgrade Pre-clearance supervision, Fulton Hogan (2021-2022)
- Harkness Road, Oakville Pre-clearance and Clearence supervision, Enviro Manage Systems (2021)
- Leppington, Willowdale Drive Sports field Clearence supervision, WesternEarth Moving (2021)
- Vineyard, Commercial Road Pre-Clearence report and tree survey, Rankine Consulting (2021)

Appendix F Likelihood of Occurrence Assessment

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the EPBC database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- 'known' = the species was or has been observed on the site
- 'likely' = a medium to high probability that a species uses the site
- 'potential' = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- 'unlikely' = a very low to low probability that a species uses the site
- 'no' = habitat within the study area and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species or ecological communities that were recorded within the study area or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, a test of significance in reference to State or Commonwealth legislation was not considered necessary.

The records column refers to the number of records occurring within 5 km of the study area, as provided by the Atlas of NSW Wildlife (BioNet) and Protected Matters Search Tool database search.

Scientific Name	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Habitat on site directly or indirectly affected	Impact Assessment Required
THREATENED ECOLOGICAL COMMUNITIES					
Blue Gum High Forest of the Sydney Basin Bioregion	**CE**	**The Blue Gum High Forest ecological community listed under the EPBC Act is limited to the Ku-ring-gai, Hornsby and Baulkham Hills local government areas. Occurs mainly in areas with deep clay soil derived from shale, generally at altitudes greater than 100 m above sea level, and that have an annual rainfall of more than 1050 mm. Also known to occur in isolated valleys on soils associated with localised volcanic intrusions.**	**Yes - this community was identified in the southern portion of the development site during field survey.**	**Yes**	**Yes**
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	E	Sydney Basin Bioregion, mostly in the Cumberland IBRA sub-region, with small occurrences in the Sydney Cataract, Wollemi and Burragorang sub-regions. It occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon." "Occurs primarily on Tertiary sands and gravels of the Hawkesbury-Nepean river system. At Agnes Banks it primarily occurs on aeolian (wind-blown) sands overlying Tertiary alluvium. Found on flat or gently undulating terrain in rain shadow areas typically receiving 700–900mm annual rainfall. The ecological community occurs primarily at low elevations up to 80m above sea level (ASL), including old ridges, dunes and terraces.	No - this community was not identified within the site during field survey.	No	No
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	E	The ecological community occurs in coastal catchments, mostly at elevations of less than 20 m above sea-level (ASL) that are typically found within 30 km of the coast. However, this distance varies by catchment; for example, low elevations can occur as far as 40 km inland on the Hawkesbury River, or more than 100 km on the Clarence River. On the mid and north coast of NSW the ecological community may also occur up to 50 m ASL on floodplains of, or coastland flats associated with, former or current coastal river systems. Coastal Swamp Oak Forest typically occurs on unconsolidated sediments, including alluvium deposits, and where soils formed during the Quaternary period as a result of sea-level rise during the Holocene period	No - this community was not identified within the site during field survey.	No	No

Scientific Name	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Habitat on site directly or indirectly affected	Impact Assessment Required
		(Sloss et al., 2007). These are most typically hydrosols, which are saturated with water for long periods of time (typically grey-black clay-loam and/or sandy loam soils). The ecological community can also occur on organosols (peaty soils). Occurrences of swamp oak trees on rocky headlands or other consolidated substrates are not considered to be a part of the ecological community, but areas where soils transition into unconsolidated sediments may contain the ecological community.			
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland Coastal Upland Swamps in the Sydney Basin Bioregion	E	Coastal Swamp Sclerophyll Forests occur on the mainland plus islands within 20 km of the coastline from south-east Queensland to eastern Victoria, specifically within the South Eastern Queensland (SEQ), NSW North Coast (NNC), Sydney Basin (SYB), South East Corner (SEC), and South East Coastal Plain (SCP) Bioregions. Coastal Swamp Sclerophyll Forests are typically found on a wide range of soils that are waterlogged or intermittently to episodically inundated.	No - this community was not identified within the site during field survey.	N/A	No
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	CE	Cooks River/Castlereagh Ironbark Forest of the Sydney Basin ecological community is endemic to NSW, within the Cumberland subregion of the Sydney Basin Bioregion as defined by version 7 of the Interim Biogeographic Regionalisation of Australia (IBRA v 7, 2012). The majority of the community is found in the north-west section of the Cumberland Subregion in the Castlereagh area between Penrith and Richmond. Other significant patches occur in the Kemps Creek and Holsworthy areas. Smaller remnants occur in the eastern section of the Cumberland Subregion (e.g. upper Cooks River Valley) The community occurs on clay-rich soils derived from predominantly Tertiary alluvium and on Wianamatta Shale derived soils found next to Tertiary alluvium (NSW NPWS, 2002; Tozer, 2003; NSW Scientific Committee, 2011). Tertiary Alluvium deposits produce less fertile gravelly clay loam soils than the surrounding shales (Tozer et al., 2010). To a lesser extent, the ecological community also occurs on Holocene Alluvium (NSW NPWS, 2002).	No - this community was not identified within the site during field survey.	N/A	No

Scientific Name	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Habitat on site directly or indirectly affected	Impact Assessment Required
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	CE	The ecological community occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans. Floodplains may be occasionally or more often saturated, water-logged or inundated. The ecological community is typically found below 50 metres above sea-level (m ASL), although it can occur up to 250 m ASL (e.g. on floodplain pockets and plateaus above nick points).	No - this community was not identified within the site during field survey.	N/A	No
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	CE	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Intergrade between clay soils from the shale rock and earthy and sandy soils from sandstone, or where shale caps overlay sandstone.	No - this community was not identified within the site during field survey.	N/A	No
Subtropical and Temperate Coastal Saltmarsh	V	Within a relatively narrow margin of the Australian coastline, within the subtropical and temperate climatic zones south of the South-east Queensland IBRA bioregion. Typically restricted to the upper intertidal environment; mainly associated with the soft substrate shores of estuaries and embayments (sandy and/or muddy) and on some open, low wave energy coasts).	No - this community was not identified within the site during field survey.	N/A	No
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	CE	Cumberland Lowlands, with remnants also occurring to the west on shale-capped ridges in the Blue Mountains. Restricted to areas with clay soil derived from Wianamatta Shale in an area that generally has an annual rainfall of more than 950 mm.	No - this community was not identified within the site during field survey.	N/A	No
Western Sydney Dry Rainforest and Moist Woodland on Shale	CE	Cumberland Plain Sub-region of the Sydney Basin Bioregion. "It generally occurs in rugged terrain and other patches may occur on undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically occupying upper sections of the slope Occurs almost exclusively on clay soils derived from Wiannamatta Group shales.	No - this community was not identified within the site during field survey.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
FAUNA							
Actitis hypoleucos	Common Sandpiper	M	Summer migrant. In NSW, widespread along coastline and also occurs in many areas inland.	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	Unlikely - suitable habitat not identified within the site.	N/A	No
Anthochaera phrygia	Regent Honeyeater	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana (*River Oak).	Unlikely - suitable habitat not identified within the site.	N/A	No
Apus pacificus	Fork-tailed Swift	M	Recorded in all regions of NSW.	Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris acuminata	Sharp-tailed Sandpiper	M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the	Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
			south-central Western Plain and east Lower Western Regions.				
Calidris canutus	Red Knot	E, M	Summer migrant to Australia. In NSW, widespread in suitable habitat along the coast. Occasionally recorded inland in all regions.	Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris ferruginea	Curlew Sandpiper	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin.	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris melanotos	Pectoral Sandpiper	M	Summer migrant to Australia. Widespread but scattered in NSW. East of the Great Divide, recorded from Casino and Ballina, south to Ulladulla. West of the Great Divide, widespread in the Riverina and Lower Western regions.	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris ruficollis	Red-necked Stint	M	Summer migrant to Australia, widespread coastal and inland NSW.	Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, saltfields, sewage ponds.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
Calidris tenuirostris	Great Knot	CE, M	In NSW, recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith.	Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Unlikely - suitable habitat not identified within the site.	N/A	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely - suitable habitat not identified within the site.	N/A	No
Charadrius leschenaultii	Greater Sand-plover	V, M	In NSW, recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries.	Almost entirely restricted to coastal areas in NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely - suitable habitat not identified within the site.	N/A	No
Charadrius mongolus	Lesser Sand-plover	E, M	Summer migrant to Australia. Found around the entire coast but in NSW most common on north coast. Rarely recorded south of the Shoalhaven estuary, and there are few inland records.	Almost entirely coastal in NSW, using sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats, sandy beaches, coral reefs and rock platforms.	Unlikely - suitable habitat not identified within the site.	N/A	No
Chlidonias leucopterus	White-winged Black Tern	M	Summer migrant. Found in coastal and sub-coastal NSW, and at times well inland.	Large coastal and inland wetlands, saltfields, tidal estuaries, lagoons, grassy swamps, and sewage ponds.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
Dasyornis brachypterus	Eastern Bristlebird	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border.	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	Unlikely - suitable habitat not identified within the site.	N/A	No
Dasyurus maculatus	Spotted-tailed Quoll	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld.	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely - suitable habitat not identified within the site.	N/A	No
Gallinago hardwickii	Latham's Snipe	M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW.	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Grantiella picta	Painted Honeyeater	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas.	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
Heleioporus australiacus	Giant Burrowing Frog	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely - suitable habitat not identified within the site.	N/A	No
Hirundapus caudacutus	White-throated Needletail	M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide.	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Unlikely - suitable habitat not identified within the site.	N/A	No
Hoplocephalus bungaroides	Broad-headed Snake	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney.	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Hydroprogne caspia	Caspian Tern	M	Widespread in coastal and inland NSW.	Coastal offshore waters, beaches, mudflats, estuaries, rivers, lakes.	Unlikely - suitable habitat not identified within the site.	N/A	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River.	Heath or open forest with a heathy understorey on sandy or friable soils.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
Lathamus discolor	Swift Parrot	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.	Box-ironbark forests and woodlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Limicola falcinellus	Broad-billed Sandpiper	M	Occur occasionally on the southern Australian coast. In NSW, mainly recorded in Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW.	Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	Unlikely - suitable habitat not identified within the site.	N/A	No
Limosa lapponica	Bar-tailed Godwit	M	Summer migrant to Australia. Widespread along the coast of NSW, including the offshore islands. Also numerous scattered inland records.	Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	Unlikely - suitable habitat not identified within the site.	N/A	No
Limosa limosa	Black-tailed Godwit	M	Arrives in August and leaves in March. In NSW, most frequently recorded at Kooragang Island, with occasional records elsewhere along the coast, and inland in the Murray-Darling Basin, on the western slopes of	Usually sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found around muddy lakes and swamps.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
			the Northern Tablelands and in the far north-western corner of the state.				
Litoria aurea	Green and Golden Bell Frog	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region.	Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or *Eleocharis* spp. (spikerushes). Some populations occur in highly disturbed areas.	Unlikely - suitable habitat not identified within the site.	N/A	No
Mixophyes balbus	Stuttering Frog	V	Along the east coast of Australia from southern Qld to north-eastern Victoria.	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Unlikely - suitable habitat not identified within the site.	N/A	No
Monarcha melanopsis	Black-faced Monarch	M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland.	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Unlikely - suitable habitat not identified within the site.	N/A	No
Motacilla flava	Yellow Wagtail	M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA.	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
Myiagra cyanoleuca	Satin Flycatcher	M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains.	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely - suitable habitat not identified within the site.	N/A	No
Numenius madagascariensis	Eastern Curlew	CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records.	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Unlikely - suitable habitat not identified within the site.	N/A	No
Numenius minutus	Little Curlew	M	Summer migrant to Australia. In NSW, most records scattered east of the Great Dividing Range, from Casino, south to Greenwell Point with a few scattered records west of the Great Dividing Range.	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	Unlikely - suitable habitat not identified within the site.	N/A	No
Numenius phaeopus	Whimbrel	M	Summer migrant to Australia. Found along almost the entire coast of NSW; scattered inland records.	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, grasslands, sports fields, lawns.	Unlikely - suitable habitat not identified within the site.	N/A	No
Petauroides volans	Greater Glider population in the Eurobodalla local government area	V	This population on the south coast of NSW is bounded by the Moruya River to the north, Coila Lake to the south and the Princes Highway and cleared land	Eucalypt forests and woodlands.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
			exceeding 700 m in width to the west.				
Petrogale penicillata	Brush-tailed Rock-wallaby	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit.	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Unlikely - suitable habitat not identified within the site.	N/A	No
Phascolarctos cinereus	Koala	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests.	Unlikely – no feed trees present/ suitable habitat not identified within the site.	N/A	No
Philomachus pugnax	Ruff	M	Regular but rare summer migrant to Australia. In NSW, recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek. Also found around the Riverina, including Windouran Swamp, Wanganella, Fivebough Swamo and the Tullakool Saltworks.	Terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. Occasionally harbours, estuaries, seashores, sewage farms and saltworks.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pluvialis fulva	Pacific Golden Plover	M	Regular widespread summer migrant to Australia, including coastal NSW, Lord Howe and Norfolk Island.	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly affected (Yes/No)	Impact Assessment Required
Pseudomys novaehollandiae	New Holland Mouse	V	Fragmented distribution across eastern NSW.	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V**	**Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.**	**Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.**	**Likely – seasonal foraging habitat available within the study area. No camps identified within development site.**	**Yes**	**Yes**

Key: M = Migratory, CE = Critically Endangered, E = Endangered, V = Vulnerable

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
FLORA							
Acacia bynoeana	Bynoe's Wattle	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains.	Heath or dry sclerophyll forest on sandy soils.	Unlikely - suitable habitat not identified within the site.	N/A	No
Acacia pubescens	Downy Wattle	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	Unlikely - suitable habitat not identified within the site.	N/A	No
Acacia terminalis subsp. Eastern Sydney	Sunshine Wattle	E	Limited mainly to near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay.	Coastal scrub and dry sclerophyll woodland on sandy soils.	Unlikely - suitable habitat not identified within the site.	N/A	No
Allocasuarina glareicola		E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	Unlikely - suitable habitat not identified within the site.	N/A	No
Asterolasia elegans		E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government	Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys.	Unlikely - suitable habitat not	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
			areas. Also likely to occur in the western part of Gosford local government area.		identified within the site.		
Caladenia tessellata	Thick Lip Spider Orchid	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast.	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	Unlikely - suitable habitat not identified within the site.	N/A	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton.	Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	Unlikely - suitable habitat not identified within the site.	N/A	No
Darwinia biflora		V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas, in an area bounded by Maroota, North Ryde, Cowan and Kellyville.	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Deyeuxia appressa		E	NSW endemic known only from two pre-1942 records in the Sydney area: Herne Bay south of Bankstown and Killara, near Hornsby.	Moist conditions.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
Epacris sparsa	Sparse Heath	V	Restricted to the lower Grose River, within the Hawkesbury and Blue Mountains LGAs.	Riparian Sandstone Scrub, on the base of cliffs or rock faces, on rock ledges or among rocks in the riparian flood zone. Also pockets of damp clay soil, chiefly on south-west facing slopes.	Unlikely - suitable habitat not identified within the site.	N/A	No
Eucalyptus camfieldii	Camfield's Stringybark	V	Narrow band from the Raymond Terrace area south to Waterfall.	Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	Unlikely - suitable habitat not identified within the site.	N/A	No
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	New England Tablelands from Nundle to north of Tenterfield.	Dry grassy woodland, on shallow soils of slopes and ridges.	Unlikely - suitable habitat not identified within the site.	N/A	No
Genoplesium baueri	Bauer's Midge Orchid	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens.	Dry sclerophyll forest and moss gardens over sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Haloragodendron lucasii		E	Confined to a very narrow distribution on the north shore of Sydney.	Dry sclerophyll forest and low open woodland on sheltered slopes near creeks, in moist sandy loam soils.	Unlikely - suitable habitat not identified within the site.	N/A	No
Hibbertia spanantha	Julian's Hibbertia	CE	Endemic to NSW where it is restricted to three locations.	Grows in forest with canopy species including Eucalyptus pilularis, E. resinifera, Corymbia gummifera and	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
			Currently only known from around Sydney.	Angophora costata. The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. Flowering in October and November, but with an odd flower throughout the year. The soil is identified as a light clay occuring on a shale sandstone soil transition.			
Lasiopetalum joyceae		V	Restricted to the Hornsby Plateau south of the Hawkesbury River, between Berrilee and Duffys Forest.	Heath on lateritic to shaley ridgetops over sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Leptospermum deanei		V	Hornsby, Warringah, Ku-ring-gai and Ryde LGAs in the Sydney region.	Woodland, riparian scrub and open forest on lower hill slopes or near creeks, on sand or sandy alluvial soil.	Unlikely - suitable habitat not identified within the site.	N/A	No
Macadamia integrifolia	Macadamia Nut	V	Not known to occur naturally in the wild in NSW; recorded from Camden Haven but it is not known if the tree was cultivated or growing naturally.	Drier subtropical rainforest.	Unlikely - suitable habitat not identified within the site.	N/A	No
Melaleuca biconvexa	Biconvex Paperbark	V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Damp places, often near streams or low-lying areas on alluvial soils.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
Melaleuca deanei	Deane's Paperbark	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.	Heath on sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Persicaria elatior	Tall Knotweed	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests).	Beside streams and lakes, swamp forest or disturbed areas.	Unlikely - suitable habitat not identified within the site.	N/A	No
Persoonia hirsuta	Hairy Geebung	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west.	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pimelea curviflora var. *curviflora*		V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south.	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
Pimelea spicata	Spiked Rice-flower	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama).	Well-structured clay soils. *Eucalyptus moluccana* (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pomaderris brunnea	Brown Pomaderris	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands.	Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely - suitable habitat not identified within the site.	N/A	No
Prostanthera densa	Villous Mint-bush	V	Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay).	Sclerophyll forest and shrubland on coastal headlands and near-coastal ranges, chiefly on sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pterostylis saxicola	Sydney Plains Greenhood	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south.	Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	Unlikely - suitable habitat not identified within the site.	N/A	No
Rhizanthella slateri	Rhizanthella slateri (Rupp) M.A. Clem. & Cribb in the	E	The population occurs near Bulahdelah (within the Great Lakes LGA).	Sclerophyll forest in shallow to deep loams.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
	Great Lakes local government area						
Rhizanthella slateri	Eastern Australian Underground Orchid	E	In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Sclerophyll forest in shallow to deep loams.	Unlikely - suitable habitat not identified within the site.	N/A	No
Rhodamnia rubescens	Scrub Turpentine	CE	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of R. rubescens typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm.	• Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Unlikely - suitable habitat not identified within the site.	N/A	No
Syzygium paniculatum	Magenta Lilly Pilly	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	• Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thesium australe	Austral Toadflax	V	In eastern NSW it is found in very small populations scattered along the coast, and from the	• Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely - suitable habitat not	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat on site directly or indirectly impacted (Yes/No)	Impact Assessment Required
			Northern to Southern Tablelands.		identified within the site.		

Key: CE = Critically Endangered, E = Endangered, V = Vulnerable

Appendix G Significant Impact Assessments for MNES

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World heritage properties
- National heritage places
- Nuclear actions.

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as critically endangered, endangered and vulnerable under the EPBC Act. The following matter of NES was assessed:

- *Blue Gum High Forest of the Sydney Basin Bioregion.*
- Grey-headed Flying-fox

Blue Gum High Forest of the Sydney Basin Bioregion

Criterion a: reduce the extent of an ecological community

The proposed action would not reduce the extent of the woodland community, rather it would involve modification and maintaining the understorey of the existing woodland that is heavily dominated by exotic species to create an APZ for the proposed action. Replanting (to APZ standards) will likely be undertaken within development site with species characteristic of the with Blue Gum High Forest community. The modification of the community for the APZ would occur over about 1.04 ha, with the remaining part of the patch (about 2.8 ha) to be improved and managed via the implementation of a VMP.

Criterion b: fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

The proposed development would not increase fragmentation of the ecological community. The existing canopy will remain intact while the weedy understorey will be removed and maintained for an APZ across about 1.04 ha. The remaining 2.76 ha would be subject to a VMP which aims to improve the structure and function of the community.

Criterion c: adversely affect habitat critical to the survival of an ecological community

The proposed impact to the ecological community involves the removal of exotic species within the action area. Characteristic features of the ecological community such as the native canopy will remain. The proposed action does adversely affect habitat critical to the survival of the ecological community.

Criterion d: modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The proposed action would not modify or destroy abiotic factors necessary for a community's survival. The proposed action would not alter the landform within areas of existing vegetation, alter the surface water patterns or reduce ground water. The community is known from relatively fertile and deep soils, but these would not be removed, or altered as part of the proposed action.

Criterion e: cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

There will not be a substantial change in the species composition, or loss of functionally important species. Rather, the proposed action would intentionally retain characteristic tree species in the canopy and representative species in the understorey, consistent with the design of the APZ. Generally only exotic species are proposed for removal. Functionally important species of the ecological community will remain intact where possible. No regular burning or harvesting of any species part of the community is proposed.

Criterion f: cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or

The proposed action would not be likely to introduce a species or assemblage of species that would invade the community to be retained, rather it would aim to eradicate existing invasive species that dominate the areas of vegetation on the development site under the implementation of a VMP.

The vegetation rehabilitation and APZ management will be undertaken under a Vegetation management Plan VMP which will ensure the correct use and management of herbicides and other potential pollutants. Construction pollutants for the proposed development will be managed under a CEMP.

Criterion g: interfere with the recovery of an ecological community

The proposed underscrubbing and maintenance of vegetation, targeting exotic species present within the ecological community will not likely interfere with the recovery of the community. The vegetation to be retained adjacent to the development site will be managed under a VMP which will aim to rehabilitate the degraded woodland and aim to increase the recovery of the ecological community.

Conclusion

The proposed development is not likely to cause a significant impact on the threatened ecological community, *Blue Gum High Forest of the Sydney Basin Bioregion*.

Pteropus poliocephalus* (*Grey-headed Flying-fox)

Pteropus poliocephalus (Grey-headed Flying-fox) is listed as a vulnerable species under the EPBC Act. This species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).

This species was not recorded within the proposal area during field survey but, has been recorded within five kilometres of the proposal area. It is unlikely that this species would use this site for roosting, but it does represent potential foraging habitat. The nearest flying-fox camp is located approximately 8 km northeast of the study area at Gordon within Stoney Creek forested area. The latest count for this camp in November 2019 estimated a population of up to 49,999.

Criterion a: Lead to a long-term decrease in the size of an important population of a species

An important population is defined as a population that is necessary for a species' long-term survival and recovery (DoE 2013). The GHFF is one population that intermixes up and down the east coast, therefore any bat population is a meta-population of this one "important population". Under the proposed action the weedy understorey of 1.04 hectares of woodland would be removed. No tree removal is proposed therefore the main foraging habitat of the site being the canopy containing flowering eucalypts will remain. The modification of the potential foraging habitat would therefore not lead to the long-term decrease in size of an important population of GHFF.

Criterion b: Reduce the area of occupancy of an important population

The distribution of the GHFF extends from Bundaberg in Queensland to Melbourne, Victoria and from the coast inland to the western slopes of New South Wales. The removal of potential foraging habitat from the proposal area would not reduce the area of occupancy of an important population of GHFF.

Criterion c: Fragment an existing important population into two or more populations

The GHFF is a highly mobile species and forms one large intermixing population along the east Australian coast. No roosting habitat would be affected and large areas of foraging habitat are present in the region. The proposed action would not fragment an existing important population into two or more populations.

Criterion d: Adversely affect habitat critical to the survival of a species

While populations fluctuate between the flying fox camps, the nearest camp is located at Gordon, approximately 8 kilometres northeast of the proposal area. The latest count for this camp in November 2019 estimated a population of up to 49,999. The proposed works would only remove the weedy understorey of native woodland on-site. The main foraging habitat on-site being the canopy containing eucalyptus flowers will remain. The proposed development will not adversely affect habitat critical to the survival of the species.

Criterion e: Disrupt the breeding cycle of an important population

The proposed action would not disrupt the breeding cycle of the GHFF. The closest camp is located 8 kilometres northeast of the proposal area at Gordon. The proposed action would not disrupt this camp and associated breeding activities during the construction or operation of the road.

Criterion f: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

No GHFF camps would be removed or disturbed, and extensive foraging habitat exists in the region within large conservation areas to the north of the study area, such as Lane Cove National Park. The proposed action would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion g: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposal area is already disturbed and modified and the proposed action would not result in the establishment of an invasive species that is harmful to the GHFF. The vegetation to be retained adjacent to the development site will be managed under a VMP which will aim to rehabilitate the degraded woodland and aim to increase the recovery of the ecological community.

Criterion h: introduce disease that may cause the species to decline

The proposed action is unlikely to present a significant ecological stress on known individuals or camps utilizing the proposal area and therefore unlikely to affect this species. The proposed action would be unlikely to introduce a disease that may cause this species to decline.

Criterion i: interfere substantially with the recovery of the species.

A National Recovery Plan for the Grey-headed Flying-fox was recently finalized in 2021. As no maternity camps would be removed or disturbed, proposed action would only result in the removal of a small amount of potential foraging habitat, and that foraging habitat exists in the surrounding landscape. It is therefore unlikely the proposed action would interfere with the recovery of this species.

Conclusion

The proposal would only remove the weedy understorey of 1.04 ha of native woodland. The canopy representing the bulk of potential foraging habitat on-site for this species will remain. The proposed action is unlikely to affect the lifecycle of the GHFF or lead to a decline in the population of this species. Based on the information provided above, the proposed action is unlikely to result in a significant impact on the Grey-headed Flying-fox. A referral to the Commonwealth is not recommended for this species.

Appendix H Biodiversity credit report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00031140/BAAS17001/22/00031143	Proposal Name 19654 Ryde Hospital Redevelopment BDAR	BAM data last updated * 16/06/2022
Assessor Name Nicole Helen McVicar	Assessor Number BAAS18077	BAM Data version * 54
Proponent Names Health Infrastructure NSW	Report Created 22/07/2022	BAM Case Status Finalised
Assessment Revision 0	Assessment Type Major Projects	Date Finalised 22/07/2022

* 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
Blue Gum High Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community	1237-Blue Gum high forest

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Dasyurus maculatus / Spotted-tailed Quoll

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
1237-Blue Gum high forest	Blue Gum High Forest in the Sydney Basin Bioregion	1.0	0	0	0

BAM Biodiversity Credit Report (Like for like)

1237-Blue Gum high forest	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Blue Gum High Forest in the Sydney Basin Bioregion This includes PCT's: 1237	-	1237_Poor	Yes	0	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Ninox strenua / Powerful Owl	**1237_Poor**	0.9	0.00

Credit Retirement Options

Like-for-like credit retirement options

Ninox strenua / Powerful Owl	Spp	IBRA subregion
	Ninox strenua / Powerful Owl	Any in NSW

BAM Biodiversity Credit Report (Like for like)

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