Hospital Road REF Works
Flora and Fauna Assessment

Health Infrastructure

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Template 2.8.1

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CBD	Central Business District
CCCC	Children's Comprehensive Cancer Centre
CEEC	Critically Endangered Ecological Community
DCP	Development Control Plan
DECC	Department of Environment and Climate Change (now DPIE)
DEEC	Department of Energy, Environment, and Conservation (now DAWE)
DAWE	Department of Agriculture, Water and the Environment
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd.
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FFA	Flora and Fauna Assessment
FM Act	NSW *Fisheries Management Act 1994*

Abbreviation	Description
HI	Health Infrastructure
HVC	High Voltage Cable
IASB	Integrated Acute Services Building
KTP	Key Threatening Processes
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
PW	Priority Weed listed under the *Biosecurity Act 2015*
PwC	Pricewaterhouse Cooper
PCT	Plant Community Type
OEH	Office of Environment and Heritage (now DPIE)
REF	Review of Environmental Factors
RHEP	Randwick Health and Education Precinct
RHW	Royal Hospital for Women
SCH	Sydney Children's Hospital
SIS	Species Impact Statement
TEC	Threatened Ecological Community
WM Act	NSW *Water Management Act 2000*

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Pricewaterhouse Cooper (PwC) (on behalf of Health Infrastructure NSW) to prepare a Flora and Fauna Assessment (FFA). This Flora and Fauna Assessment (FFA) report will accompany a Review of Environmental Factors (REF) for an assessment under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the excavation and diversion of services from the Hospital within the Randwick Local Government Area (LGA).

Three ecological assessments have been previously undertaken by ELA within the study area for the hospital upgrade State Significant Development Application and site preparation works.

- Request for Waiver of Biodiversity Development Assessment Report (BDAR) – Randwick Campus Redevelopment (ELA 2018a)
- Randwick Campus Demolition and Site Clearance – Flora and Fauna Assessment (ELA 2018b)
- Randwick Campus Redevelopment Stage 1 – Biodiversity Development Assessment Report (ELA 2018c).

The study area has been highly modified and consists of planted native and exotic vegetation and opportunistic weeds. Three native trees, one *Tristaniopsis laurina* (Water Gum) and two *Angophora costata* (Smooth-barked apple) and two exotic trees, *Syzygium jambos* (Rose Apple) and *Ulmus parvifolia* (Chinese Elm), will be impacted by the proposed works. There is potential that two adjacent trees, both native, *Angophora costa* and *Syzygium australe* (Brush Cherry) may be impacted. This will be subject to the arborist assessment during construction works. These trees have been included in this assessment.

No native Plant Community Types (PCTs) or threatened ecological communities (TECs) will be impacted by the proposed works. Marginal foraging habitat was available in the study area, for highly mobile threatened fauna species, *Pteropus poliocephalus* (Grey-headed Flying- Fox) within the *Angophora costata* trees. Foraging habitat for Grey-headed Flying-fox will be impacted by the proposed works, as this species is known to forage within *Angophora costata*. No suitable habitat was available for any threatened flora species or any other threatened fauna species.

The Grey-headed Flying Fox is listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act). A Test of Significance was prepared to assess the impact of the proposed works on the Grey-headed Flying Fox and it concluded that the proposal is unlikely to have a significant impact on this threatened species. The proposal is unlikely to have a significant impact on any other threatened species or ecological community listed under the BC Act. Therefore, a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) would not be required.

The Grey-headed Flying Fox is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An Assessment of Significance was prepared to assess the impact of the proposed works on the Grey-headed Flying Fox and it concluded that the proposal is unlikely to have a significant impact on this species. The proposed works are unlikely to have a significant impact on any other threatened species or ecological communities listed under the EPBC Act.

A number of mitigation measures have been recommended within this report to ameliorate potential direct and indirect impacts on native vegetation within and adjacent to the development.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by PwC Australia (on behalf of NSW Health Infrastructure [HI]) to prepare a Flora and Fauna Assessment (FFA) for proposed services works associated with the Hospital Road Review of Environmental Factors (REF) works. This FFA has been prepared to assess potential impacts to flora and fauna associated with the proposed demolition and clearance works of Hospital Road.

This flora and fauna assessment (FFA) report has been prepared to accompany a REF for proposed diversion of services at Hospital Road, Randwick. The works are being assessed under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report assesses potential impacts of the proposed works on flora and fauna species listed under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Study area

Randwick is located in Sydney's Eastern Suburbs approximately 6 km south-east of the Sydney Central Business District (CBD). The survey site (hereafter referred to as the 'study area') comprises the northern half of Hospital Road, Randwick. The study area also includes footpaths and vegetation along the eastern side of the road (Figure 1). A small number of trees are located along Hospital Road.

1.2 Background and proposed works

The Randwick Health and Education Precinct (RHEP) is one of the most comprehensive health innovation districts in Australia. While health care at RHEP has been evolving for over 160 years, the last five years has seen a strengthening of collaboration amongst a wide range of organisations in the precinct, including with government, universities and community.

Hospital Road is an important road that supports the precinct and provides access to existing buildings such as the Sydney Children's Hospital (SCH) and Royal Hospital for Women (RHW). Hospital Road provides access to the campus logistical hub located on Delivery Drive. Additionally, Hospital Road will become a key link for vehicles and pedestrians enabling the integration of the existing campus with the future Integrated Acute Services Building (IASB) and SCH Stage 1/ Children's Comprehensive Cancer Centre (CCCC).

Hospital Road provides access to Delivery Drive and is currently accessed by vehicles and pedestrians from Magill Street to the South and High Street to the North. Figure 2 below shows the area of Hospital Road that this report addresses and illustrates the scope of works.

The proposed works on Hospital Road will involve excavation works to enable the lowering of Hospital Road for vehicle access. These works on Hospital Road are pivotal in allowing for the development of an interlinked campus and removing the interface between pedestrians and vehicles. To achieve this, key service infrastructure assets that are currently located in Hospital Road will need to be diverted. Additionally, remediation, piling works, and excavation will need to be undertaken.

The REF scope will involve the diversion of services from Hospital Road. This scope will require critical service infrastructure to be relocated. The scope of works will include the following:

- remediation (Hospital Road North)
- retention piling from interface location up to the end of Hospital Road (east and west)
- retention piling (High Street boundary) (north)
- excavation of Hospital Road North (approximately 1,000 m^2)
- Hospital Road North services diversion (Ausgrid, AARNET, Telstra and private services (i.e. water, fire services))
- works on the pedestrian footpaths/roadway at the intersection of Hospital Road and High Street.
- all associated works to enable the relocation of services including but not limited to:
  - non-destructive digging
  - concrete cutting
  - traffic control and diversions
  - temporary restorations
  - removal of disused services
- backfilling with appropriate material
- removal of material from site
- works associated with service cutovers.

The study area that has been assessed for this FFA includes a 500 mm wide trench along the eastern boundary allowing for the installation of the required new cabling and removal of existing cabling that is no longer required.

Potential impacts and risks for the existing services is subject to negotiation and approvals by each affected authority. Liaison with each authority is to be undertaken as part of the design process.

1.3 Key definitions

The following key terms and definitions are used in this flora and fauna assessment:

- *Proposed works* – the proposed development of the substation as described in Section 1.2.
- *Study area* – the extent outline in Figure 1.
- *Impact area (subject site)* - the area likely to be directly or indirectly impacted by the proposal as per the definitions in the Threatened Species Tests of Significance Guidelines (OEH, 2018).
- *Local population* - the population that occurs within the subject site. The assessment of the local population may extend to include individuals beyond the study area, if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the subject site, according to the following definitions:
  - The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the subject site.

- The local population of resident fauna species comprises those individuals known or likely to occur in the subject site, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the subject site.
- The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the site from time to time.

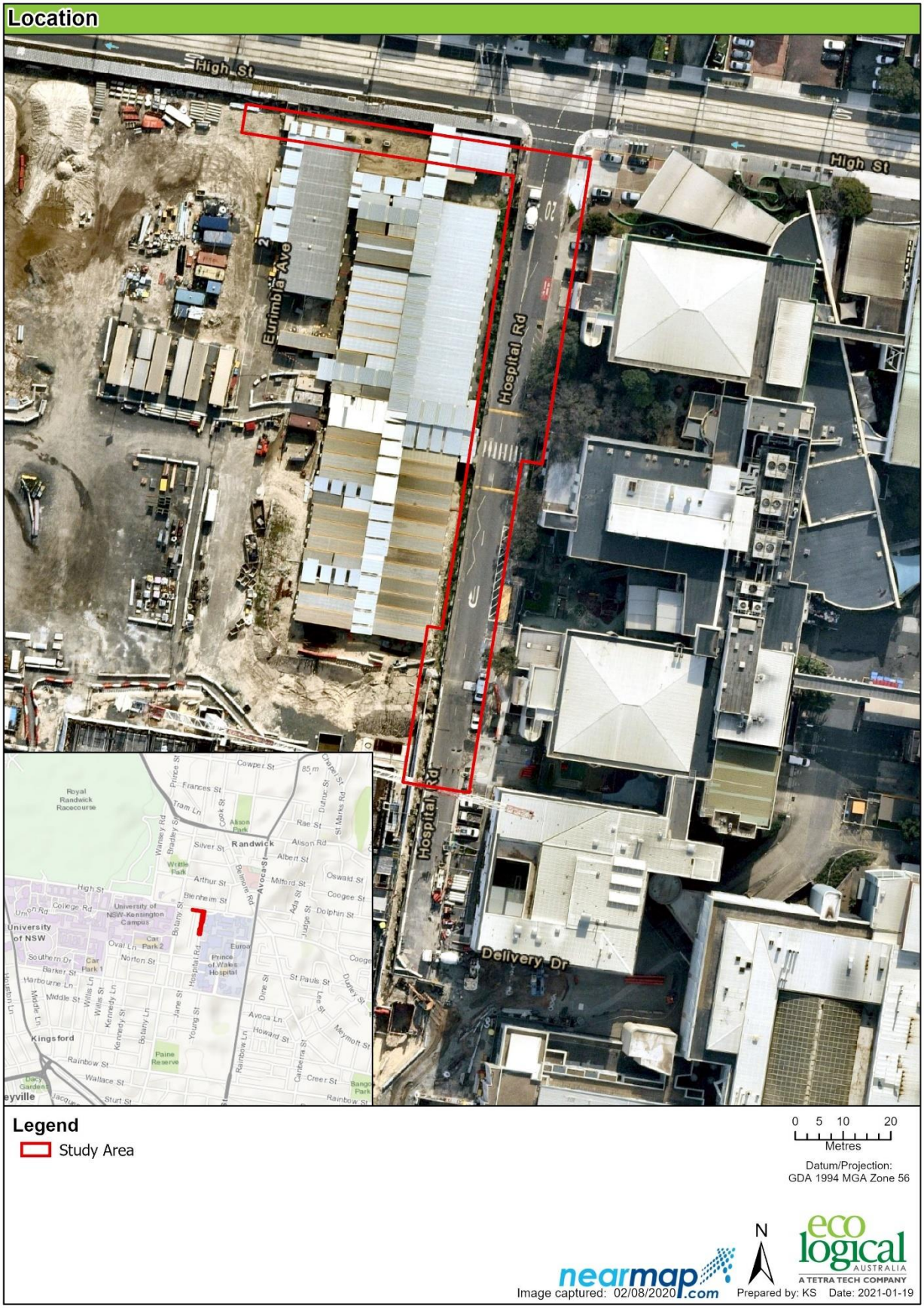

Figure 1: Location map

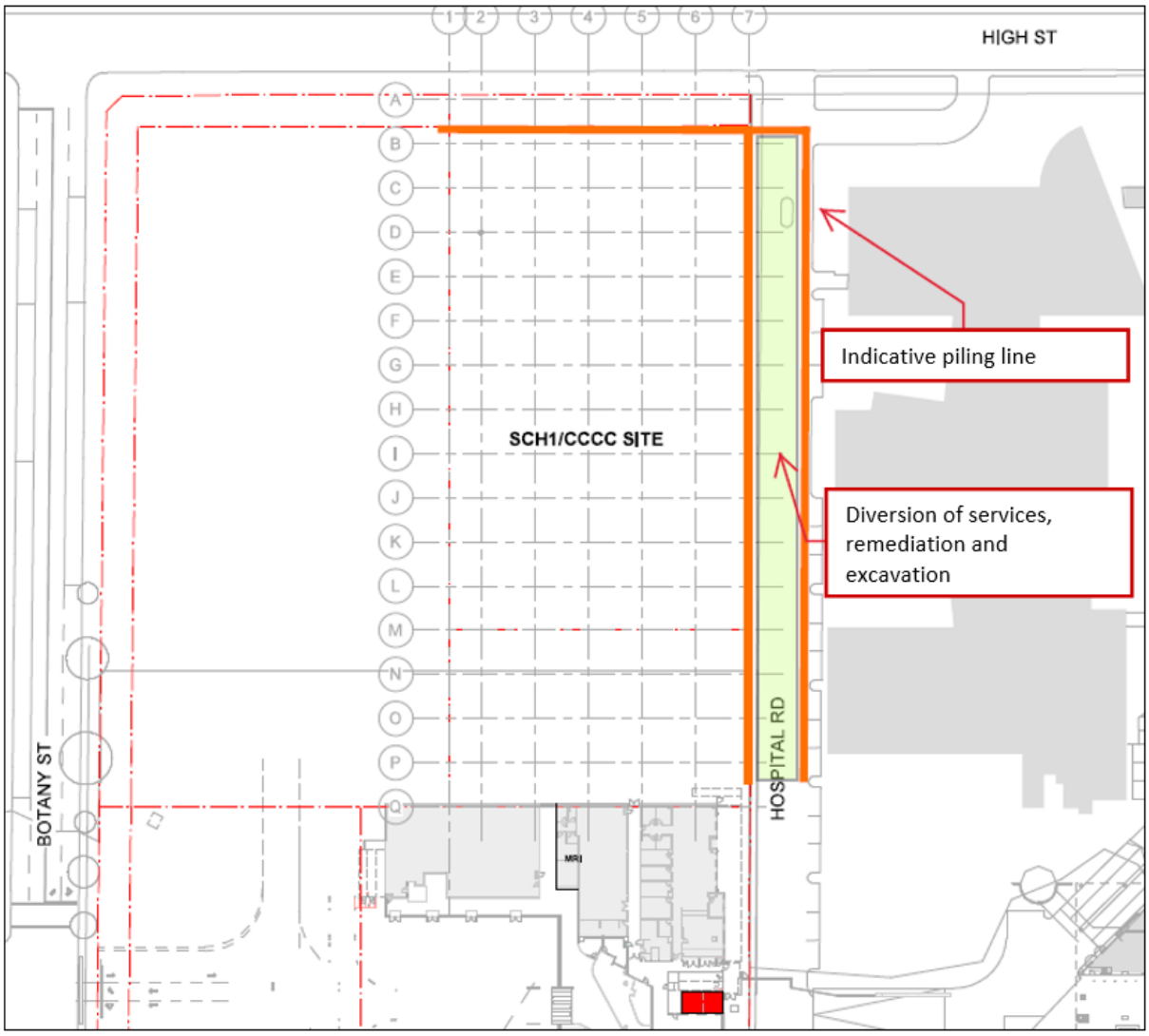

Figure 2: Context of the study area

2. Legislative context

Table 1: Legislation relevant to the proposed works

Name	Relevance to the project	Section in this report
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Matters of National Environmental Significance (MNES) have been identified as having a potential to occur within the locality. This report assesses the likelihood of occurrence of MNES within the site and assess potential impacts of the proposal on MNES.	Section 5.3 and Appendix B
State		
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals. The EP&A Act places a duty on the determining authority to adequately address a range of environmental matters including maintenance of biodiversity and the likely impact to threatened species, populations or ecological communities (under the BC Act– refer below). The proposed enabling works are to be assessed under Part 5 of the EP& Act 1979.	All report
Biodiversity Conservation Act 2016 (BC Act)	An assessment of the proposed development in accordance with the BC Act is provided in Section 5 of this report. For activities being assessed under Part 5 of the EP&A Act, if a significant impact is likely to occur as indicated by the 5-part test, then the proponent may choose to undertake a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR).	Section 5.2 and Appendix B
Biosecurity Act 2015 (BS Act)	Under the BS Act, priority weeds have been identified for local government areas and assigned strategies to contain, remove or manage. Occupiers of land (this includes owners of land) have responsibility for taking appropriate action for priority weeds on the land they occupy. The field survey identified two priority weeds and eight additional weeds of regional concern in the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 which was developed under this Act.	Section 4.1.4
Fisheries Management Act 1994 (FM Act)	The development does not involve harm to mangroves or other protected marine vegetation, dredging, reclamation or blocking of fish passage and therefore a permit under the FM Act is not required.	N/A
Water Management Act 2000 (WM Act)	The project does not involve an 'activity' on waterfront land therefore a Controlled Activity Approval under s91 of the WM Act is not required.	N/A
Planning Instruments		
Randwick City Council Local Environment Plan (LEP) 2012	The LEP 2012 contains a clause (6.5) pertaining to protecting terrestrial biodiversity. The proposed works do not impact upon any mapped areas of biodiversity within the study area under this LEP.	N/A

3. Methods

3.1 Literature and data review

A review of readily available databases pertaining to the ecology and environmental features of the study area and surrounding area and existing vegetation mapping was conducted to identify records of threatened species, populations and communities and their potential habitat. Databases, reports and vegetation mapping that were reviewed included:

- Request for Waiver of Biodiversity Development Assessment Report (BDAR) – Randwick Campus Redevelopment (ELA 2018a)
- Randwick Campus Demolition and Site Clearance – Flora and Fauna Assessment (ELA 2018b)
- Randwick Campus Redevelopment Stage 1 – Biodiversity Development Assessment Report (ELA 2018c)
- BioNet / Atlas of NSW Wildlife database search (DPIE 2020b) within 5 km of the study area accessed August 2020
- EPBC Act Protected Matters Search Tool 5 km database search (Department of Agriculture, Water and the Environment (DAWE) 2020) accessed August 2020
- NSW Threatened Species Profiles (DPIE 2020b)
- Sydney Metropolitan Catchment Management Authority vegetation mapping (OEH 2016)
- Randwick LEP 2012
- Randwick Development Control Plan (DCP) 2013
- Randwick City Council Significant Tree Register (Randwick City Council 2007)
- Urban Ecology Strategic Action Plan (City of Sydney 2014)
- Aerial imagery and topographic maps of the study area.

Species from both the BioNet and DAWE online search had been combined in previous reports (ELA 2018a, ELA 2018b, ELA 2018c) to produce a list of threatened species, populations and communities that may occur within the subject site. The likelihood of occurrence for threatened species, populations and communities on the site was determined based on location of database records, the likely presence or absence of suitable habitat in the subject site, and knowledge of the species' ecology. A renewed database search was incorporated into the previous results to determine any additional species requiring assessment.

Five categories for the likelihood of occurrence of species are used in this report, defined as follows:

- "yes" = the species was or has been observed in the study area
- "likely" = a medium to high probability that a species uses the study area
- "potential" = suitable habitat for a species occurs in the study area, 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 study area, and
- "no" = habitat in the study area and in its vicinity is unsuitable for the species.

Following the site inspection, this list of "potentially affected species" was refined with an understanding of the local environment and available habitat in the study area. The likelihood table in Appendix B reflects the final list of species and their likelihood of occurrence.

Results of the BioNet search are shown in Figure 3 and Figure 4.

3.2 Field survey

A site inspection of the subject site was conducted on 14 August 2020 by ELA ecologist Mike Lawrie. A previous inspection undertaken by ELA in on 29 November 2017 involved vegetation validation with the previous SSDA boundary (encompassing the area between High Street, Hospital Road, Botany Road and Magill Street), the majority of which was approved and removed for the Randwick Campus Redevelopment. Previous vegetation mapping undertaken by ELA was used as base mapping for the inspection. The purpose of the inspection was to:

- Validate existing vegetation mapping (OEH 2016, ELA 2018) and determine the condition of vegetation present, focussing on direct and indirect impact areas.
- Identify presence of or habitat for any threatened flora and fauna species.

The vegetation and habitat on the site were identified by walking over the entire site using the random meandering technique of Cropper (1993) and recording dominant flora species. The boundaries of vegetation communities and species assemblages within the site were confirmed. Where the boundaries of vegetation communities differed from existing vegetation mapping, these were modified on hard copy maps and marked with a hand-held GPS. If hollow-bearing trees (HBTs) were present, they were mapped using a GPS.

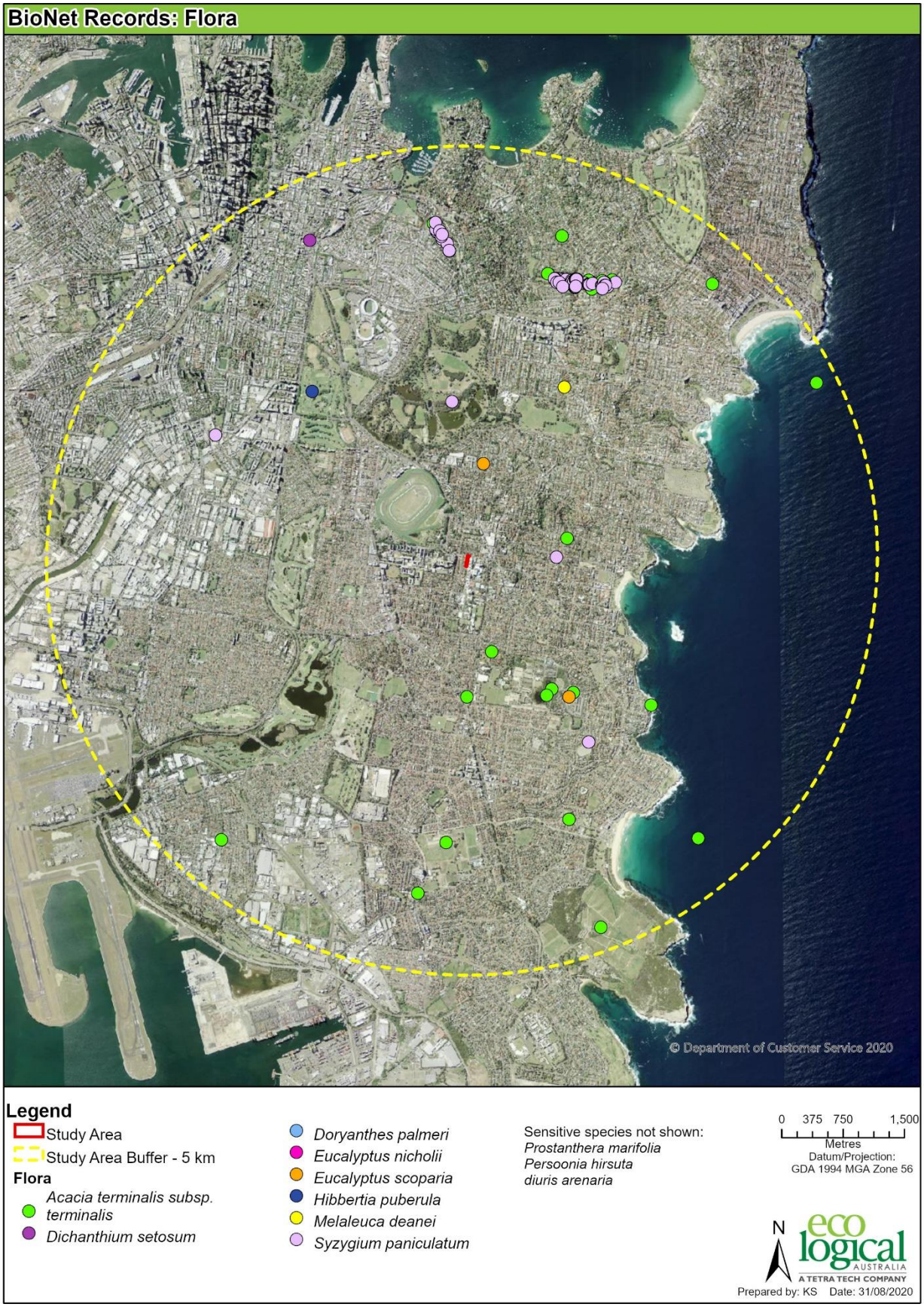

Figure 3: BioNet Atlas flora search within 5 km of the study area

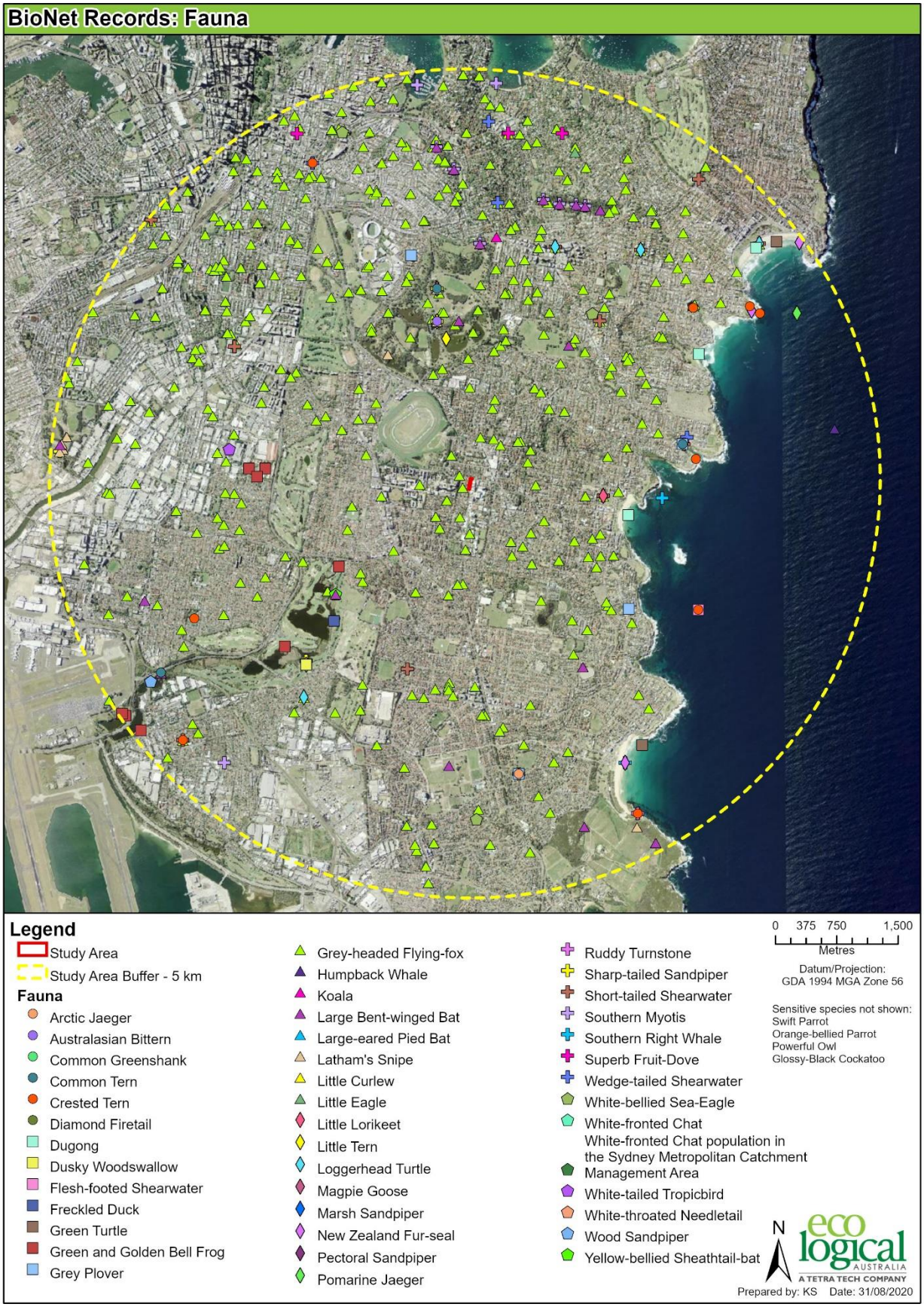

Figure 4: BioNet Atlas fauna search within 5 km of the study area

4. Existing Environment

4.1 Vegetation communities

4.1.1 Planted native/exotic

The study area primarily consisted of cleared areas and hard surfaces including the hospital construction site, roads and footpaths. Only a small amount of planted vegetation was present as landscape plantings and gardens. No remnant native vegetation was present in the study area. Native species present in the study area included *Angophora costata* (Smooth-barked Apple), *Tristaniopsis laurina* (Water Gum), *Glochidion ferdinandi* (Cheese Tree), *Hibbertia scandens* (Climbing Guinea Flower), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Cotula australis* (Common Cotula). A number of planted exotic species were also present including *Viburnum* sp., *Agapanthus praecox* (African Lily), *Celtis sinensis* (Japanese Hackberry), *Jasminum polyanthum* (White Jasmine) and *Ulmus parvifolia* (Chinese Elm). A number of opportunistic weeds were also present such as *Ehrharta erecta* (Panic Veldt Grass), *Cinnamomum camphora* (Camphor Laurel) and *Sonchus oleraceus* (Common Sowthistle).

The vegetation was not representative of any native PCT nor is it consistent with any threatened ecological community (TEC). A map of vegetation within the development site is shown in Figure 5. Photos of the vegetation are shown in Figure 6 and Figure 7.

4.1.2 Threatened flora

No threatened flora species were present within the study area. Suitable habitat for threatened flora species is not available due to the high level of modification and absence of remnant native vegetation within the subject site.

4.1.3 Threatened fauna and fauna habitat

Suitable habitat for threatened fauna species within the study area was limited to foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox). Vegetation within the study area was not connected to any larger areas of quality habitat.

The highly fragmented trees in the study area provide poor quality stepping stone habitat for highly mobile species such as birds and Grey-headed Flying-fox. However, due to the fragmented nature of habitat within the urban landscape the species likely to utilise these resources or corridors are restricted to highly mobile and urbanised fauna species and would not rely on these limited resources for survival.

No roosting habitat is available within the study area for hollow-dependent threatened fauna species due to the absence of hollow-bearing trees. The study area also lacks built structures such as buildings, culverts and bridges.

4.1.4 Priority Weeds

The *Biosecurity Act 2015* and Greater Sydney Regional Strategic Weed Management Plan (Local Land Services 2019) provide specific legal requirements for state level priority weeds and recommendations for regionally significant weeds. Priority weeds, regionally significant weeds and Weeds of National Significance (WoNS) recorded in the study area are listed in Table 2.

Table 2: Significant weeds recorded in the study area

Scientific Name	Common Name	Priority weed / Required duty	Other weed of regional concert / Asset at risk	WoNS
Agapanthus praecox	Agapanthus	No	Yes – Environment	No
Asparagus asparagoides	Bridal Creeper	Yes **Mandatory measure** - A person must not import into the State or sell. **Regional strategic response** - Identify priority assets for targeted management	No	Yes
Celtis sinensis	Chinese Celtis	No	Yes – Environment, Agriculture	No
Cinnamomum camphora	Camphor Laure	No	Yes – Environment, Agriculture, Human health	No
Hedychium gardnerianum	Ginger lily	No	Yes – Environment	No
Ochna serrulata	Ochna	No	Yes – Environment	No
Olea europaea subsp. *cuspidata*	African Olive	Yes **Mandatory measures** - The plant or parts of the plant are not traded, carried, grown or released into the environment. - Land managers prevent spread from their land where feasible. - Land managers reduce the impact on priority assets.	No	No
Schefflera actinophylla	Umbrella Tree	No	Yes – Environment	No
Syagrus romanzoffiana	Cocos palm	No	Yes – Environment	No
Ulmus parvifolia	Chinese Elm	No	Yes – Environment	No

Figure 5: Vegetation within the development site

Figure 6: Planted native and exotic vegetation to be removed

Figure 7: *Tristaniopsis laurina* (Water Gum) requiring removal

5. Impact Assessment

5.1 Summary of impacts

5.1.1 Direct impacts

The works will result in the removal of three planted native trees, one *Tristaniopsis laurina* and two *Angophora costata*, and two planted exotic trees, *Syzygium jambos* (Rose Apple) and *Ulmus parvifolia* (Chinese Elm) totalling an area of approximately 0.035 ha. There is potential that during construction works two additional native trees, *Angophora costata* and *Syzygium australe* (0.0009 ha) may be impacted by excavation works near the roots zone. The exact nature of the impacts on these two additional trees will not be fully assessed until construction works have begun and the arborist has assessed the impacts.

A worse-case scenario has been applied which includes these two additional trees as part of the overall impacts of the works. Therefore, the proposed works may result in the worst case scenario impact of 0.013 ha.

No native PCTs or TECs will be directly or indirectly impacted by the proposed works. No threatened flora will be directly impacted by the proposed works. There is potential that the threatened Grey-headed Flying-fox could utilise the *Angophora costata* as foraging habitat. The potential impacts to this species as a result of the proposed works are discussed in Section 5.2.1.

5.1.2 Indirect impacts

Indirect impacts as a result of the proposed works may include:

- Increased edge effects (including spread of weeds), trampling of gardens, due to the increase in human access to the vegetation within the subject site.
- Changes to water quality through run off, sedimentation and erosion from construction works.
- Rubbish dumping.

The long term effects of these potential indirect impacts is considered to be negligible. Mitigation measures and recommendations have been provided in Section 6.

5.1.3 Key threatening processes

One Key Threatening Processes (KTPs) listed under the BC Act and / or EPBC Act is relevant to the proposed works:

- Clearing of native vegetation (BC Act) / Land clearance (EPBC Act).

Three planted native trees will require removal as a result of the proposed works. The removal of native trees, including the small *Tristaniopsis laurina* assessed as being in poor health as part of the Arboricultural Impact Assessment (ELA, 2020), will not significantly contribute to this KTP.

5.2 *Biodiversity Conservation Act 2016*

5.2.1 Test of significance (BC Act)

A 'test of significance' (also known as a 5-part test) is required for Part 5 development to determine if the development is likely to have a significant impact on any threatened species, population or ecological community. If a significant impact is indicated by the 5-part test, then the proponent may opt to undertake a Species Impact Statement (SIS) or BDAR.

One threatened fauna species, Grey-headed Flying-fox, has potential to occur within the study area with marginal foraging habitat available in *Angophora costata* on the eastern side of Hospital Road. The proposed works would result in the removal of a two *Angophora costata* trees. An additional *Tristaniopsis laurina* will be removed, however, this species is not listed as a known feed tree species for Grey-headed Flying-fox (Eby and Law, 2008, Department of Environment & Climate Change NSW, 2008) A Grey-headed Flying-fox camp is located approximately 1 km to the north in Centennial Park. This camp will not be directly or indirectly impacted by the proposed work. As the proposed works will result in the loss of a small amount of foraging habitat for Grey-headed Flying-fox, a Test of Significance was completed for this species (Appendix C). It concluded that the proposed development is unlikely to have a significant impact on the Grey-headed Flying Fox.

It is unlikely that the proposed development would have a significant impact on any other threatened species or ecological community in accordance with Section 7.3 of the BC Act.

5.2.2 Biodiversity Values Map

The Biodiversity Values Map (BV Map) is a threshold for entry into the Biodiversity Offsets Scheme (BOS) for local development under Part 4 of the EP&A Act and does not apply to activities being assessed under Part 5 of the EP&A Act. Therefore, the BV Map does not apply to this proposal. However, as a conservative measure, the BV Map was viewed as part of this assessment. The proposed works will not impact any area mapped as high biodiversity value on the BV Map v10 (DPIE 2020).

5.2.3 Serious and Irreversible Impacts (SAII)

For activities assessed under Part 5 of the EP&A Act, the BC Act requires a determining authority to take likely SAII into consideration and determine any additional or appropriate measures to minimise the impact if approval is granted. DPIE has published the *Guidance to Assist a Decision-Maker to Determine a Serious and Irreversible Impact* (DPIE 2019) which contains a list of potential species (and their habitat) and ecological communities that meet the SAII principles and criteria.

No candidate entities for SAII are likely to be impacted by the proposal.

5.3 Significance Assessment (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where "Matters of National Environmental Significance" (MNES) may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a MNES" is defined as a "controlled action", and requires approval from the Commonwealth DAWE which is responsible for administering the EPBC Act.

The Grey-headed Flying-fox has marginal foraging habitat available in the study area. However, the proposed works will result in the removal of two potential food trees. The known camp 1 km to the north in Centennial Park will not be directly or indirectly impacted by the proposed works. As the proposed works will impact on potential foraging habitat for Grey-headed Flying Fox, a significance assessment was completed (Appendix D). The assessment concluded that the proposed works are unlikely to result in a significant impact on Grey-headed Flying-fox. No additional MNES are likely to be significantly impacted by the proposed works.

6. Recommendations

A number of general mitigation measures will be implemented which will reduce the potential impact on biodiversity values. Specific mitigation measures that relate to specific sensitive areas, threatened species and threatened ecological communities are outlined below in this section.

The following mitigation measures are recommended to reduce the ecological impacts associated with the proposed works within the subject site:

- Develop and implement a Construction Environmental Management Plan which contains the measures to ameliorate and mitigate against potential impacts to environmental values outside of the impact footprint.
- Protective barrier fencing should be erected pre-construction and during construction to ensure that related impacts are contained within the work areas and trees to be retained are not impacted.
- Erosion/sediment controls should be implemented during any excavation or construction works to avoid offsite impacts or areas of vegetation being retained.

7. Conclusion

Eco Logical Australia Pty Ltd (ELA) was engaged by PwC Australia (on behalf of NSW Health Infrastructure HI) to prepare a Flora and Fauna Assessment (FFA) for proposed services works associated with the Hospital Road REF works for an assessment under Part 5 of the EP&A Act.

The subject site is highly modified and contains only a small amount of planted native and exotic vegetation along Hospital Road. Planted native species included *Angophora costata* (Smooth-barked Apple), *Glochidion ferdinandi* (Cheese Tree), *Hibbertia scandens* (Climbing Guinea Flower) and *Tristaniopsis laurina* (Water Gum). Planted exotics and opportunistic weeds included *Ulmus parvifolius* (Chinese Elm), *Viburnum* sp., *Celtis sinensis* (Japanese Hackberry) and *Ehrharta erecta* (Panic Veldtgrass). The vegetation within the study area was not consistent with any native PCT or any TEC listed under the BC Act or EPBC Act.

No threatened flora or fauna species were recorded within the study area. *Angophora costata* (Smooth-barked Apple) and *Syzygium australe* (Brush Cherry) provides marginal seasonal foraging habitat for Grey-headed Flying-fox) and the proposed works will involve the removal of two trees of this species. A Test of Significance under the BC Act and an Assessment of Significance under the EPBC Act were completed to assess potential impacts to the Grey-headed Flying Fox as a result of these works. These concluded that there is unlikely to be a significant impact to this species as a result of the proposed works.

The proposed works are unlikely to have a significant impact on any other threatened species or ecological communities listed under the NSW BC Act or Commonwealth EPBC Act.

A number of mitigation measures have been recommended within this report to ameliorate potential direct and indirect impacts on native vegetation within and adjacent to the development.

8. References

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

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

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

DAWE 2020. National Flying-fox monitoring viewer. Australian Government.

DAWE 2020a. Protected Matters Search Tool [online]. Available: http://www.environment.gov.au/epbc/protect/index.html (Accessed: August 2020).

DAWE 2020b. Species Profile and Threats Database. Available http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

Department of Environment and Climate Change NSW, 2008. Best practice guidelines for the grey-headed flying fox.

Department of Environment and Energy (DoEE), 2017. Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus. Commonwealth of Australia, 2017. Commonwealth of Australia, 2017.

DPIE 2019. Guidance to assist a decision-maker to determine a serious and irreversible impact. State of NSW and Department of Planning, Industry and Environment.

DPIE 2020a. 'Threatened Species Database (5 km radius search). OEH Sydney, NSW. (Data viewed August 2020)'.

DPIE 2020b. Threatened Species Profiles. Available: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?

Eby, P. and Law, B. 2008. Ranking the feeding habitats of Grey-headed flying foxes for conservation management. Prepared for The Department of Environment and Climate Change (NSW) & The Department of Environment, Water, Heritage and the Arts October 2008.

ELA 2018a. Request for Waiver of Biodiversity Development Assessment Report (BDAR) – Randwick Campus Redevelopment.

ELA 2018b. Randwick Campus Demolition and Site Clearance – Flora and Fauna Assessment.

ELA 2018c. Randwick Campus Redevelopment Stage 1 – Biodiversity Development Assessment Report

ELA 2020. Hospital Road REF Works- Arboricultural Impact Assessment. Prepared for Health Infrastructure

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

Local Land Services 2019. ‘Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022’.

NSW Flora Online 2017. Available: www.plantnet.rbgsyd.nsw.gov.au

OEH 2016. 'The Native Vegetation of the Sydney Metropolitan Area'.

OEH 2018. ‘Threatened Species Test of Significance Guidelines’.

Appendix A - Flora species recorded in the study area

Table 3: Flora species recorded in the study area

Family	*Species Name*	Common Name	Exotic (*)
Adoxaceae	*Viburnum tinus*		*
Amaryllidaceae	*Agapanthus praecox*	African Lily	*
Apocynaceae	*Plumeria* sp.	Frangipani	*
Araliaceae	*Schefflera actinophylla*	Umbrella Tree	*
Arecaceae	*Syagrus romanzoffianus*	Cocos Palm	*
Asparagaceae	*Asparagus asparagoides*	Bridal Creeper	*
Asparagaceae	*Liriope muscari*	Lilyturf	*
Asteraceae	*Cotula australis*	Common Cotula	
Asteraceae	*Lapsana communis* subsp. *Communis*	Nipplewort	*
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	*
Bignoniaceae	*Radermachera sinica*	China Doll	*
Cannabaceae	*Celtis sinensis*	Japanese Hackberry	*
Commelinaceae	*Callisia fragrans*	Inch Plant	*
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	
Iridaceae	*Dietes robinsoniana*	Lord Howe Wedding Lily	*
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	*
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	
Moraceae	*Morus alba*	White Mulberry	*
Myrtaceae	*Angophora costata*	Smooth-barked Apple	
Myrtaceae	*Syzygium australe*	Brush Cherry	
Myrtaceae	*Tristaniopsis laurina*	Water Gum	
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	*
Oleaceae	*Jasminum polyanthum*	White Jasmine	*
Poaceae	*Ehrharta erecta*	Vasey Grass	*
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	*
Ulmaceae	*Ulmus parvifolia*	Chinese Elm	*
Zingiberaceae	*Hedychium gardnerianum*	Ginger Lily	*

Appendix B - Likelihood of occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the 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 on site 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 would be impacted by the proposed works. 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.

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profiles.

Table 4: Threatened ecological communities (TECs) likelihood table

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence	Assessment of Significance required
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	V / CE	E	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion. Dominated by *Eucalyptus parramattensis* subsp. *parramattensis*, *Angophora bakeri* and *E. sclerophylla.* A small tree stratum of *Melaleuca decora* is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species such as *Banksia spinulosa* var. *spinulosa, Melaleuca nodosa, Hakea sericea* and *H. dactyloides* (multi-stemmed form). The ground stratum consists of a diverse range of forbs including *Themeda australis, Entolasia stricta*, *Cyathochaeta diandra, Dianella revoluta* subsp. *revoluta, Stylidium graminifolium*, *Platysace ericoides*, *Laxmannia gracilis* and *Aristida warburgii.*	Unlikely	No
Coastal Upland Swamps in the Sydney Basin Bioregion	E	E	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (n the Woronora plateau). Occurs primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils. May include tall open scrubs, tall closed scrubs, closed heaths, open graminoid heaths, sedgelands and fernlands. Larger examples may include a complex of these structural forms.	Unlikely	No
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	E	CE	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney. *E. ovata* (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azadarach* (white cedar), *Casuarina cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa, Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia, Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda* and *Phyllanthus gunnii.* The groundcover is composed of abundant forbs, scramblers and grasses.	Unlikely	No

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence	Assessment of Significance required
Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E	E	Predominantly a sclerophyllous heath or scrub community although, depending on site topography and hydrology, some remnants contain small patches of woodland, low forest or limited wetter areas. Common species include *Banksia aemula, B. ericifolia, B. serrata*, *Eriostemon australasius, Lepidosperma laterale, Leptospermum laevigatum, Monotoca elliptica* and *Xanthorrhoea resinifera*. Associated with disjunct patches of nutrient poor aeolian (wind blown) dune sand.	Unlikely	No
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	-	E	The meadows of the ecological community occur as almost pure stands of *Posidonia australis* (monospecific meadows) or multispecies meadows dominated by *P. australis* (for example, with *Zostera muelleri* subsp. *capricorni, Halophila ovalis*). The ecological community typically occurs in subtidal waters at depths ranging less than 1m to 10 m on sand and silty mud substrate. In these waters, salinity is close to marine levels, dropping only for short periods following rainfall. The ecological community is absent from brackish water (i.e. hyposaline) conditions such as intermittently open lagoons.	Unlikely	No
Western Sydney Dry Rainforest and Moist Woodland on Shale	E	CE	A dry vine scrub community of the Cumberland Plain, western Sydney. Canopy trees include Prickly Paperbark (*Melaleuca styphelioides*), Hickory Wattle (*Acacia implexa*) and Native Quince (*Alectryon subcinereus*). Many rainforest species occur in the shrub layer, such as Mock Olive (*Notelaea longifolia*), Hairy Clerodendrum (*Clerodendrum tomentosum*) and Yellow Pittosporum (*Pittosporum revolutum*). The shrub layer combines with vines, such as Gum Vine (*Aphanopetalum resinosum*), Wonga Vine (*Pandorea pandorana*) and Slender Grape (*Cayratia clematidea*) to form dense thickets in sheltered locations.	Western Sydney Dry Rainforest and Moist Woodland on Shale	E

E= Endangered Ecological Community, CE = Critically Endangered Ecological Community.

Table 5: Threatened flora likelihood table

Scientific Name	Common Name	TSC Act Status	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of Occurrence	Assessment of Significance required
Acacia terminalis subsp. terminalis	Sunshine Wattle	E1	E	Limited mainly to near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay. It grows in coastal scrub and dry sclerophyll woodland on sandy soils.	44	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Allocasuarina glareicola		E1	E	*Allocasuarina glareicola* is primarily restricted to the Richmond district on the north-west Cumberland Plain, with an outlier population found at Voyager Point. It grows in Castlereagh woodland on lateritic soil.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Asterolasia elegans		E1	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. It grows on Hawkesbury sandstone and can be found in sheltered forests on mid- to lower slopes and valleys.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of Occurrence	Assessment of Significance required
Caladenia tessellata	Thick Lip Spider Orchid	E1	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.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	It is known from a range of vegetation communities including swamp-heath and woodland. The larger populations typically occur in woodland dominated by *Eucalyptus sclerophylla* (Scribbly Gum), *E. sieberi* (Silvertop Ash), *Corymbia gummifera* (Red Bloodwood) and *Allocasuarina littoralis* (Black Sheoak); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Dichanthium setosum	Bluegrass	V	V	In NSW, found on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes. Grows in cleared woodland, grassy roadside remnants and highly disturbed pasture, on heavy basaltic black soils and red-brown loams with clay subsoil.	1	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Diuris arenaria	Sand Doubletail	E1		Coastal heath and dry grassy eucalypt forest.	1	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of Occurrence	Assessment of Significance required
Doryanthes palmeri	Giant Spear Lily	V		Exposed rocky outcrops, cliff-tops and on steep cliff-faces in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest.	2	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Eucalyptus camfieldii	Camfield's Stringybark	V	V	Narrow band from the Raymond Terrace area south to Waterfall. Grows In coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Grassy open forest or woodland on poor sandy loams, most commonly on gently sloping or flat sites.	1	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Eucalyptus scoparia	Wallangarra White Gum	E1	V	Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	2	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of Occurrence	Assessment of Significance required
Genoplesium baueri	Bauer's Midge Orchid	E1	E	Known from coastal areas from northern Sydney south to the Nowra district. Previous records from the Hunter Valley and Nelson Bay are now thought to be erroneous. Grows in shrubby woodland in open forest on shallow sandy soils and flowers from December to March.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Hibbertia puberula		E1		Wollemi National Park south to Morton National Park and the south coast near Nowra. Low heath, dry sclerophyll woodland, upland swamps, on sandy soils or clay.	1	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Melaleuca deanei	Deane's Paperbark	V	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.	2	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Melaleuca biconvexa	Biconvex Paperbark	V	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.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of Occurrence	Assessment of Significance required
Persicaria elatior	Tall Knotweed	V	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.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Persoonia hirsuta	Hairy Geebung	E1	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.	1	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Pimelea curviflora var. curviflora	-	V	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.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Pimelea spicata	Spiked Rice-flower	E1	E	In western Sydney, *Pimelea spicata* occurs on an undulating topography of well-structured clay soils, derived from Wianamatta shale. It is associated with Cumberland Plains Woodland, in open woodland and grassland often in moist depressions or near creek lines. Has been located in disturbed areas that would have previously supported	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of Occurrence	Assessment of Significance required
Prostanthera marifolia	Seaforth Mintbush	E4A,3	CE	Only known from the northern Sydney suburb of Seaforth. In or in close proximity to the endangered Duffys Forest ecological community, on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	3	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Syzygium paniculatum	Magenta Lilly Pilly	E1	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.	58	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No
Thesium australe	Austral Toadflax	V	V	Widespread throughout the eastern third of NSW but most common on the North Western Slopes, Northern Tablelands and North Coast. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (DECC 2007). The preferred soil type is a fertile loam derived from basalt although it occasionally occurs on metasediments and granite.	0	Unlikely. Suitable habitat not present due to high level of modified vegetation of the study area.	No

Table 6: Threatened fauna likelihood table

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Amphibia							
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock based streams, where the soil is soft and sandy so that burrows can be constructed.	0	Unlikely. Suitable habitat not present. Not known from the locality.	No
Litoria aurea	Green and Golden Bell Frog	E1,P	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.	10	Unlikely. Suitable habitat not present due to absence of waterbodies.	No
Aves							
Anseranas semipalmata	Magpie Goose	V		Shallow wetlands, floodplains, grasslands, pastures, dams and crops.	0	Unlikely. Suitable habitat not present due to absence of waterbodies.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Anthochaera phrygia	Regent Honeyeater	E4A	CE	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (*C. cunninghamiana*). It primarily feeds on nectar from box and ironbark eucalypts and occasionally from Banksia's and mistletoes. It is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar. Suitable habitat likely to be present within the Precinct.	0	Unlikely. Suitable habitat not present due to lack of preferred feed trees and highly modified vegetation.	No
Botaurus poiciloptilus	Australasian Bittern	E1	E	Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bullrushes) and *Eleocharis* spp. (spikerushes).	1	Unlikely. Suitable habitat not present.	No
Burhinus grallarius	Bush Stone-curlew	E1		In NSW, it occurs in lowland grassy woodland and open forest.	0	Unlikely. Suitable habitat not present.	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	52	Unlikely. No feed trees present. No roosting habitat.	No
Dasyornis brachypterus	Eastern Bristlebird	E1	E	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.	0	Unlikely. No known populations in the Sydney region.	No
Epthianura albifrons	White-fronted Chat	V		Saltmarsh vegetation, open grasslands and sometimes low shrubs bordering wetland areas.	1	Unlikely. Suitable habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Falco hypoleucos	Grey Falcon	E1		Shrubland, grassland and wooded watercourses, occasionally in open woodlands near the coast, and near wetlands.	0	Unlikely. Suitable habitat not present.	No
Glossopsitta pusilla	Little Lorikeet	V		Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	1	Unlikely. Suitable habitat not present due to highly modified vegetation and absence of hollows/.	No
Grantiella picta	Painted Honeyeater	V	V	A nomadic species that typically inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests with abundant mistletoe (DECC 2007). It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring *Amyema* sp mistletoe (DECC 2007).	0	Unlikely. Suitable habitat not present.	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	V		Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	2	Unlikely. Suitable habitat not present due to lack of foraging or nesting habitat.	No
Lathamus discolor	Swift Parrot	E1	CE	Box-ironbark forests and woodlands.	6	Unlikely. Suitable habitat not present due lack of suitable foraging trees.	No
Lophoictinia isura	Square-tailed Kite	V		Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	0	Unlikely. Suitable habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Neophema chrysogaster	Orange-bellied Parrot	E4A	CE	Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also small islands and peninsulas, saltworks, golf courses, low samphire herbland and taller coastal shrubland.	1	Unlikely. Suitable habitat not present.	No
Ninox strenua	Powerful Owl	V		Woodland, open sclerophyll forest, tall open wet forest and rainforest.	23	Unlikely. Suitable habitat not present.	No
Numenius minutus	Little Curlew		M	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	1	Unlikely. Suitable habitat not present.	No
Pandion cristatus	Eastern Osprey	V		Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	0	Unlikely. Suitable habitat not present.	No
Petroica boodang	Scarlet Robin	V		Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	0	Unlikely. Suitable habitat not present.	No
Ptilinopus superbus	Superb Fruit-Dove	V		Rainforest and closed forests. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	2	Unlikely. Suitable habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Rostratula australis	Australian Painted Snipe	E1	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (ibid.). Breeding is often in response to local conditions; generally occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (ibid.).	0	Unlikely. Suitable habitat not present.	No
Stagonopleura guttata	Diamond Firetail	V		Grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas and lightly wooded farmland.	1	Unlikely. Suitable habitat not present.	No
Stictonetta naevosa	Freckled Duck	V		Freshwater swamps and creeks, lakes, reservoirs, farm dams and sewage ponds.	4	Unlikely. Suitable habitat not present.	No
Tyto novaehollandiae	Masked Owl	V		Dry eucalypt forests and woodlands from sea level to 1100 m.	2	Unlikely. Suitable habitat not present.	No
Xenus cinereus	Terek Sandpiper	V	M	A rare migrant to the eastern and southern Australian coasts. The two main sites in NSW are the Richmond River estuary and the Hunter River estuary. Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	0	Unlikely. Suitable habitat not present.	No
Mammalia							

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	1	Unlikely. Suitable habitat not present due to highly modified vegetation and lack of nearby roosting habitat	No
Dasyurus maculatus	Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2007j), more frequently recorded near the ecotones of closed and open forest and in NSW within 200km of the coast. Preferred habitat is mature wet forest (Belcher 2000b; Green & Scarborough 1990; Watt 1993), especially in areas with rainfall 600 mm/year (Edgar & Belcher 2008; Mansergh 1984). Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable (Catling et al. 1998, 2000). This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).	0	Unlikely. Suitable habitat not present.	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E1	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.	0	Unlikely. Suitable habitat not present. No known local population.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	36	Unlikely.	No
Myotis macropus	Southern Myotis	V		Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20 m.	9	Unlikely. Study area not within 200 m of suitable waterbodies.	No
Petauroides volans	Greater Glider population in the Eurobodalla local government area	E2	V	Eucalypt forests and woodlands.	0	Unlikely. Suitable habitat not present.	No
Phascolarctos cinereus	Koala	V	V	Eucalypt woodlands and forests.	1	Unlikely. Suitable habitat not present.	No
Pseudomys novaehollandiae	New Holland Mouse		V	A small burrowing native rodent with a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. A social animal, living predominantly in burrows shared with other individuals. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha and the species peaks in abundance during early to mid-stages of vegetation succession typically induced by fire.	0	Unlikely. Suitable habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V**	**V**	**Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.**	**1138**	**Potential. Camp located 1 km to the north. Marginal foraging habitat within planted *Angophora costata*.**	**Yes. Trees to be removed (*Angophora costata*) provide foraging habitat.**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies. Typically roosts in hollow-bearing trees and has been known to also roost in caves.	1	Unlikely. Suitable habitat not present	No
Reptilia							
Hoplocephalus bungaroides	Broad-headed Snake	E1	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.	0	Unlikely. Suitable habitat not present.	No
Listed migratory species							
Apus pacificus	Fork-tailed Swift		M	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas.	0	Unlikely. Suitable habitat not present	No
Hirundapus caudacutus	White-throated Needletail		M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather.	1	Unlikely. Suitable habitat not present	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
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.	0	Unlikely. Suitable habitat not present.	No
Monarcha trivirgatus	Spectacled Monarch		M	Mountain / lowland rainforest, wooded gullies, riparian vegetation including mangroves.	0	Unlikely. Suitable habitat not present.	No
Motacilla flava	Yellow Wagtail		M	An insectivorous bird, inhabiting open country near water, such as wet meadows. It nests in tussocks.	0	Unlikely. Suitable habitat not present.	No
Myiagra cyanoleuca	Satin Flycatcher		M	Habitat typically includes wetter, denser forest, often at high elevations.	0	Unlikely. Suitable habitat not present.	No
Pluvialis fulva	Pacific Golden Plover		M	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	0	Unlikely. Suitable habitat not present.	No
Pluvialis squatarola	Grey Plover		M	Mudflats, saltmarsh, tidal reefs and estuaries.	4	Unlikely. Suitable habitat not present.	No
Rhipidura rufifrons	Rufous Fantail		M	It is a summer breeding migrant to southeastern Australia. It is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation. Open country may be used by the Rufous Fantail during migration.	0	Unlikely. Suitable habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence	Assessment of Significance required
Tringa nebularia	Common Greenshank		M	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	1	Unlikely. Suitable habitat not present.	No

M = Migratory, V= Vulnerable; E= Endangered, E2 = Endangered Population, CE = Critically Endangered, PE= Presumed extinct.

Appendix C BC Act Test of Significance: Grey-headed Flying fox

BC Act	Question	Response
7.3.1 a)	In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Factors likely to have an adverse effect on the life cycle of the Grey-headed Flying-fox would include a substantial loss and / or fragmentation of habitat or alteration of fire regime. The proposed development will result in impacts to two planted *Angophora costata* within the study area, considered to be potential foraging habitat for the Grey-headed Flying-fox. There is potential that two additional trees, *Angophora costata* and *Syzygium australe* may also be impacted and are considered potential foraging habitat for this species. No camps are located within the impact area. The Grey-headed Flying-fox is highly mobile and is likely to only utilise habitat within the study area on an occasional basis for foraging and dispersal. Considering the significant area of potential foraging habitat nearby at Centennial Park that is within the foraging range (up to 50 km from camps), the proposed development is unlikely to have an adverse effect on the lifecycle of the Grey-headed Flying-fox, such that a viable local population would be placed at risk of extinction.
7.3.1 b) i	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable.
7.3.1 b) ii	In the case of an endangered ecological community or critically endangered ecological community: Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	Not applicable.
7.3.1 c) i	In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity	Two planted *Angophora costata* trees will be removed as a result of the proposed works. Two additional trees, *Angophora costata* and *Syzygium australe* may also be impacted if the works encroach the root zone.
7.3.1 c) ii	In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of	The Grey-headed Flying-fox is a highly mobile species and impacts to two or four native planted trees in a highly urbanised area will not increase fragmentation or isolation of foraging habitat.

BC Act	Question	Response
	habitat as a result of the proposed development or activity	
7.3.1 c) iii	In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	The habitat to be removed is likely to only be used as an occasional foraging resource across a larger foraging and home range. No breeding habitat will be impacted. Considering the small proportion of potential habitat to be impacted within the study area (two native planted trees), the habitat to be removed is not considered critical to the long-term survival of this species within the locality.
7.3.1 d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	No critical habitat (declared areas of outstanding biodiversity value under the BC Act) has been declared for this species.
7.3.1 e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	One key threatening process is relevant to the proposed works, namely habitat loss from the clearing of native vegetation. The final determination for the Grey-headed Flying-fox identifies habitat loss as part of the decline of this species. Under the proposed works, the removal of up to four planted native trees is unlikely to exacerbate this key threatening process.
Conclusion	**Is there likely to be a significant impact?**	**No**

Appendix D EPBC Act Assessment of Significance: Grey-headed Flying fox

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	lead to a long-term decrease in the size of an important population of a species	No. An important population is defined as a population that is necessary for a species' long-term survival and recovery. The Grey-headed Flying-fox is considered to be one population that intermixes up and down the east coast, therefore any bat population is a meta-population of this one "important population". The proposed development will remove two native planted *Angophora costata* trees which provide potential foraging habitat for this species. There is potential that two additional trees, *Angophora costata* and *Syzygium australe* may also be impacted if the works encroach the root zone. Given the large areas of suitable foraging habitat nearby at Centennial Park, this loss of vegetation is unlikely to adversely affect the Grey-headed Flying-fox such that its population will be placed at risk of extinction.
2)	reduce the area of occupancy of an important population	No. The distribution of the Grey-headed Flying-Fox 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 in the form of two planted native trees from the study area would not reduce the area of occupancy of an important population of Grey-headed Flying-fox. The Grey-headed Flying-fox may occasionally forage within the study area.
3)	fragment an existing important population into two or more populations	No. The Grey-headed Flying-fox is a highly mobile species and forms one large intermixing population along the east Australian coast. No roosting habitat will be impacted, and large areas of foraging habitat are present in the locality. The proposed action will not fragment an existing important population into two or more populations.
4)	adversely affect habitat critical to the survival of a species	No. The potential foraging habitat impacted by the proposed development does not meet the criteria of habitat critical to survival, or essential habitat, for the Grey-headed Flying-fox as described in the Draft Recovery Plan for the Grey-headed Flying-fox 2009.
5)	disrupt the breeding cycle of an important population	No. The proposed action will not disrupt the breeding cycle of the Grey-headed Flying-fox given that the impacted vegetation is likely to be potential foraging habitat only.
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No. Grey-headed Flying-fox camps would not be removed or disturbed, and extensive foraging habitat exists in the region within large urban parkland areas. The proposed action will not modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion	Question	Response
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No. The site is already disturbed and highly urbanised. The proposed action will not result in the establishment of an invasive species that is harmful to the Grey-headed Flying-fox.
8)	introduce disease that may cause the species to decline, or	No. Grey-headed Flying-fox are reservoirs for the Australian bat lyssavirus and can cause clinical disease and mortality in Grey-headed Flying-fox. The proposed action would not increase the incidence of this disease.
9)	interfere substantially with the recovery of the species.	No. A Draft National Recovery Plan for the Grey-headed Flying-fox was developed in 2009. The relatively small amount of foraging habitat to be removed is unlikely to substantially interfere with the recovery of this species.
Conclusion	**Is there likely to be a significant impact?**	No. The proposal would result in the removal of two planted native trees considered to be potential foraging habitat for the species, therefore having a minimal impact on potential foraging habitat for the Grey-headed Flying Fox. The proposed action is not considered likely to have a significant impact given the extent of potential foraging habitat within the locality.

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