Flora and Fauna Assessment

64 Mackillop Drive Baulkham Hills

Prepared for
Aqualand Dee Why Developments Pty Ltd.

11 September 2017

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Contents

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List of figures

List of tables

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Abbreviations

Abbreviation	Description
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CEEC	Critically Endangered Ecological Community
DECC	Department of Environment and Climate Change (now OEH)
DotEE	Commonwealth Department of the Environment and Energy
ELA	Eco Logical Australia
EPA Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FM Act	*Fisheries Management Act 1994*
HBT	Hollow-bearing Tree
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
STIF	Sydney Turpentine Ironbark Forest
TEC	Threatened Ecological Community
THSC	The Hills Shire Council
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
VMP	Vegetation Management Plan
WoNS	Weeds of National Significance

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Executive summary

Eco logical Australia (ELA) has been commissioned by Aqualand Dee Why Development Pty Ltd (herein referred to as Aqualand) to prepare a Flora and Fauna Assessment (FFA) for a proposed development at Lots 1001 and 1002 on DP 1190982, 64 Mackillop Drive, Baulkham Hills NSW ("Subject Site") located within the Hills Shire Council (THSC) Local Government Area (LGA). This document reports on the ecological values within the study area and considers the impacts from the proposed works in relation to current environmental planning legislation.

Two threatened ecological communities were mapped on and to the south of the study area:

- Cumberland Plain Woodland (CPW) listed as a critically endangered ecological community listed under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016* (BC Act). The condition of this vegetation within the study area was classified as good, with a canopy cover greater than 10%; however as the understorey is > 50% exotic this vegetation does not satisfy the required condition for listing under the EPBC Act – within study area;
- Sydney Turpentine Ironbark Forest (STIF) listed as a critically endangered ecological community under the BC Act, and was in moderate to low condition. However, the condition did not satisfy the criteria for listing under the EPBC Act – to the south of the study area.

One threatened flora species *Grevillea juniperina* subsp. *juniperina* was identified during the site inspection. However this species was found to be located on land which has approved consent under previous Development Consent 6/2012/JP. No threatened flora species were recorded or were likely to occur within the study area. No threatened fauna species were recorded during field surveys. However, a number of habitat features, including hollow-bearing trees (HBTs) were identified within the study area and are likely to provide habitat for threatened fauna such as tree-roosting microchiropteran (microbat) species. Additionally, the canopy layer provides potential foraging for the *Pteropus poliocephalus* (Grey-headed Flying-fox).

The potential impact of the proposal on threatened species was assessed through application using Assessments of Significance (5-part test) pursuant to the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). These assessments concluded that the proposal is unlikely to have a significant impact on threatened flora and fauna, and therefore, a Species Impact Statement is not required.

Following consideration of the administrative guidelines for determining significance under the EPBC Act, it is considered that the proposal is unlikely to have a significant impact on any threatened fauna species.

Following a review of the BC Act framework and new assessment methodology required under the legislation, it was considered unlikely that a development application for this site (in its current form) would trigger the Biodiversity Offsets Schemes at the DA stage.

Avoidance and mitigation measures have been provided to reduce impacts to threatened species within and adjacent to the site (**Section 6**).

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1 Introduction

This Flora and Fauna Assessment (FFA) report has been prepared for the proposed development at 64 Mackillop Drive, Baulkham Hills, (Lot 1001 and Lot 1002 DP 1190982) (**Figure 1**). Aqualand has acquired the above site which has Development Consent 6/2012/JP dated 25 September 2013 for medium density residential development. Aqualand is investigating the feasibility of redeveloping Lots 1001 and 1002 for a higher residential density given the imminent North West Rail Line and nearby Norwest Station. This FFA assesses potential impacts of the proposed development, including direct and indirect impacts on flora and fauna listed under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act) and the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Potential impacts were assessed through application of the Assessment of Significance (section 7.3 of the Biodiversity Conservation Act 2016) and application of the EPBC Act Significant Impact Criteria. This report also identifies avoidance and mitigation measures to minimise impacts on threatened species (**Section 6**).

This report also considers the following THSC fact sheets and the Department of Environment and Climate Change (DECC now the Office of Environment and Heritage – OEH) assessment of significance guidelines:

- *Ecological Assessments for Proposed Developments* (THSC 2014a)
- *Development and Threatened Species* (THSC 2014b)
- *Threatened species assessment guidelines. The assessment of significance* (DECC 2007).

1.1 Proposal description

This Planning Proposal seeks to amend The Hills Local Environmental Plan 2012 to rezone the site from the current split zoning of R2 Low Density Residential and R3 Medium Density Residential to part R3 Medium Density Residential, part R4 High Density Residential, part RE1 Public Recreation and retain existing R2 Low Density Residential. This Planning Proposal includes amendments to the maximum building height development standards to allow varying heights of part 9m, part 12m and part 16m in the proposed R4 High Density Residential land and modifications to the heritage map. The Planning Proposal is accompanied by a masterplan which provides for approximately 110 medium density dwellings comprising of townhouses and small lot dwellings, approximately 270 apartments in low rise residential flat buildings, a public reserve and a communal space incorporating the heritage farmhouse and curtilage.

1.2 Impact assessment

The assessment of the impact of the proposal on threatened species and communities was undertaken using the following steps:

- Identification of known or potential habitat for threatened species or communities within and adjacent to the site.
- Assessment of the likely impact of the proposal on any threatened species or communities through Assessments of Significance and/or Significant Impact Criteria.
- Identification of any additional controls or mitigation measures that would be required to avoid a significant impact.

Assessments of Significance (5-part tests under s7.3 of the BC Act 2016) and EPBC Significant Impact Criteria assessment were undertaken for the threatened ecological communities and threatened species that could be potentially impacted by the project. These are provided in **Appendix C** and **Appendix D.**

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1.3 Key definitions

The following terminology has been adopted in this report:

- *Subject site*: the area of direct impact under the proposal i.e. the development footprint.
- *Study area*: includes area of direct and indirect impacts under the proposal (**Figure 1**) which includes the development footprint and the vegetation to be retained.
- *Locality:* a 5 km radius around the subject site

1.4 Site and locality

The study area is located on Lots 1001 and 1002 of DP 1190982 at 64 Mackillop Drive, Baulkham Hills within The Hills Shire LGA and is shown in **Figure 1**. The subject site is bounded by Mackillop Drive to the east and Barina Downs Road to the north. Areas outside of the study area directly to the south and south east, and some internal road infrastructure have previously been approved under the existing Development Consent 6/2012/JP

Under Development Consent 6/2012/JP, Condition 6 of the consent states:

> '*Approval is granted for the removal of only those trees affected by road and drainage works. Trees shall only be removed as required at each stage of the development. All other trees are to remain and are to be protected during all works. Suitable replacement trees are to be planted upon completion of construction.*'

Accordingly, issue of the Construction Certificate for the Civil Works package including internal road construction, and road widening and footpath construction along Barina Downs Road allows removal of affected trees. It should be noted that although previously approved for removal, design for the proposed development has sought to minimise impacts on trees along Barina Downs Road and internal roads to maintain native vegetation screening and preserve the Cumberland Plain Woodland ecological community. ELA have assessed the retaining wall drawing provided by Calibre (17-000013-SK44 dated 21/08/2017) and the development footprint provided by DKO (version F supplied by DKO 29/08/17) to assess the viability of retaining trees along Barina Downs Road (ELA, 2017).

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Figure 1: Location of the study area and indicative development layout

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2 Statutory Framework

Commonwealth and State legislation and policies, as well as local policies apply to the assessment, planning and management of ecological issues within the study area. A brief outline of the relevant Commonwealth and State Acts and Policies, and local policies, are provided below in **Table 1.**

Table 1: Legislative context

Name	Relevance to the project	Section in this report
Commonwealth		
Environmental 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 concludes that the development is not likely to have a significant impact on MNES.	Section 5 and Appendix B & C
State		
Biodiversity Conservation Act 2016 (BC Act)	The Biodiversity Conservation Act 2016 (BC Act) came into effect on 25 August 2017, changing the way biodiversity (ecological) impacts are assessed and approved in NSW. This includes a framework for the assessment methodology and introduces the new Biodiversity Offsets Scheme. Following a review of the BC Act framework and new assessment methodology required under the legislation, it was considered unlikely that a development application for this site (in its current form) would trigger the Biodiversity Offsets Scheme.	Section 5 and Appendix B & Appendix C
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.	Appendix B
Biosecurity Act 2015	The Biosecurity Act repealed the Noxious Weeds Act 1993 and provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans (RSWMP) developed for each region in NSW. Appendix 1 of each RSWMP identifies the priority weeds for control at a regional scale. However, landowners and managers must take appropriate actions to reduce the impact of problem weed species regardless of whether they are listed in Appendix 1 of the RSWMP or not as the general biosecurity duty applies to these species.	Section 4.6.5
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

Name	Relevance to the project	Section in this report
Planning Instruments		
The Hills Local Environment Plan 2012	The site is zoned RU2 and RU3, - Low density residential and Medium density residential respectively. Under the Hills Local Environment Plan (LEP) 2012. The objectives of this zones are: R2: • To provide for the housing needs of the community within a low density residential environment • To enable other land uses that provide facilities or services to meet the day to day needs of residents. • To maintain the existing low density residential character of the area R3: • To provide for the housing needs of the community within a medium density residential environment. • To provide a variety of housing types within a medium density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of residents and • To encourage medium density residential development in locations that are close to population centres and public transport routes The Biodiversity (Terrestrial) Clause 7.4 does not applies to the site.	Section 5.6
Hills Development Control Plan 2012	The Hills Development Control Plan 2012 contains provisions relating to residential development and the maintenance of bushland and biodiversity values.	Section 5.7

3 Methodology

3.1 Literature review and database search

- Threatened species database search tools:
  - Office of Environment and Heritage (OEH) Atlas of NSW Wildlife 5 km search radius (OEH 2017a) (Accessed July, 2017).
  - Department of the Environment and Energy (DotEE) Online search for Matters of National Environmental Significance (MNES) with 5km buffer around the study area (DotEE 2017a) (Accessed July, 2017).
- Previous vegetation mapping:
  - The Hills Shire Council Vegetation Mapping (THSC 2012).
- Soil Landscape (Chapman and Murphy 1989)
- Local Government Legislation:
  - The Hills Shire Council planning instruments
  - The Hills Local Environmental Plan (LEP) 2012
  - The Hills Development Control Plan(DCP) 2012, Part B Section 2 - Residential
- Previous reports:
  - Ambrose Ecological Services Pty Ltd. 2011. Bushland Rehabilitation Management Plan.

Aerial photography (Bing Maps and Google Earth) of the site and surrounds were also used to investigate the extent of vegetation cover and landscape features. In addition, relevant GIS datasets (soil, geology, drainage) were reviewed.

Species from both the Wildlife Atlas and DotEE online search were combined to produce a list of threatened species, populations and communities that may occur within the study area. The likelihood of occurrences for threatened species, populations and communities in the site 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 assessments and targeted surveys.

After the field inspections had been completed the likelihood of occurrence of each species, population or communities was determined again. This was based on the increase in knowledge about the extent and type of habitats and about which species were present on the site. The likelihood of occurrence of species, populations and communities following the field inspection is presented within the likelihood table in **Appendix B.**

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3.2 Field assessment

The field assessment was undertaken by ELA ecologists, Toni Frecker and Stacey Wilson on 7 August 2017. The purpose of the inspection was to:

- validate existing vegetation mapping (THSC 2012) and determine the condition of vegetation communities present and / or presence of any threatened ecological communities
- identify any habitat for any threatened flora and fauna species

The vegetation and habitat on the site was 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 was 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.

A plant species list is provided in **Appendix A**. Targeted surveys for threatened plants were not undertaken within the subject site. Other management issues such as weed infestations, pest species and dumping of waste materials was noted during the field surveys.

The location of some hollow-bearing (HBTs) trees was recorded using a hand-held GPS and the species of tree and dimension of the hollows were recorded. However, a comprehensive survey of HBTs outside of the subject site was not undertaken. Bird species and other fauna species were recorded opportunistically and no targeted fauna surveys were conducted. The location and type of habitat features such as drainage lines, fallen logs, rock outcrops, water bodies and signs of fauna such as scats, scratches and tracks were also recorded during the inspection.

3.2.1 Survey limitations

The field inspections were conducted outside of the optimal survey period for some flora and fauna. Thus, it is possible that flora and fauna species that may occur in the site were not recorded due to the life cycle and behaviour of species and seasonal considerations. Targeted surveys would need to be undertaken to more adequately capture the diversity of flora and fauna that could be use the study area. Since this was not possible, habitat assessments were undertaken to predict the likely presence of species. In addition, considering the habitat available on site, the condition of the vegetation and the proposed impacts, the survey effort was deemed satisfactory for the purposes of this report.

A conservative approach was also taken in assuming the presence of species that could potentially occur in the site (that is, species were assessed to have the potential to be present even if the potential for this was low).

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4 Existing environmental and ecological values

4.1 Landscape context and land use

The north west portion of the study area is currently used as residential accommodation for the Sisters of St Joseph and as function centre. The majority of the native vegetation in the study area has previously been previously cleared for use by grazing livestock. Areas along the access road (i.e the driveway) and around the heritage-listed buildings have been landscaped with exotic plantings (Ambrose Ecological Services, 2011). Residential properties adjoin the southern and western boundaries of the subject site. Surrounding development is mostly detached dwellings to the north with some multi dwelling housing development.

4.2 Soils and topography

The majority of the study area was located on Picton (Colluvial) soil landscapes. A small portion along the north of the study area contains Luddenham (Erosional) soil landscapes.

Picton (Colluvial) soil landscapes occur on steep low hills on fine textured Wianamatta Group shales, typically associated with tall open wet sclerophyll forest. Dominant tree species typically include *Eucalyptus saligna* (Sydney blue gum) and *Eucalyptus pilularis* (Blackbutt). Much of the vegetation has been extensively cleared for agricultural purposes and low density residential areas.

Luddenham soil landscapes also occur on undulating to rolling low hills. Underlain geology includes the Wianamatta Group Ashfield Shale and Bringelly Shale formations (Chapman & Murphy, 1989). Vegetation associated with Glenorie soils are characterised by dry, open sclerophyll forests dominated by *Eucalyptus maculata* (Spotted gum) and *Eucalyptus moluccana* (Grey box). Grazing is the dominant land use over much of this soil landscape. Increasing pressure for home-sites is resulting in more areas of this landscape changing from semi-rural to suburban land use.

4.3 Threatened ecological communities

During the desktop literature review (DotEE 2017a), six threatened ecological communities (TEC) were identified as having the potential to occur within the area and surrounds. These include:

- Castlereagh Scribbly Gum and Agnes Banks Woodland (Listed as Vulnerable under the BC Act and as Endangered under the EPBC Act).
- Cooks River / Castlereagh Ironbark Forest (Listed as Endangered under the BC Act and as Critically Endangered under the EPBC Act).
- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Listed as Critically Endangered under the BC and EPBC Act).
- Shale/Sandstone Transition Forest (Listed as Critically Endangered under both the BC and EPBC Acts).
- Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (Listed as Endangered under the BC Act and as Critically Endangered under the EPBC Act).
- Western Sydney Dry Rainforest and Moist Woodland on Shale (Listed as Endangered under the BC Act and as Critically Endangered under the EPBC Act).

A search for threatened species using the Protected Matters Search Tool and Atlas of NSW Wildlife (within a 5 km buffer around the study area) and the review of literature, identified a number of threatened

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flora species, threatened fungi and threatened fauna or migratory species that have the potential to occur within the study (**Appendix B**).

It should be noted that the results of the Protected Matters Search Tool, which have been included in **Appendix B**, is only a list of species based on habitat modelling. Therefore, not all species listed in **Appendix B** are shown on the maps in this report. The Atlas of NSW Wildlife database records of flora and fauna within 5 km of the site are shown in **Figure 2** and **Figure 3** respectively. It should be noted that some sensitive species cannot be displayed at this resolution. These species are noted on the figures.

4.4 Threatened flora species

The desktop review identified a total of 33 threatened flora species listed under the BC or EPBC Acts, which may have the potential to occur within a 5 km radius of the study area. An assessment of the likelihood of occurrence of threatened flora species within the impact assessment area is provided in **Appendix B** and was used to guide the site inspection methodology.

4.5 Threatened fauna species

The desktop literature review identified a total of 72 threatened fauna species listed under the BC, EPBC Act and Fisheries Management (FM) Acts, which may have the potential to occur within a 10 km radius of the study area. An assessment of the likelihood of occurrence of threatened flora species within the impact assessment area is provided in **Appendix B** and was used to guide the site inspection methodology. The threatened flora and fauna species that were identified as having a potential, likely or known occurrence in the site and that have potential to be impacted include:

Flora

- *Epacris purpurascens* var. *purpurascens* (Port Jackson heath)
- *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea)
- *Persoonia hirsuta* (Hairy Geebung)
- *Eucalyptus nicholii* (Narrow-leaved Black Peppermint)

Fauna

- *Falsistrellus tasmaniensis (Eastern False Pipistrelle)*
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Pseudophryne australis* (Red-Crowned Toadlet)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Pommerhelix duralensis* (Dural Land Snail).

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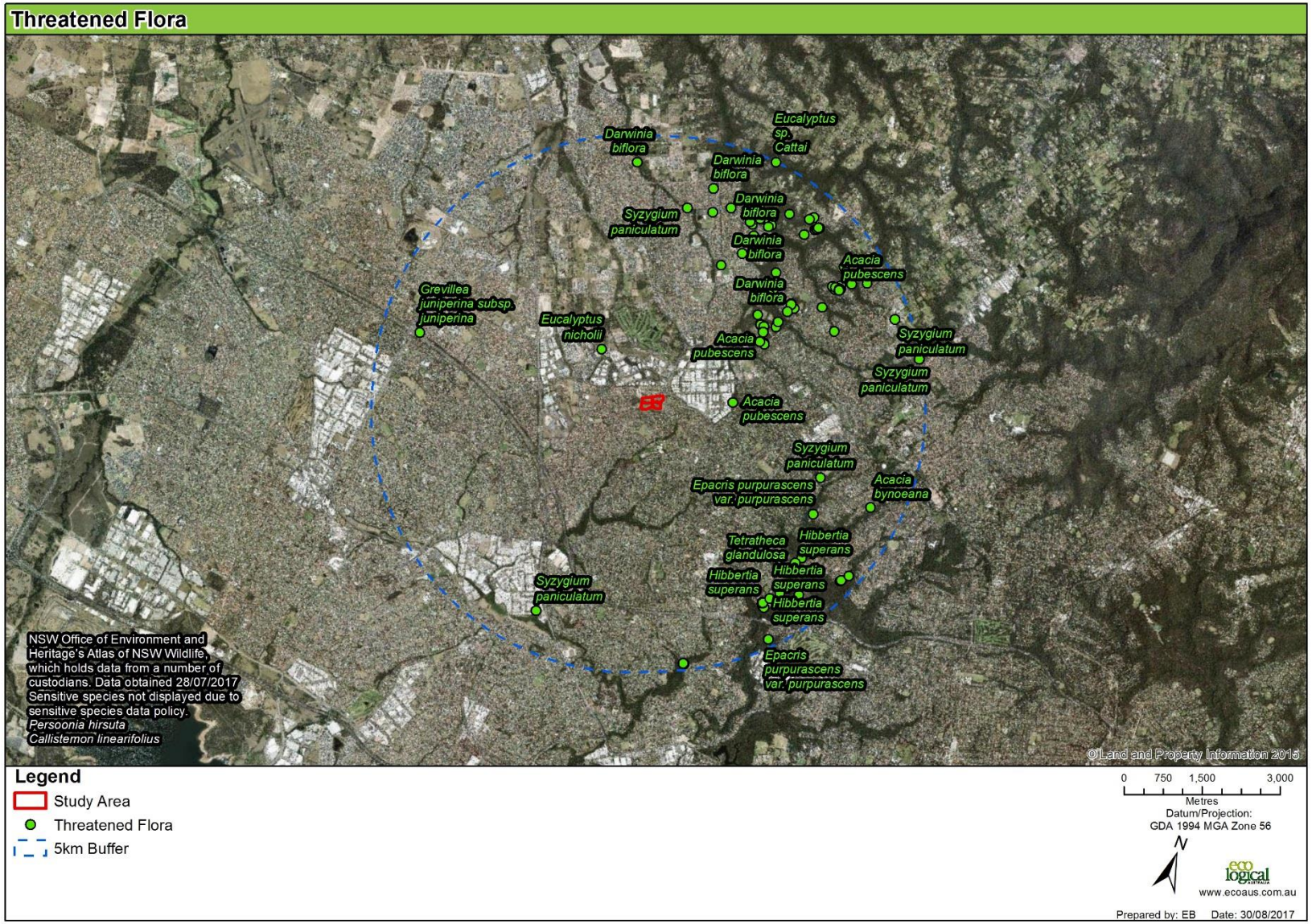

Figure 2: Atlas search records threatened flora within 5 km of the study area

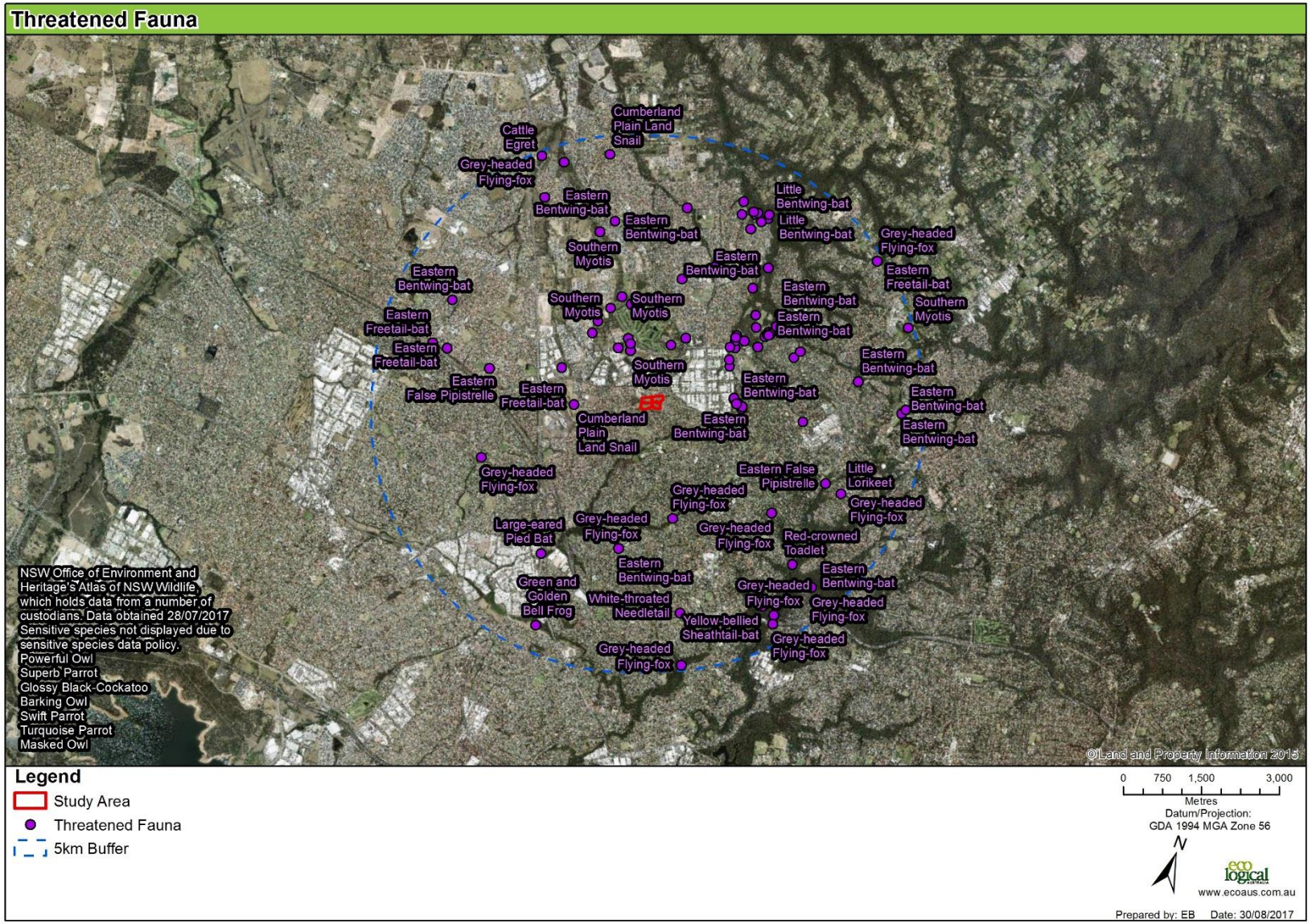

Figure 3: Atlas search records threatened fauna within 5 km of the study area

4.6 Vegetation communities

Previous mapping by THSC (2012) identified that the native vegetation in the study area contained Cumberland Plain Woodland (CPW) (**Figure 4**). CPW is listed as critically endangered under both the BC and EPBC Acts. A report by Ambrose Ecological Services, 2011 validated the patch of native vegetation adjacent to the driveway through the centre of the site as Cumberland Plain woodland, and the patch of vegetation in the south of the site as Sydney Turpentine Ironbark Forest (STIF), which is listed as an endangered ecological community under the BC Act and as critically endangered under the EPBC Act.

The site inspection undertaken by ELA ecologists confirmed that CPW exists in the northern patch of vegetation adjacent to the drive way and also includes two remnant trees in the north-east of the study area. ELA also confirmed the presence of STIF in the south of the study area. However this area is not as extensive as previously mapped by Ambrose Ecological Services, 2011 as many of the trees along the southern boundary were plantings and not part of the remnant community.

The validated vegetation mapping is shown in **Figure 5** and a plant species list is provided in **Appendix A.**

4.6.1 Cumberland Plain Woodland

The patch of CPW on site included large *Eucalyptus tereticornis* trees, and *Angophora floribunda* along the driveway. These trees are remnant and not part of the landscaped plantings. The CPW extends only to the canopy of these trees. A limited number of native grasses and forbs occur within 2m around the base of the tree trunks, but becomes exotic after this point and continues beyond the edges of the canopy. A mid-storey layer in this community is absent due to past clearing and ongoing maintenance (i.e. mowing). The ground covers which constituted the CPW on site included; *Wahlenbergia gracilis* (Sprawling Bluebell), *Microlaena stipoides, Dichondra repends (Kidney Weed), Aristida vagans, Cymbopogon refractus* (Barbed Wire Grass) (**Plate 1**).

Plate 1: Cumberland Plan Woodland in the north of the study area.

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4.6.2 Sydney Turpentine Ironbark Forest

The dominant canopy species consisted of *Eucalyptus crebra* (Narrow-leaved Ironbark), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus globoidea* (White Stringybarks), *Eucalyptus grandis* (Flooded Gum) and *Allocasuarina littoralis (*Black She-oaks). The STIF community on site lacks a mid-storey layer due to clearing in the past and current grazing activities. The ground layer species included native *Aristida vagans* (Threeawn Speargrass), *Glycine microphylla* (Small-leaf glycine), *Panicum simile* (Two-colour Panic) and *Microlaena stipoides* (Weeping Grass). The presence of exotic species is high in the mid-ground layer and included; *Sida rhombifolia* (Paddy's Lucerne), *Lantana camara*, *Senecio madagascariensis* (Fireweed), *Ehrharta erecta* (Panic Veldtgrass) and *Asparagus aethiopicus* (Asparagus Fern) (**Plate 2**).

Plate 2: Low condition Sydney Turpentine Ironbark Forest (STIF) in the south of the study area.

4.6.3 Weeds and exotics

Weeds and exotics occurred across the extensive cleared areas of the site. Exotic species across the study area included; *Bromus catharticus* (Prairie Grass) (), *Sida rhombifolia*, (Paddys Lucerne), *Paspalum dilatatum* (Paspalum), *Chloris gayana* (Rhodes Grass) *Protasparagus aethiopicus* (Asaparagus Fern), *Lantana camara* (Lantana) , *Pennisetum clandestinum* (Kikuyu), *Cinnamomum camphora* (Camphor Laurel, *Ageratina adenophora*, Crofton Weed, *Bidens pilosa* (Cobbler's Peg) *()*, *Hypochaeris radicata* (Catsears) and *Sonchus oleraceus* (Milk-thistle) (**Plate 3**).

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Plate 3: Extensive cleared, exotic grasslands.

4.6.4 Landscaped areas / existing development

Areas along the driveway, landscaped gardens around the building and the boundary areas of the subject site, have been landscaped with a mix of exotic and non-locally native plant species including F*lindersia australis* and *Stenocarpus sinuatus*. Landscape plantings included a mix of large trees and shrubs including: *Jacaranda mimosifolia* (Jacaranda), *Liquidamber styraciflua* (Liquidamber), *Erythrina x sykesii*, (Coral Tree), *Cotoneaste*r sp. (Cotoneaster) *Pinus radiata* (Monterey Pine), *Fraxinus pennsylvanica*) Green Ash and *Fraxinus griffithsii* (Griffith's Ash). Non-locally native trees that have been planted include (*Lophostemon confertus*, (Brush Box), *Corymbia citriodora* (Lemon-scented Gum), *Stenocarpus sinuatus* (Queensland Firewheel Tree), *Araucaria heterophylla (*Norfolk Island Pine) and *Melia azedarach (*White

Cedar) (**Plate 4**).

Plate 4: Landscaped plantings along access driveway.

4.6.5 Noxious weeds

The *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds. Under the Act all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Specific legal requirements apply to State determined priorities under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022. Weeds listed as 'other weeds of regional concern' under the plan warrant resources for local control or management programs and are a priority to keep out of the region. Inclusion in this list may assist Local Control Authorities and/or land managers to prioritise action in certain circumstances where it can be demonstrated the weed poses a threat to the environment, human health, agriculture etc.

Of the weeds identified during field surveys, five have been listed as State level priority weed and six species listed as other weeds of regional concern. The noxious weeds present, their priority listing under the Act, the associated asset / value at risk and whether they are Weeds of National Significance (WoNS), are presented in **Table 2.**

Table 2: State and Regional level priority weeds and other weeds of concern present across the site

Scientific Name	Common Name	WoNS	Management Objective
State-level Priority Weed			
Asparagus aethiopicus	Asparagus Fern	Yes	Asset protection
Bryophyllum species	Mother-of-millions	No	Asset protection
Lantana camara	Lantana	Yes	Asset protection
Rubus fruticosus agg. sp.	Blackberry	Yes	Asset protection
Senecio madagascariensis	Fireweed	Yes	Asset protection
Other weeds of regional concern		**Asset / value at risk**	
Bryophyllum species	Mother-of-millions	No	Environment, Agriculture, Human Health
Cinnamomum camphora	Camphor Laurel	No	Environment, Agriculture, Human Health
Cotoneaster glaucophyllus	Cotoneaster	No	Environment
Onopordum acanthium	Scotch Thistle	No	Agriculture
Andropogon virginicus	Whiskey Grass	No	Environment
Solanum mauritianum	Wild Tobacco	No	Environment, Agriculture

Asset protection: These Weeds are widely distributed in some areas of the State. As Weeds of National Significance, their spread must be minimised to protect priority assets.

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4.6.6 Threatened ecological communities

Two threatened ecological communities, Cumberland Plain Woodland (CPW) and Sydney Turpentine Ironbark Forest (STIF) were identified on site. CPW is listed as critically endangered under the BC and EPBC Act. STIF is listed as endangered under the BC Act and as critically endangered under the EPBC Act.

4.6.7 Threatened flora species

Two threatened flora species listed under the BC Act, *Grevillea juniperina* subsp. *juniperina* were recorded outside of the study area within a previously approved footprint (6/2012/JP). No other threatened flora species were found or were considered to have the potential to occur on site.

4.6.8 Threatened fauna species

No threatened fauna species were recorded on site. Based on the habitat features present on the site and a review of database records, the following species were considered likely to occur on the site and have potential to be impacted by the proposal:

- *Falsistrellus tasmaniensis (Eastern False Pipistrelle)*
- *Miniopterus schreibersii oceanensis (Eastern Bent-wing Bat)*
- *Mormopterus norfolkensis (Eastern Freetail-bat)*
- *Saccolaimus flaviventris (Yellow-bellied Sheathtail-bat).*
- *Scoteanax rueppellii (Greater broad-nosed-bat)*
- *Pteropus poliocephalus* (Grey-headed Flying-fox).

All the native vegetation on the site and the HBTs provide potential roosting and foraging habitat for threatened microbats. The presence of *Ficus* spp. on site was also considered potential foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox).

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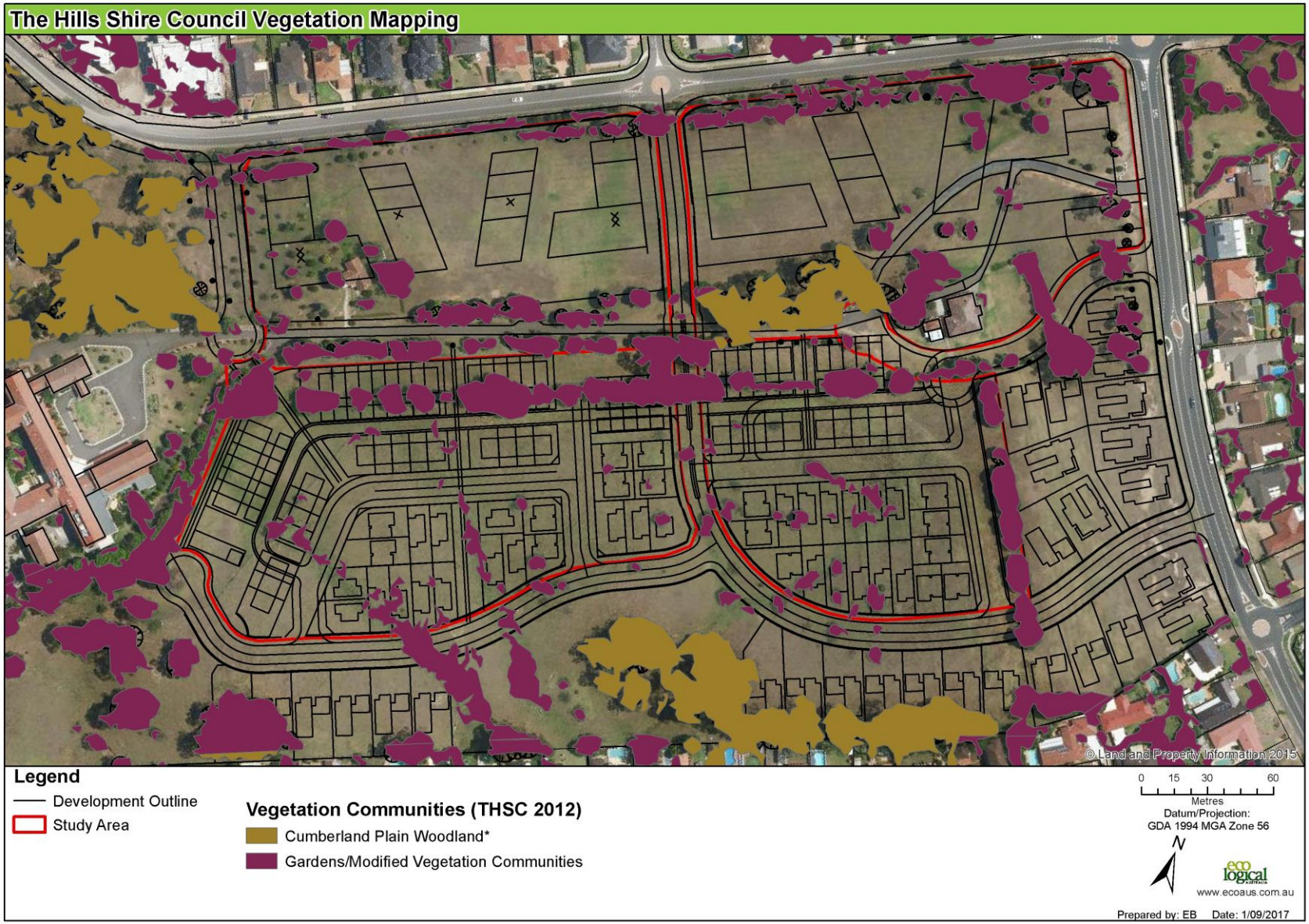

Figure 4: Previous Vegetation Mapping (THSC 2012).

4.6.9 Field survey results

An assessment of the habitat features was used to determine the suitability of the study area to support populations of fauna species, including threatened species. Assessment included opportunistic fauna observations, indirect evidence such as scats, scratch marks or observation of important foraging or breeding habitats.

No threatened fauna species were recorded within the study area. However, suitable habitat features which may be utilised by threatened species were recorded within the study area. One dead stag and ten hollow-bearing trees (HBTs) were recorded during field surveys. These habitat features may provide roasting or breeding habitat for highly mobile species such as microchiropteran (microbat) species, possums/gliders, reptiles and bird species. This may include a number of threatened microbat species which have been recorded within the locality of the study area (refer to **Figure 2**). The subject site contained limited habitat resources with large exotic grassland and scattered trees contributing as the main fauna resources present.

4.6.10 Wildlife connectivity corridors

The Hills Shire Council has a Terrestrial Biodiversity overlay which maps areas of high biodiversity and ecological value across the local government area (Hills LEP 2012 clause 7.4). The Terrestrial Biodiversity layer does not include the vegetation within the study area or the adjoining properties.

Although the vegetation within the study area does not form part of THSC Terrestrial Biodiversity layer, the vegetation is likely to assist in the disbursement of fauna species into adjacent habitats.

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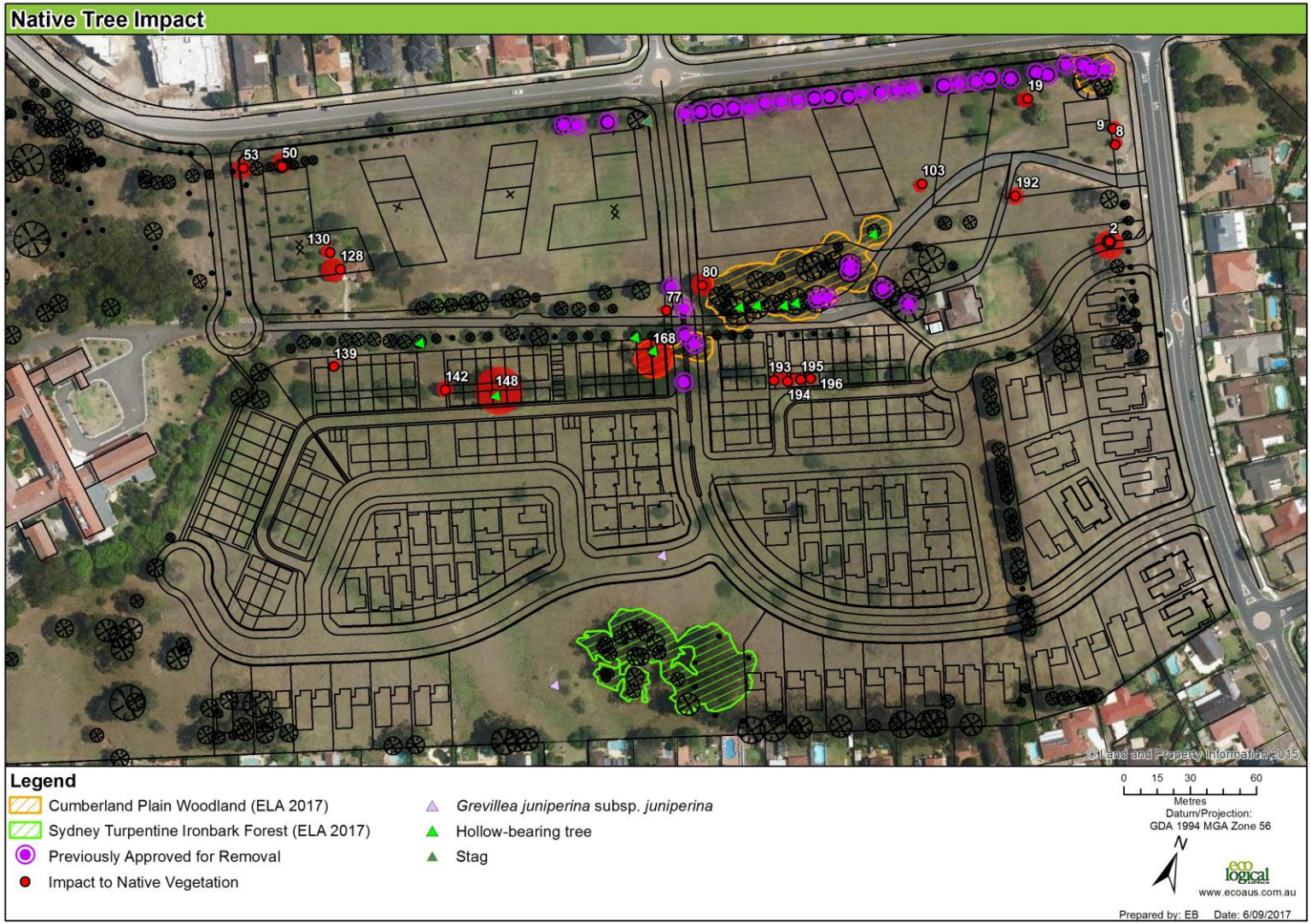

Figure 5: ELA validated vegetation and native trees impacted by the development footprint.

5 Impact Assessment

5.1 Introduction

The proposed development footprint has avoided the patches of higher quality CPW vegetation recorded in the north-east corner of the site and the CPW recorded adjacent to the existing driveway (**Figure 5**) and has utilised previously cleared landscape. However, impacts to some native vegetation will occur as a result of the proposed development. Some of these impacts may be mitigated through management measures provided in Section 6 and through the effective management of the remaining STIF vegetation retained within the 'Public Reserve Open Space' lot 1001.

The potential impact of the proposal to selected threatened species and communities listed under the BC Act was assessed by undertaking Assessments of Significance (**Appendix C**). The potential impact of the proposal to selected threatened species and communities listed under the EPBC Act was assessed by applying Significant Impact Criteria (**Appendix D**).

According to the DECC (2007) guidelines, unless adequate surveys have been undertaken to show that a threatened species, population or community does not occur on the site, then that species, population or community "should be considered in the rationale that determines the list of threatened species, populations and ecological communities for the assessment of significance" (DECC 2007). Accordingly, the threatened or migratory species for which targeted surveys have not been undertaken have been considered in the rationale that determines the list of species that require an assessment of significance. The rationale is based on the level of knowledge of habitats on the site and the potential for threatened species to occur, which is provided in the likelihood table in **Appendix B.**

THSC (2014a) requires that the assessor conducting an impact assessment undertake a sufficient level of survey for threatened or migratory species or populations on the site and describe and justify the suitability of the survey methods employed. The survey methods are described in **Section 3**. The field inspection and subsequent habitat assessment was considered sufficient in determining the likelihood of threatened species or migratory species occurring and was used to inform the impact assessments.

Species were selected for the assessment of significance by considering how they and their habitat might be affected by the proposal. Some species which are wide-ranging, mobile and breed in habitat not present on the site may still occur on the site from time to time e.g. some highly mobile birds. The proposal would not affect any habitat that is important to the survival of these species and therefore no Assessment of Significance or Significant Impact Criteria were applied.

Assessments of Significance and Significant Impact Criteria were applied to those species and communities for which the proposal has the potential to significantly impact on their breeding, movement or foraging habitat or resources. Where such species had potential habitat on the site but no adequate targeted surveys could be undertaken to show that they do not occur, they were assumed to be present and Assessments of Significance were undertaken or Significant Impact Criteria were applied (DECC 2007).

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5.2 Direct impacts

5.2.1 Clearing of native vegetation

0.12 ha of native vegetation to NSW will be removed for the proposed development. This includes a mixture of remnant trees and landscape plantings (ELA 2017 Arborist report). This vegetation contains limited habitat resources for threatened species. The vegetation to be removed occurs as single trees with low species diversity directly under the base of these trees. Approximately 0.02 ha of CPW consisting of a single *E. tereticornis* tree (listed under the BC Act) will be removed.

The development has predominantly utilised cleared areas or vegetation in poor condition and therefore minimised impacts to CPW mapped on site. Although some single native trees will be removed, the majority remnant CPW will be avoided and the STIF will be retained within the study area. The impact of the clearing of native vegetation and loss of habitat for fauna species has been addressed in the following section. The direct impacts associated with the clearing of vegetation for the proposed development footprint is shown in **Figure 5.**

5.2.2 Removal of potential habitat for threatened species

There is potential that up to two HBTs and one stag (standing dead tree) may be removed as part of the proposed development. Two HBTs are located in close proximity to the proposed driveway and one dead stag is within close proximity to proposed dwellings and will require removal under the current proposal. As a precautionary approach, it has been taken to include both HBTs and the stag for removal as part of this impact assessment.

The remaining seven HBTs will be retained in the study area. A significant proportion of the hollows identified within the study area have a small entrance and may provide suitable roosting or breeding habitat for threatened microbats. The loss of tree hollows is listed as a Key Threatening Process (KTP) in the decline of native biodiversity. Recommendations have been provided in **Section 6** and include the installation of nest boxes to mitigate the loss of HBTs.

5.3 Indirect impacts

Potential indirect impacts may result from the proposed development and may include:

- Changes to hydrology through run off, sedimentation and erosion from construction works.
- Increased edge effects (including spread of weeds), due to the increase in human habitation and human access to the vegetation within the study area.
- Increased runoff through impervious surfaces and stormwater runoff.
- Increased presence of domestic pets.
- Rubbish dumping.

5.4 Key threatening processes

A number of Key Threatening Processes (KTPs) listed under the BC Act and / or EPBC Act are likely to be relevant to the proposed works. These include:

- Clearing of native vegetation (BC Act) / Land clearance (EPBC Act).
- Invasion of native plant communities by exotic perennial grasses (BC Act).
- Removal of dead wood and dead trees (BC Act).
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition (BC Act).

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5.5 EPBC Act Significant Impact Criteria

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 Department of the Environment and Energy (DotEE) which is responsible for administering the EPBC Act. The process includes conducting a significant impact criteria assessment for listed matters of NES that may be impacted by the proposal. Significant impact guidelines (DotE 2013) have been developed by the Commonwealth, to provide assistance in conducting the Assessment of Significance and to outline criteria to determine whether or not a referral to the Commonwealth is required.

Two TECs, CPW and STIF were recorded during the site inspection. However, the condition of vegetation for these communities did not meet the stringent criteria required for listing under the EPBC Act. Therefore, an assessment under the EPBC Act for the two communities were not required.

The habitat assessment identified potential foraging habitat for the Grey-headed Flying-fox and taking the precautionary principle, a Significant Impact Criteria assessment was conducted (**Appendix D**). The assessment concluded that a significant impact is not likely to occur as a result of the proposed works. It is noted that some threatened fauna species may utilise the site intermittently as marginal foraging habitat. However, these species are highly mobile and the amount of habitat to be impacted is negligible in comparison to the availability of similar habitat in the adjacent landscape and locality and so the Significant Impact Criteria assessment was not conducted for these highly mobile fauna species.

5.6 The Hills Shire Council Local Environmental Plan (2012)

The Hills Local Environmental Plan (LEP) 2012 aims to guide the orderly and sustainable development of The Hills, balancing its economic, environmental and social needs. Specific ecological aims include to preserve and protect the natural environment of The Hills and to identify environmentally significant land for the benefit of future generations. Under this LEP, the study area is zoned as R2 (Low density residential) and R3 (Medium residential residential) and permits a mix of dual occupancies and dwelling houses, and multi dwelling housing with consent. There are no 'values' recorded on councils terrestrial biodiversity overlay for the site (Clause 7.4).

5.7 The Hills Shire Council Development Control Plan (2012)

The study site is also subjected to The Hills Development Control Plan, Part B Section 2 (2.8), which contains considerations for bushland and biodiversity in residential areas.

The objective of the clause is to:

(i) To conserve and protect the biodiversity of the Shire including habitats of threatened flora and fauna species and communities in accordance with Council's ESD objective 1 and 4.

The development controls relating to biodiversity are:

(a) Significant flora and fauna species, communities and ecological communities should be preserved.

(b) Development should be designed to retain existing bushland and fauna habitats, including identifiable corridors and linkages.

In conformation with Development Control Plan (s2.2.8 (a and b), the revised lot layouts and building envelopes, and the Public Reserve Open Space ensure the protection of the landscape, biodiversity by consolidating and protecting the most viable biodiversity values within the site; and to minimise impacts to these key biodiversity values.

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The CPW identified on site is avoided by the Conceptual masterplan and the STIF on site will be retained within the Public Reserve Open Space and should be managed under a Vegetation Management Plan. The VMP will detail the specifications for weed control and how this will be managed in perpetuity.

5.8 Biodiversity Conservation Act 2016 and Biodiversity Offsets Scheme

The Biodiversity Conservation Act 2016 (BC Act) came into effect on 25 August 2017, changing the way biodiversity (ecological) impacts are assessed and approved in NSW. This includes a framework for the assessment methodology and introduces the new Biodiversity Offsets Scheme.

Cumberland Plain Woodland and Sydney Turpentine Ironbark Woodland are listed as Critically Endangered Ecological Communities.

Section 6.5 of the BC Act introduces the concept of 'Serious and Irreversible Impacts' (SAII). Section 7.16 of the Act states that the consent authority must refuse consent for local development (under Part 4 of the EP&A Act 1979) which has SAII. Whilst CPW has been listed as a candidate community for SAII, neither the OEH nor The Hills Council have provided any guidance for what would be considered SAII for this community. ELA believes it unlikely that an impact of 0.02 ha would be considered a SAII however this cannot be confirmed until guidance is provided by OEH or THC.

Following a review of the BC Act framework and new assessment methodology required under the legislation, it was considered unlikely that a development application for this site (in its current form) would trigger the Biodiversity Offsets Schemes, and therefore, impacts from the proposal will not require offsets. The proposal was not considered to meet the Biodiversity Offsets Schemes thresholds or 'test of significance' requirement, because:

- Less than 0.25 ha of native vegetation will be removed.
- There will be no impacts to sensitive areas identified on the Biodiversity Values Lands Map.
- A 'test of significance' to trigger the Biodiversity Offsets Scheme was not considered necessary, or required for other threatened species, ecological communities or their habitats.

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6 Avoidance and mitigation measures

The following measures are designed to minimise potential impacts from works associated with clearing native vegetation for the masterplan.

6.1 Avoidance

The current proposal has been designed to avoid threatened ecological communities and also where possible, been designed to avoid the sensitive habitats of threatened species such as HBTs. The main measure that will ameliorate potential impacts on threatened species is the avoidance of habitat in the small patch of STIF forest in the study area which will be retained as Public Open Space. The Public Open Space will retain a proportion of potential habitat on the site for threatened species.This area will be managed for biodiversity according to the Vegetation Management Plan (VMP).

6.2 Mitigation

A number of general mitigation measures will be implemented which will reduce the potential impact on threatened species listed under the BC Act and EPBC Act. Specific mitigation measures that relate to specific sensitive areas, threatened species and threatened ecological communities are outlined in the tables below in this section. These measures are relevant for DA and construction stages.

The following mitigation measures should be implemented as part of the construction process:

- Prior to works commencing, marking out of boundaries of the disturbance footprint by an ecologist so that works do not encroach into areas that have been designated for Public Reserve Open Space.
- Supervision of works by an ecologist to ensure that clearing is restricted to the marked out areas.
- Management of the introduction of weed propagules in the site through washing down of equipment prior to their use.
- Temporary tree protection measures (such as machinery exclusion zones from tree roots or tree trunk protection) should be in place during any construction works, if trees are to be retained on site and to protect adjacent native vegetation.
- Establishment of clearly defined areas, such as the works area and any 'no-go' areas within/adjacent to work site boundaries that are not to be in any way disturbed or damaged by the works (e.g. native vegetation to the east of the site).
- Construction fencing pre-construction and during construction to ensure that related impacts are contained within the work areas.
- Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior the commencement of the construction work.
- Soil and erosion measures should be inspected regularly (weekly at least), more often during rain periods to ensure that they are in proper working order.
- No chemicals or rubbish should be allowed to escape the construction area.
- All chemicals should be correctly stored within bunding.
- It is recommended that the patch of CPW to be retained should also be included under a VMP. The VMP would include details on the specifications for weed control, pest management, seed collection and revegetation techniques. This measure would help to mitigate indirect impacts to both STIF and CPW such as increase in rubbish, trampling, increased weed presence etc.

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- Regular monitoring of cleared areas and the Public Reserve Open Space after heavy rainfall and follow-up work to repair/install erosion and sedimentation controls.
- Pre-clearing surveys for tree felling which will minimise impacts to fauna and relocate any fauna or take injured fauna to the veterinary or WIRES.

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7 Conclusion

Eco Logical Australia Pty Ltd (ELA) was commissioned to prepare a Flora and Fauna Assessment report for a Gateway Approval Pathway for the proposed redevelopment into higher residential dwellings at 64 Mackillop Drive, Baulkham Hills (the study area). ELA conducted an assessment of the ecological values of the study area and assessed the direct and indirect impacts of the clearing of native vegetation.

Where possible the proposed development has utilised cleared and exotic areas. Under the proposed development 0.12 ha of native vegetation, including 0.02 ha of CPW listed under the BC and EPBC Act will be removed. No impacts to STIF forest are expected under the current development proposal. The remaining patches of CPW on site (approximately 0.28 ha) will be avoided by the development and 0.22 ha of STIF will be retained within Public Open Space within the study area.

Recommendations were provided in **Section 6** of this report and include the implementation of a VMP to reduce weed infestations and establish native species diversity within the patch of STIF.

One threatened flora species was recorded within the study area. This species was found in the proposed road corridor which has approval Under Development Consent 6/2012/JP. No other threatened flora or fauna species were recorded during the field survey.

The vegetation within the study area may provide roosting / breeding and foraging habitat for microbats and foraging for the Grey-headed Flying-fox. Assessments of significance have been undertaken for one TEC and four threatened fauna which may be impacted under the proposal. These assessments are provided in **Appendix C** and **Appendix D**. The outcome of the assessments determined that the proposed development is unlikely to have a significant impact on threatened species or TECs, therefore a Species Impact Statement would not be required.

Implementation of the mitigation measures provided in **Section 6** will assist in the protection of threatened fauna habitat, CPW and STIF within the study area.

Following a review of the BC Act framework and new assessment methodology required under the legislation, it was considered unlikely that a development application for this site (in its current form) would trigger the Biodiversity Offsets Schemes, and therefore, impacts from the proposal will not require offsets. The proposal was not considered to meet the Biodiversity Offsets Schemes thresholds or 'test of significance' requirement, because:

- Less than 0.25 ha of native vegetation will be removed.
- There will be no impacts to sensitive areas identified on the Biodiversity Values Lands Map.
- A 'test of significance' to trigger the Biodiversity Offsets Scheme was not considered necessary, or required for other threatened species, ecological communities or their habitats.

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Appendix A : Species recorded on site

Scientific Name	Common Name
Flora	
Acacia decurrens	Black Wattle
Agapanthus sp.*	-
Allocasuarina torulosa	Forest Oak
*Andropogon virginicus**	Whiskey Grass
Angophora floribunda	Rough-barked Apple
Aristida ramosa	Purple Wiregrass
Aristida vagans	Three-awn Speargrass
*Asparagus aethiopicus**	*Asparagus Fern*
Austrostipa sp.	-
*Bidens pilosa**	Cobbler's Peg
Bothriochloa sp.	-
Briza sp.*	-
Bryophyllum delagoense	Mother of Millions
*Bryophyllum delagoense**	Mother of Millions
Callistemon sp.	-
*Cinnamomum camphora**	Camphor Laurel
*Cinnamomum camphora**	Camphor laurel
Cirsium sp.*	-
Conyza bonariensis	Flaxleaf Fleabane
Cotoneaster sp.	-
Cotula sp.*	-
Cymbopogon refractus	Barbed Wiregrass
Dichelachne sp.	-
Dichondra repens	Kidney Weed
*Ehrharta erecta**	Panic Veldtgrass
Einadia hastata	Berry Saltbush
Eragrostis brownii	Common Lovegrass
Erythrina x sykesii	Coral Tree
Eucalyptus crebra	Narrow-leaved Ironbark

Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus microcorys	Tallowwood
Eucalyptus moluccana	Grey Box
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus tereticornis	Forest Red Gum
Ficus sp.	Fig Tree
*Gardenia jasminoides**	Cape Jasmine
Geranium homeanum	Northern Cranesbill
Gleichenia microphylla	Scrambling Coral Fern
Glycine tabacina	Variable Glycine
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea
Hydrocotyle sp.*	-
*Hypochaeris radicata**	Catsear
Lagerstroemia sp.*	Crepe myrtle
Lagunaria sp.*	Norfolk Island Hibiscus
*Lantana camara**	Lantana
Lophostemon confertus (Planted)	Brush Box
Magnolia sp.	-
Melaleuca decora	White Feather Honeymyrtle
Microlaena stipoides	Weeping Grass
*Nerium oleander**	Oleander
*Nothoscordum inodorum**	Onion Weed
*Onopordum acanthium**	Scotch Thistle
*Opuntia stricta**	Prickly Pear
Panicum simile	Two-coloured Panic
Paspalidium distans	-
*Paspalum dilatatum**	Dallisgrass
*Pennisetum clandestinum**	Kikuyu Grass
Pinus sp.	
Pittosporum undulatum	Sweet Pittosporum
*Plantago lanceolata**	Lamb's Tonuge

Podocarpus sp.*	-
Rubus fruiticosus sp. aggregate	Blackberry
Sedge (sample)	-
*Senecio madagascariensis**	Fireweed
Setaria sp.*	-
*Sida rhombifolia**	Paddy's Lucerne
Sigesbeckia orientalis	Indian Weed
*Solanum mauritianum**	Wild Tobacco
*Solanum mauritianum**	Wild Tobacco Bush
*Solanum nigrum**	Blackberry Nightshade
Solanum prinophyllum	Forest Nightshade
*Sporobolus fertilis**	Giant Parramatta Grass
*Stellaria media**	Chickweed
*Stenocarpus sinuatus**	Queensland Firewheel Tree
Verbena sp.*	-
*Vicia sativa**	Common Vetch
Wahlenbergia gracilis	Sprawling Bluebell
Yellow daisy (photo) Toni	-
Fauna	
Acridotheres tristis	Common myna
Ardea ibis	Cattle Egret
*Bos taurus**	Domestic cattle
Cacatua galerita	Sulphur-crested cockatoo
Cacatua sanguinea	Little Corella
Grallina cyanoleuca	Magpie-lark
Hirundo rustica	Barn swallow
Malurus cyaneus	Superb Fairy Wren
Trichoglossus moluccanus	Rainbow Lorikeet

** Denotes exotic / introduced species*

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:

- "yes" - 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.

An assessment of significance was conducted for threatened species or ecological communities that were recorded within the site or had a higher likelihood of occurring and were not recorded during the site visit and that potential to be significantly impacted. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the site 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, an assessment of significance in reference to State or Commonwealth legislation was not considered necessary.

Note, that assessments for the likelihood of occurrence were made both prior to site inspection and following site inspection. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which sorts of habitat to look for during site inspection. The post-survey assessments to determine "final affected species" were made after observing the available habitat in the site and are depicted in the table below.

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

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database (DotEE 2017a) and the NSW Threatened Species Profiles (OEH 2017b).

Table 3: Threatened ecological communities 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	EEC	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.*	No. Not recorded during site inspection.	No
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	E	CEEC	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.	No. Not recorded during site inspection.	No

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence	Assessment of Significance required
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	CEEC	CEEC	Has an open forest structure and occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel. A transition plant community which grades into Cumberland Plain Woodland where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick. Was not recorded during the site inspection s.	Yes. Recorded during site inspection	No
Shale/Sandstone Transition Forest	CEEC	CEEC	Occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. It typically occurs in moderately wet sites, with an annual rainfall of 800-1100mm per year, and on clay soils derived from Wianamatta shale. The tree canopy is dominated by Turpentine and a variety of eucalypt species. Its distribution is mainly on the Cumberland Plain of the Sydney region. Was not recorded during the site inspection s.	No. Not recorded during site inspection.	No.
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	EEC	CEEC	Open forest, with dominant canopy trees including *Syncarpia glomulifera* (Turpentine), *Eucalyptus punctata* (Grey Gum), *Eucalyptus paniculata* (Grey Ironbark) and *E. eugenioides* (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) *E. saligna* (Sydney Blue Gum) is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Polyscias sambucifolia* (Elderberry Panax). Occurs close to the Shale/Sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaux. A transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.	Yes. Recorded during site inspection.	No

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence	Assessment of Significance required
Western Sydney Dry Rainforest and Moist Woodland on Shale	EEC	CEEC	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.	No. Not recorded during site inspection.	No.

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

Table 4: Threatened flora species likelihood of occurrence table

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
Acacia bynoeana	Bynoe's Wattle	E1	V	*Acacia bynoeana* is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains, and has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels.	3	Potential. Suitable habitat present.	No, not detected during survey
Acacia gordonii	-	E1	E	Sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops.	1	Unlikely. Not observed during site inspection. Suitable habitat limited within impact area.	No. Habitat limited in impact area and negligible compared to available habitat in locality.
Acacia pubescens	Downy Wattle	V	V	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.	14	No, not detected during survey	No
Allocasuarina glareicola	-	E1	E	Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis*, *Eucalyptus fibrosa*, *Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora*.	0	Unlikely. Not observed during site inspection. Suitable habitat	No. Habitat limited in impact area and negligible compared to

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
						limited within impact area.	available habitat in locality.
Asterolasia elegans	-	E1	E	Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys.	0	Unlikely. Not observed during site inspection. Suitable habitat limited within impact area.	No. Habitat limited in impact area and negligible compared to available habitat in locality.
Callistemon linearifolius	Netted Bottlebrush	V	-	Grows in dry sclerophyll forest on the coast and adjacent ranges.	1	Unlikely. Not observed during site inspection	No. Suitable habitat not present.
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	0	Unlikely. Suitable habitat not present.	No.
Darwinia biflora	-	V	V	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	89	Potential, suitable habitat present.	No. Not recorded in impact area.
Dillwynia tenuifolia	-	V	-	Occurs in vegetation similar to Cumberland Plain Woodland, on Wianamatta Shale soils.	0	No. No suitable habitat.	No.
Epacris purpurascens var. *purpurascens*	-	V		Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	226	Potential. Suitable habitat available.	No. Habitat limited in impact area and negligible compared to

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
							available habitat in locality.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Dry grassy woodland, on shallow soils of slopes and ridges of the Northern Tablelands.	6	No. No suitable habitat.	No.
Eucalyptus camfieldii	Camfield's Stringybark	V	V	Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	1	No. No suitable habitat.	No.
Eucalyptus scoparia	Wallangarra White Gum	E	V	Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	1	No. No suitable habitat.	No.
Eucalyptus sp. *Cattai*	-	E1	-	"Scrub, heath and low woodland on sandy soils, generally on ridge tops on laterised clays overlying sandstone."	8	Unlikely. Not observed during site inspection	No. Conspicuous species. Not recorded during site inspection
Genoplesium baueri	Bauer's Midge Orchid	E1	E	Dry sclerophyll forest and moss gardens over sandstone.	0	Unlikely. Not observed during site inspection	No. Suitable habitat not present.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	V	-	Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest, on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.	10	Yes observed during site inspection	No. Suitable habitat not present due to grazing livestock and continuous

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
							maintenance (i.e mowing)
Grevillea parviflora subsp. *supplicans*	-	E1	-	Heathy woodland associations on skeletal sandy soils over sandstones.	0	Unlikely. Not observed during site inspection. Suitable habitat very limited within development site	No. Habitat limited in impact area and negligible compared to available habitat in locality. Not recorded during site inspection
Hibbertia superans	-	E1	-	Open woodland and heathland, and appears to prefer open disturbed areas.	94	Unlikely. Not observed during site inspection. Suitable habitat very limited within development site	No. Habitat limited in impact area and negligible compared to available habitat in locality. Not recorded during site inspection
Lasiopetalum joyceae		V	V	Heath on lateritic to shaley ridgetops over sandstone.	0	Unlikely. Not observed during site inspection. Suitable habitat very limited within development site	No. Habitat limited in impact area and negligible compared to available habitat in locality. Not

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
							recorded during site inspection
Leucopogon fletcheri subsp. *fletcheri*	-	E1		Dry eucalypt woodland or in shrubland on clayey lateritic soils, generally along ridges and spurs.	6	Unlikely. Not observed during site inspection. Suitable habitat very limited within development site	No. Habitat limited in impact area and negligible compared to available habitat in locality. Not recorded during site inspection
Melaleuca deanei	Deane's Paperbark	V	V	Heath on sandstone.	3	Unlikely. Not observed during site inspection. Suitable habitat very limited within development site	No. Habitat limited in impact area and negligible compared to available habitat in locality. Not recorded during site inspection
Olearia cordata	-	V	V	Open sclerophyll forest and open shrubland, on sandstone ridges.	0	Unlikely. Not observed during site inspection	No. Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
Pelargonium sp. *Striatellum* (G.W Carr 20345)	Omeo Stork's-bill	E	E	In NSW, *Pelargonium* sp. *Straitellum* (G.W. Carr 10345) is known from the Southern Tablelands. Otherwise, only known from the shores of Lake Omeo near Benambra in Victoria where it grows in cracking clay soil that is probably occasionally flooded.	0	Unlikely. Suitable habitat not available.	No.
Persoonia hirsuta	Hairy Geebung	E1	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	14	Unlikely. Suitable habitat not available.	No.
Persoonia mollis subsp. *maxima*	-	V	V	Dry to wet sclerophyll forest, in deep sheltered gullies or steep upper hillsides on Hawkesbury Sandstone.	1	Unlikely. Suitable habitat not available.	No.
Pimelea curviflora var. *curviflora*	-	V	V	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	15	Unlikely. Suitable habitat not available.	No.
Pimelea spicata	Spiked Rice-flower	E1	E	"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."	76	Unlikely. Not observed during site inspection	No. Suitable habitat not present.
Pterostylis gibbosa	Illawarra Greenhood	E1	E	Open forest or woodland, on flat or gently sloping land with poor drainage.	0	Unlikely. Not observed during site inspection	No. Suitable habitat not present.
Pterostylis saxicola	Sydney Plains Greenhood	E1	E	Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest	0	Unlikely Not observed during site inspection	Habitat limited in impact area and negligible

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of Occurrence	Assessment of Significance required
				or woodland on shale/sandstone transition soils or shale soils.			compared to available habitat in locality. Not recorded during site inspection
Pultenaea parviflora		E1	V	Dry sclerophyll forest, especially Castlereagh Ironbark Forest, Shale Gravel Transition Forest and transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland."	1	Unlikely Not observed during site inspection	Habitat limited in impact area and negligible compared to available habitat in locality. Not recorded during site inspection
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	Subtropical and littoral rainforest on gravels, sands, silts and clays.	6	Unlikely. Not observed during site inspection	No. Suitable habitat not present.
Tetratheca glandulosa	Glandular Pink Bell	V	-	Heath, scrub, woodlands and open forest on upper-slopes and mid-slope sandstone benches. Soils generally shallow, consisting of a yellow, clayey/sandy loam.	24	Unlikely. Suitable habitat not available.	No.
Thesium australe	Austral Toadflax	V	V	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	0	Unlikely. Not observed during site inspection	No. Suitable habitat not present.

CE = Critically Endangered, E = Endangered; E1 = Endangered Population, V = Vulnerable, V1 = Vulnerable Population, M = Migratory

Table 5: Fisheries Management Act (1994) species likelihood table

Scientific Name	Common Name	BC Act	EPBC Act	FM Act	Habitat Associations	Records	Habitat present within study area	Likelihood of occurrence	Assessment of Significance required
Austrocordulia leonardi	Sydney Hawk Dragonfly	-	-	E	The known distribution of the species includes three locations in a small area south of Sydney, from Audley to Picton. The species is also known from the Hawkesbury-Nepean, Georges River and Port Hacking drainages. The Sydney hawk dragonfly has specific habitat requirements, and has only ever been collected from deep and shady riverine pools with cooler water. Larvae are found under rocks where they co-exist with *Austrocordulia refracta*.	0	Suitable habitat not present.	No	No
Archaeophya adamsi	Adan's Emerald Dragonfly	-	-	E	Adam's emerald dragonflies are one of Australia's rarest dragonflies. The species is only known from a few sites in the greater Sydney region. Larvae have been found in small creeks with gravel or sandy bottoms, in narrow, shaded riffle zones with moss and rich riparian vegetation.	0	Suitable habitat not present	No	No
Macquaria australasica	Macquarie Perch	-	E	E	Habitat for this species is bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	0	Suitable habitat not present. Site adjacent to lower reaches.	No	No

Scientific Name	Common Name	BC Act	EPBC Act	FM Act	Habitat Associations	Records	Habitat present within study area	Likelihood of occurrence	Assessment of Significance required
Prototroctes maraena	Australian Grayling	--	V	PE	Historically, this species inhabited coastal streams from the Grose River southwards through NSW, VIC and TAS. On the mainland, this species has been recorded from rivers flowing east and south of the main dividing range. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops. Grayling migrate between freshwater streams and the ocean and as such it is generally accepted to be a diadromous species (migratory between fresh and salt waters).	0	Suitable habitat not present	No	No
Pristis zijsron	Green sawfish	-	V	PE	Green Sawfish were once widely distributed in the northern Indian Ocean, around south and south-east Asia and around northern Australia and have been recorded as far south as Jervis Bay. The last confirmed sighting of the Green Sawfish in NSW was in 1972 from the Clarence River at Yamba. Green sawfish live on muddy or sandy-mud soft bottom habitats in inshore areas. They also enter estuaries, where they have been found in very shallow water.	0	Suitable habitat not present	No	No

V= Vulnerable; E= Endangered, PE= Presumed extinct.

Table 6: Threatened fauna species likelihood table

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Anthochaera Phrygia	Regent Honeyeater	E	E & M	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.	4	No. No suitable present.	No.
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.	4	Unlikely	No. A highly mobile species which is not likely to be directly or indirectly impacted.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Woodlands and dry open sclerophyll forest, usually eucalypts and mallee associations. Also have recordings in shrub and heathlands and various modified habitats, including regenerating forests. In western NSW, this species is primarily associated with River Red Gum/Black Box/Coolabah open forest/woodland and associated with larger river/creek systems.	27	Potential. Widespread and utilises a broad range of habitats.	No. A highly mobile species which is not likely to be directly or indirectly impacted.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Botaurus poiciloptilus	Australasian Bittern	V	E	Occurs in terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats, reedbeds, swamps, streams, and estuaries.		Potential. Potential habitat along the river bank.	No. Not likely to be directly or indirectly impacted.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	8	Unlikely	No
Calyptorhynchus lathami	Glossy Black Cockatoo	V	-	Associated with a variety of forest types containing *Allocasuarina* species, usually reflecting the poor nutrient status of underlying soils. Intact drier forest types with less rugged landscapes are preferred. Nests in large trees with large hollows. Nearest record for this species is 600 m west of the study area.	4	Potential. Breeding habitat not present. foraging habitat present.	No. Highly mobile species not likely to be impacted.
Calidris ruficollis	Red-necked Stint	-	M	Coastal and inland shallow wetlands, sewage ponds, tidelines, tidal mudflats.	1	No. No suitable present.	No.
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.	3	No. No suitable present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	Distributed through central NSW on the western side of the Great Dividing Range and sparsely scattered to the east of the Divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys. The Brown Treecreeper occupies eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories.	1	Unlikely. Preferred habitat not present. habitat available.	No.
Cuculus optatus	Oriental Cuckoo	-	Mi	Monsoon rainforest, rainforest edges, leafy trees in paddocks, river flats, roadsides, mangroves, islands. Breeds overseas.	0	Potential. Suitable foraging habitat available.	No. A highly mobile species which is not likely to be directly or indirectly impacted.
Cuculus saturatus	Oriental Cuckoo	-	M	Monsoon rainforest, rainforest edges, leafy trees in paddocks, river flats, roadsides, mangroves, islands. Breeds overseas.	0	Potential. Suitable foraging habitat available.	No. A highly mobile species which is not likely to be directly or indirectly impacted.
Daphoenositta chrysoptera	Varied Sittella	V	-	Distribution includes most of mainland Australia except deserts and open grasslands. Prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with	17	Unlikely. Preferred	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
				dead branches, mallee and *Acacia* woodland. Feeds on arthropods from bark, dead branches, or small branches and twigs.		habitat not present.	
Dasyomis brachypterus	Eastern Bristlebird	E1	E1	Habitat is characterised by dense, low vegetation and includes sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest, as well as open woodland with a heathy understorey. In northern NSW occurs in open forest with tussocky grass understorey.	-	No. No suitable present.	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, 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, especially in areas with rainfall 600 mm/year. Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable. 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. Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows.	7	Unlikely. Preferred habitat not present.	No. Not likely to be directly or indirectly impacted.
Falco subniger	Black Falcon	V	-	Woodland, shrubland and grassland, especially riparian woodland and agricultural land. Often associated with streams or wetlands.	1	No. No suitable present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Prefers moist habitats with trees taller than 20 m. Roosts in tree hollows but has also been found roosting in buildings or under loose bark.	24	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.
Gallinago hardwickii	Latham's Snipe	-	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover. Occupies a variety of vegetation around wetlands including wetland grasses and open wooded swamps. Can occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers. They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches and sewage and dairy farms. They can also occur in various sites close to humans or human activity (e.g. near roads, railways, airfields, commercial or industrial complexes).	2	No. Preferred habitat not present.	No
Glossopsitta pusilla	Little Lorikeet	V	-	In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in	8	Potential. Foraging habitat present.	No. Highly mobile species not likely to be directly or indirectly impacted.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
				the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively.			
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. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring *Amyema* sp. mistletoe.	0	Unlikely Preferred habitat not present.	No.
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	Forages over large open fresh or saline water bodies, coastal seas and open terrestrial areas. Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away.	2	Unlikely. Preferred habitat not present.	No.
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	No. No suitable present.	No.
Hieraaetus morphnoides	Little Eagle	V	-	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	1	Unlikely	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
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.	10	Unlikely. Preferred habitat not present.	No. A highly mobile species that is not likely to be directly or indirectly impacted.
Hirundo rustica	Barn Swallow	-	M	Open country, agricultural land, especially near water; railyards, towns, overhead wires.	0	Potential. Potential habitat includes scattered trees.	No. No direct or indirect impacts on potential habitat.
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Typical sites consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin. They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer. Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia, C. gummifera, Eucalyptus sieberi, E. punctata* and *E. piperita*.	0	No. No suitable present.	No.
Ixobrychus flavicollis	Black Bittern	V	-	Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present.	3	No. No suitable present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Lathamus discolor	Swift Parrot	E	CE	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*).	19	Unlikely. Preferred habitat not present.	No. Highly mobile species not likely to be directly or indirectly impacted.
Litoria aurea	Green and Golden Bell Frog	E	V	It can utilise a variety of natural and man-made waterbodies such as coastal swamps, marshes, lakes, other estuary wetlands, riverine floodplain wetlands, stormwater detention basins, farm dams, bunded areas, drains, ditches and other structures capable of storing water. Permanent swamps and ponds with established fringing vegetation (e.g. *Typha* sp. and spikerushes–*Eleocharis* sp.) adjacent to open grassland areas for foraging and free from predatory fish such as Mosquito Fish (*Gambusia holbrooki*) are also.	2	No. No suitable present.	No.
Litoria littlejohni	Littlejohn's Tree Frog	V	V	It has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree	0	No. No suitable present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
				canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer.			
Lophoictinia isura	Square-tailed Kite	V	-	In coastal areas associated tropical and temperate forests and woodlands on fertile soils with an abundance of passerine birds. May be recorded inland along timbered watercourses. In NSW it is commonly associated with ridge or gully forests dominated by *Eucalyptus longiflora* (Woollybutt), *E. maculata* (Spotted Gum), or *E. elata, E. smithii* (Peppermint Gum).	2	Unlikely. Preferred habitat not present.	No Highly mobile species not likely to be directly or indirectly impacted.
Melanodryas cucullata cucullata	Hooden Robin (south-eastern form)	V	-	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	0	Unlikely. Preferred habitat not present.	No
Melithreptus gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Predominantly associated with box-ironbark association woodlands and River Red Gum. Also associated with drier coastal woodlands of the Cumberland Plain and the Hunter, Richmond and Clarence Valleys.	2	Unlikely. Preferred habitat not present.	No.
Meridolum corneovirens	Cumberland Land Snail	E	-	Associated with open eucalypt forests, particularly Cumberland Plain Woodland (CPW) described in Benson (1992). Found under fallen logs, debris and in bark and leaf litter around the trunk of gum trees or burrowing in loose soil around clumps of grass. Urban waste may also form suitable habitat.	58	No. No suitable present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Merops ornatus	Rainbow Bee-eater	-	M	Resident in coastal and subcostal northern Australia; regular breeding migrant in southern Australia, usually arriving Sept-Oct, departing Feb-Mar. Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs. Nest is a chamber at the end of a burrow, up to 1.6 m long, tunneled in flat or sloping ground, sandy back or cutting (*ibid*).	1	Unlikely. Preferred habitat not present.	No. A highly mobile species that is not likely to be directly or indirectly impacted.
Miniopterus australis	Little Bent-wing Bat	V	-	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. This species shelter in a range of structures including culverts, drains, mines and caves. Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found. Breeding occurs in caves, usually in association with *M. schreibersii*.	14	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. It forages above and below the tree canopy on small insects. Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter.	72	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.
Mixophyes balbus	Stuttering Frog	E	V	Occurs in a variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest that are generally characterised by deep leaf litter or thick	0	No. No suitable present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
				cover from understorey vegetation. Breeding habitats are streams and occasionally springs. Not known from streams disturbed by humans or still water environments.			
Monarcha melanopsis	Black-faced Monarch	-	M	Habitat typically includes rainforest and eucalypt forests, with feeding occurring in tangled understorey.	0	Unlikely. Preferred habitat not present.	No.
Monarcha trivirgatus	Spectacled Monarch	-	M	Wet forests, mangroves.	0	No. Suitable habitat not present.	No.
Mormopterus norfolkensis	Eastern Freetail Bat	V	-	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range. Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges. Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut.	40	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.
Motacilla flava	Yellow Wagtail	-	Ma	Migrant that breeds overseas.	0	Potential. Potential foraging habitat present.	No. A highly mobile species that is not likely to be directly or

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
							indirectly impacted.
Myiagra cyanoleuca	Satin Flycatcher	-	M	Habitat typically includes wetter, denser forest, often at high elevations.	0	No. Suitable habitat not present.	No.
Myotis macropus (formerly *M. adversus*)	Southern Myotis	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water. While roosting (in groups of 10-15) it is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains. It forages over streams, dams and pools catching insects and small fish by raking their feet across the water surface.	17	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.
Neophema pulchella	Turquoise Parrot	V	-	Eucalypt and cypress pine open forests and woodlands, ecotones between woodland and grassland, or coastal forest and heath.	1	Unlikely. Preferred habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Ninox connivens	Barking Owl	V	-	Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	6	Unlikely	No
Ninox strenua	Powerful Owl	V	-	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes. Large trees with hollows at least 0.5m deep are required for shelter and breeding. Has been recorded approximately 1 km from the proposed sewer lines.	124	Unlikely No suitable hollows and limited foraging habitat present.	No. Highly mobile species unlikely to be directly or indirectly impacted.
Numenius madgascariensis	Eastern Curlew	-	CE	Intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	0	Unlikely. Preferred habitat not present.	No.
Pandion haliaetus	Osprey	V	M	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	0	Unlikely. Preferred habitat not present.	No.
Petauroides volans	Greater Glider	-	V	The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider	1	No. Suitable habitat not present.	No

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
				favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.			
Petaurus australis	Yellow-bellied Glider	V	-	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter. Large hollows within mature trees are required for shelter, nesting and breeding.	0	No. Suitable habitat not present.	No.
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices.	0	No. Suitable habitat not present.	No
Petroica boodang	Scarlet Robin	V	-	Occurs from the coast to the inland slopes in NSW. After breeding (July-Jan), some disperse to the lower valleys and plains of the tablelands and slopes, and may appear as far west as the eastern edges of the inland plains in autumn and winter. Primarily resides in dry eucalypt forests and woodlands, with usually open and grassy understorey, with scattered shrubs. Abundant logs and fallen timber are important habitat components. In autumn and winter may live in open grassy woodlands, grasslands or grazed paddocks with scattered trees, and may join mixed flocks of small insectivorous birds.	2	Unlikely. Preferred habitat not present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Petroica phoenicea	Flame Robin	V	-	Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herbfields, heathlands, shrublands and sedgelands at high altitudes.	1	No. Suitable habitat not present.	No.
Petroica rodinogaster	Pink Robin	V	-	Rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies.	1	No. Suitable habitat not present.	No.
Phascolarctos cinereus	Koala	V-E2	V	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70%, with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis.*	3	Unlikely. Not observed and no signs observed during site inspection.	No. Not likely to be directly or indirectly impacted.
Polytelis swainsonii	Superb Parrot	V	V	Box-gum woodland, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	2	No. Suitable habitat not present.	No.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Pommerhelix duralensis	Dural Woodland Snail	E	E	This species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes.	25	No. No suitable present.	No
Pseudophryne australis	Red-crowned Toadlet	V	-	They are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings on Triassic sandstones of the Sydney Basin. It also mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop. Associated with open forest to coastal heath. Utilises small ephemeral drainage lines which feed water from the top of the ridge to the perennial creeks below for breeding, and are not usually found in the vicinity of permanent water.	13	Unlikely. Suitable habitat not present on site.	No
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy.	90	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging habitat present.
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	Potential. Potential foraging habitat present.	No. A highly mobile species that is not likely to be directly or

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
							indirectly impacted.
Rostratula australis	Painted Snipe	-	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. 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.	0	No. Suitable habitat not present.	No.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	14	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range, tending to be more frequently located in more productive forests. Within denser vegetation types, use is made of natural and man-made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey.	22	Potential. Potential roosting and foraging habitat present.	Yes. Suitable foraging and roosting habitat present.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Associations	No. of records within 5 km radius of the site	Likelihood of occurrence	Assessment of Significance required
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forests and woodlands from sea level to 1100 m.	2	Unlikely. Suitable habitat not present on site	No
Tyto Tenebricosa	Sooty Owl	V	-	Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	1	Unlikely. Suitable habitat not present on site	No

CE = Critically Endangered, E = Endangered; E1 = Endangered Population, V = Vulnerable, V1 = Vulnerable Population, M = Migratory

Appendix C : NSW BC Act (5-Part Test)

The Assessment of Significance (5-part test) is applied to species, populations and ecological communities listed on Schedules 1 and 2 of the BC Act and Schedules 4, 4A and 5 of the Fisheries Management Act. The assessment sets out factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Biodiversity Development Assessment Report at the DA stage. All factors must be considered and an overall conclusion made based on all factors in combination.

The impact assessment was undertaken for the following threatened species and ecological communities:

Ecological Communities

- Cumberland Plain Woodland (BC Act)

Macrobats

- Pteropus poliocephalus (Grey-headed Flying-fox)

Microbats

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Mormopterus norfolkensis* (Eastern Freetail Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Myotis macropus* (Southern Myotis)

It is noted that the TSC Act has now been repealed, and a new 5-part test is required under the BC Act. This new 5-part test is very similar, and essentially a simplified version of the 7-part test.

Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) is listed as a Critically Endangered Ecological Community under the BC Act. In the NPWS vegetation mapping of the Cumberland Plain, two forms of Cumberland Plain Woodland have been identified: Shale Hills Woodland and Shale Plains Woodland. Shale Hills Woodland occurs mainly on the elevated and sloping southern half of the Cumberland Plain and is the most widely distributed form of CPW (NPWS 2002). The dominant canopy trees in CPW include *Eucalyptus moluccana* (Grey Box), *E. tereticornis* (Forest Red Gum) and *E. crebra* (Narrow-leaved Ironbark), although *Corymbia maculata* (Spotted Gum) and *E. eugenioides* (Thin-leaved Stringybark) may also occur. The community typically has a shrub layer dominated by *Bursaria spinosa* (Blackthorn), with other shrubs, such as *Acacia implexa, Indigofera australis* and *Dodonaea viscosa* subsp. *cuneata*, also present. The diverse understorey layer is similar for both forms of Cumberland Plain Woodland. It is common to find grasses, such as *Themeda australis* (Kangaroo Grass*), Microlaena stipoides* var. *stipoides* (Weeping Meadow Grass) in the community, as well as herbs, such as *Dichondra repens* (Kidney Weed), *Brunoniella australis* (Blue Trumpet) and *Desmodium varians* (NPWS 2002).

Before European settlement, CPW was extensive across western Sydney, covering 125,000 hectares. In 2002 there was only 9% of the original extent, with a further 14 % remaining as scattered trees across the landscape (NPWS 2002). CPW occurs in the Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly Local Government Areas (DECC, 2010).

Cumberland Plain Woodland is habitat for many flora and fauna species. Some threatened species supported by CPW include Pimelea spicata and *Meridolum corneovirens (*Cumberland Plain Land Snail).

Clearing for agriculture and urban development is the greatest threat to CPW. Given it exists now only in fragments, CPW is vulnerable to disturbances, such as weed invasion, increased soil nutrients, rubbish dumping and frequent fire. Weeds, such as *Eragrostis curvula (*African Lovegrass), *Olea europaea* subsp. *cuspidata* (African Olive) and *Chloris gayana* (Rhodes Grass), are major threats to the community (DECC, 2010).

Approximately 0.02 ha of CPW, consisting of a single *Eucalyptus tereticornis* tree is proposed to be removed as part of this proposal.

1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. in the case of a threatened species, whether the action proposed 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.

CPW is a critically endangered ecological community and therefore this question is not applicable.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) 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

A single E. *tereticornis* which is mapped as CPW (0.02 ha) will be removed as part of the proposed works. However, 0.27 ha patch of CPW mapped adjacent to the existing driveway is considered to be the local occurrence of CPW in the study area. It is unlikely that the removal of a single species, which is already fragmented from this patch will place the local occurrence of CPW on site at risk of extinction.

(ii) 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

The proposed vegetation clearance consists of a single *E. tereticornis* with a highly disturbed and exotic understorey. Given the highly degraded nature of the vegetation (consisting only as a single native tree) to be removed and the fact that the local occurrence of CPW will remain in the study area and likely throughout the locality, it is considered unlikely that the proposal would modify the composition of the community such that it would place the local occurrence of CPW at risk of extinction.

c. in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposal will result in the removal of a single *E. tereticornis* tree (0.02 ha).

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

One *E. tereticornis* which exists as a single, isolated tree is to be removed as part of the proposed works. The patch of CPW that exists adjacent to the driveway in the north-east of the site is considered to be the local occurrence of the community. Since the local occurrence is already fragmented the removal of a single tree would not further isolate or fragment the local occurrence of CPW.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The CPW at the site has undergone significant past disturbance with evidence of selective clearing and it remains as scattered trees with an exotic grassy understorey. Given the vegetation proposed for removal is comprised of a single tree with an exotic understorey, it is unlikely that the removal of a single tree would represent and area of habitat that is important to the long-term survival of this community within the locality.

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 has been declared for Cumberland Plain Woodland. No other critical habitat has been declared on this patch.

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.

Vegetation clearance is listed as a key threatening process. The area of potential habitat to be cleared is small (approximately 0.02 ha and exists as a single tree with an exotic understorey. Additional areas of the community would remain within the study area. Therefore, it is unlikely that the proposal would exacerbate any key threatening processes to such an extent that they would place any local occurrences of CPW at risk of extinction.

Conclusion

The proposal would result in the removal of approximately 0.02 ha of CPW. However, the proposed vegetation removal is unlikely to be considered significant for the following reasons:

- Clearance area is very small; a single, isolated tree with an exotic, grassy understorey in relation to the local occurrence of CPW in the study area.
- The site is highly modified and invaded by exotic species
- Additional CPW is present within the study area 0.27 ha
- A VMP will be implemented to help conserve the remaining CPW in the study area. The VMP will mitigate against indirect impacts to this community.

On the basis of the above considerations, it is unlikely that the proposed development will result in a significant impact on the CPW in the study area.

Microchiropteran bats

Due to similar habitat requirements and associated impacts, a single 7-part test has been undertaken for the following microchiropteran bats;

Falsistrellus tasmaniensis (Eastern False Pipistrelle)
Miniopterus schreibersii oceanensis (Eastern Bent-wing Bat)
Mormopterus norfolkensis (Eastern Freetail-bat)
Saccolaimus flaviventris (Yellow-bellied Sheathtail-bat).
Scoteanax rueppellii (Greater broad-nosed-bat)

***Falsistrellus tasmaniensis* (Eastern False Pipistrelle)** is listed as a vulnerable species under the TSC Act. The Eastern False Pipistrelle is wide-ranging, occurring along the southeast coast of Australia with records from South East Queensland, New South Wales, Victoria and Tasmania. The species occurs in sclerophyll forests from the Great Dividing Range to the coast, and generally prefers wet habitats where trees are more than 20 m high. Roosting occurs in hollow trunks of eucalypt trees, usually in single sex colonies, but the species has been recorded roosting in caves under loose bark and occasionally in old wooden buildings. Their flight pattern is high and fast and they forage within or just below the tree canopy. They feed on a variety of prey including moths, rove beetles, weevils, plant bugs, flies and ants. This species is threatened by a number of processes including loss of trees for foraging and hollow-bearing trees for roosting, disturbance to winter roosting and breeding sites, and application of pesticides in or adjacent to foraging areas

***Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)** occupies a range of forested environments (including wet and dry sclerophyll forests), along the coastal portion of eastern Australia, and through the Northern Territory and Kimberley area. It forages from just above the tree canopy, to many times the canopy height in forested areas, and will utilise open areas where it is known to forage at lower levels. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Although roosting primarily occurs in caves, it has also been recorded in mines, culverts, stormwater channels, buildings, and occasionally tree-hollows. This species occupies a number of roosts within specific territorial ranges usually within 300 km of the maternity cave, and may travel large distances between roost sites.

***Mormopterus norfolkensis* (Eastern Freetail-bat)** is listed as a vulnerable species under the BC Act. The Eastern Freetail-bat is found in dry eucalypt forests and woodlands on the east coast where they utilise tree hollows for roosting. They forage for insects among canopy gaps and on edges of vegetation and mainly roost in hollow-bearing trees. This species will utilise paddock trees and remnant vegetation in farmland where these are in proximity to larger forest remnants. This species usually forages within a few kilometres of its roost

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)** is listed as a vulnerable species under the BC Act. The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. The species roosts singly or in groups of up to six, in tree hollows and buildings, in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees. Breeding has been recorded from December to mid-March, when a single young is born.

Scoteanax rueppellii (Greater Broad-nosed Bat) is listed as a vulnerable species under the BC Act. The Greater Broad-nosed Bat ranges from both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New

England Tablelands. Usually associated with woodland, moist and dry eucalypt forest and rainforest. It usually roosts in tree hollows, but has also been found in buildings. The species forages after sunset along creek and river corridors for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees.

1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. in the case of a threatened species, whether the action proposed 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.

There is potential for these species to appear within the site for foraging or roosting purposes as hollow-bearing trees occur in the native vegetation on and adjacent to the site. Given the relatively high abundance of similar aged trees and similar habitat in the surrounding landscape, the habitat in the site is not expected to be important roosting or breeding habitat for these species.

Given that these species are highly mobile, the small amount (approximately 18 native trees scattered across the study area) of habitat proposed for removal and the fact that potential roosting habitat would be retained in Public Reserve Open Space and the surrounding landscape it is considered unlikely that the proposal would impact on the life cycle of these species such that they would place viable local populations at risk of extinction.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(iii) 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

(iv) 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

N/A

c. in relation to the habitat of a threatened species or ecological community:

(iv) (the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(vi) (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The proposal will result in the removal of two hollow-bearing trees and one dead stag. However, there are likely to be more HBTs in the extensive surrounding landscape that that would provide alternative roosting habitat for these species. The proposal will result in the removal and modification of approximately 27 trees scattered across the study area, representing potential foraging habitat. However, considering the extent of similar suitable foraging habitat in the community lots and the adjacent landscape, the foraging habitat to be removed is considered to be negligible in comparison.

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)

N/A

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.

A key threatening process (KTP) is defined under the BC Act as "a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities". KTPs that are relevant to the proposal and these species include:

- Loss of hollow-bearing trees
- Clearance of native vegetation

The proposal will result in the clearance of approximately 18 native tree species representing potential foraging habitat (include two HBTs). However, more extensive and similar habitat would be retained and managed in the Public Reserve Open Space and would continue to exist in the surrounding landscape. The potential indirect impacts of this KTP will also be mitigated through mitigation measures and the management of Public Reserve Open Space for biodiversity.

Conclusions

The proposal is unlikely to significantly affect these species given that:

- The proposal would not isolate habitat for these highly mobile species.
- The amount of potential foraging habitat for these species is considered negligible in comparison to the amount of similar habitat directly adjacent to the site and present throughout the locality.
- Remnant vegetation and the majority of hollows will be avoided by the proposal and potential foraging habitat will be retained in the Public Open Space and managed for conservation through the implementation of a Vegetation Management Plan.

Therefore, the proposal is unlikely to have a significant impact on these Microchiropteran bats and their survival in the locality. As such, a Species Impact Statement (SIS) is not required.

Pteropus poliocephalus (Grey-headed Flying-fox)

Pteropus poliocephalus is listed as vulnerable under the BC Act and EPBC Act. The species is endemic to the east coast of Australia with a distribution from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast.

P. poliocephalus is a highly mobile species whose migration patterns are determined by the availability of flowering food resources. The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and occurs in rainforest, woodlands, paperbark swamps and *Banksia* woodlands. This species feeds in particular on the nectar and pollen of native trees, especially *Eucalyptus* sp., *Melaleuca* sp. and *Banksia* sp., and fruits of rainforest trees and vines. During times when native food resources are limited, GHFF forage on fruit crops and cultivated gardens.

Roosting camps are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, *Melaleuca* woodland, *Casuarina* forest or mangroves. These sites have a dense canopy, providing them with the moist, humid microclimate they require for breeding. Campsites are critical for mating, birthing, rearing of young and as diurnal refuge from predators. Females give birth during October to November and continue to support their young until March. During this time urban gardens, cultivated fruit crops and roadside verges may also provide important foraging habitat for this species. Urban environments may also be used as a temporary roost during long migrations.

This species is threatened by a number of processes including loss of foraging habitat, disturbance of roosting sites, unregulated shooting, electrocution on power-lines, competition of roosts with the Australian White Ibis and noise.

No targeted surveys were conducted for GHFF. However, the site is located within approximately 30 km radius of a maternity bat camp at Gordon.

1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a. in the case of a threatened species, whether the action proposed 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.

One known *P. poliocephalus* maternity camp at Gordon is located approximately 30 km from the site. Therefore, any GHFF that would occur on the subject site are likely to be part of a viable local population that is centred on this maternity camp.

The factors which may impact on the life cycle of this species includes loss of foraging habitat, fragmentation of habitats, electrocution from power-lines and disturbance to maternity camps including noise production. The proposal is not likely to produce noise levels that would disturb the maternity camp, given the distance from the camp.

While some nectar resources provided by trees will be removed, such habitat will also be retained and managed in Public Reserve Open Space and will continue to provide foraging resources for this species. Therefore, proposal is not likely to have an adverse effect on the life cycle of this species as foraging resources and similar resources will remain on the site and in the surrounding landscape. Therefore, the proposal is not likely to place at risk of extinction a viable local population of this species.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(v) 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

(vi) 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

This species is not an endangered population.

c. in relation to the habitat of a threatened species or ecological community:

(vii) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(viii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(ix) (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The proposal will result in the removal of two hollow-bearing trees and one dead stag. However, there are likely to be more HBTs in the extensive surrounding landscape that that would provide alternative roosting habitat for these species. The proposal will result in the removal and modification of approximately 18 trees scattered across the study area, representing potential foraging habitat. However, considering the extent of similar suitable foraging habitat in the community lots and the adjacent landscape, the foraging habitat to be removed is considered to be negligible in comparison.

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)

N/A

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.

A key threatening process (KTP) is defined under the BC Act as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*".

KTPs that are relevant to the proposal and *P. poliocephalus* include:

- Clearance of native vegetation

The proposal will result in the clearance of some native vegetation in the form of scattered trees. However, more extensive and similar habitat would be retained and managed in the Public Reserve Open Space and would continue to exist in the surrounding landscape. The potential indirect impacts of this KTP will also be mitigated through mitigation measures and the management of Public Reserve Open Space for biodiversity.

Conclusion

The proposal will result in the removal of approximately some potential foraging habitat for this species. However, it is unlikely to have a significant impact on this species such that it would put a local population of the species at risk of extinction or substantially isolate any areas of potential habitat as:

- Vegetation proposed for removal provides minimal foraging resources compared to the surrounding vegetation
- This species is highly mobile and forages widely
- No potential roosting habitat would be impacted.

Consequently, a Species Impact Statement is not required for the proposal with respect to *P. poliocephalus*.

Appendix D : EPBC Act Assessments of Significance

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

The Grey-headed Flying-fox is listed as a vulnerable threatened species under the EPBC Act.

This species utilises a wide variety of habitats (including disturbed areas) for foraging, and have been recorded travelling long distances on feeding forays. Fruits and flowering plants of a wide variety of species are the main food source. The species roosts in large 'camps' of up to 200 000 individuals. Camps are usually formed close to water and along gullies, however, the species has been known to form camps in urban areas.

Grey-headed Flying Fox has not been recorded on site but is known from the locality within close proximity to the study area. The vegetation within the site provides marginal potential foraging habitat in the form of individual Fig Trees. It is considered likely that this species would use the site and adjacent areas on occasion for foraging purposes. No roosting camps are located within the site.

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

The closest camp is known from Parramatta Park in Parramatta located approximately 4 km south east of the site. This colony of *P. poiliocephalus* is an important maternity population for this species. Individuals will move between maternity and non-maternity camps around Sydney to utilise foraging resources.

Foraging for this important population occurs within a 50 km radius around Parramatta. Available foraging resources include: street trees, urban bushland and conservation reserves.

Only a relatively small area of potential foraging habitat would be removed under the proposed action. The amount of habitat to be affected is small given the extensive amount of similar or better quality habitat available in the local area. No individuals or camps of *P. poliocephalus* were recorded on the site. The proposed action will not impact on any part of any known camps for this species.

Given that other foraging habitat exists in the surrounding landscape, and that this species is wide-ranging (traveling up to 50 km in one night), the proposal is unlikely to affect any important populations of this species that would lead to a long-term decrease in the size of an important population of the *P. poliocephalus*

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

The Australian population of GHFF is an important population. The area of occupancy for this population is dynamic, and individuals move between bat camps throughout the Australian east coast. This species is highly mobile and camp sizes may change during seasonal fluctuations.

The proposal is unlikely to reduce the area of occupancy for this population as no impacts to a known camp will occur. Furthermore, impacts to foraging habitat is minorgiven the availability of similar foraging habitat present in adjacent areas and the highly mobile nature of this species.

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

The Grey-headed Flying-fox population across Sydney is highly dynamic and individuals move between permanent camps to utilise foraging resources. They will return to permanent camps to rear offspring. Individuals are highly mobile and populations are not static.

It is unlikely that any known camp or an important population will be fragmented under the proposed action. The proposed action will only result in the removal of some ficus spp.. This vegetation is potential foraging habitat for the Grey-headed Flying-fox. Large amounts of similar habitat are available adjacent to the study area and in the wider locality. Therefore, the proposed action is unlikely to fragment the existing important population into two or more populations.

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

As the proposal would not involve the removal of any camp, it would be unlikely to create a barrier to movement or remove breeding habitat. The proposal would remove some potential foraging foraging habitat for the species. Potential foraging habitat would be retained in Public Reserve Open Space. Therefore, it is unlikely that habitat critical to the survival of this species would be adversely affected.

Foraging habitat within a 50 kilometre radius of a roost site with greater than 30,000 individuals is foraging habitat critical to the survival of this species. The study area is approximately 4 km north west of the nearest camp at Parramatta. The camp at Parramatta has previously recorded numbers between 10,000 and 49,000 in May 2015 and November 2015 and again in May 2016. However, counts performed since November 2016 estimates the population between 500 and 2,500 individuals with the most recent count performed in February 2017. This decline in numbers during the most recent count may be due to the high temperatures experienced over summer months in recent years. It is expected that population numbers have the potential to fluctuate due to a number of factors.

Since this population has recorded high numbers previously as a precaution the foraging habitat at the study area is consistent with habitat that would be critical to the survival of this species.

While the habitat would be critical to the survival of the species, the removal of a small amount of single ficus trees is unlikely to significantly impact on the population, given the vast amount of foraging habitat in the foraging range of this species. There is better, more contiguous habitat available in the surrounding landscape, therefore the species is considered likely to use the study area on an occasional basis and would not be dependent on the foraging resources within the study area.

Criterion e: disrupt the breeding cycle of an important population

As no camps for the species would be impacted or disturbed, it is unlikely the proposed work would disrupt the breeding cycle of an important population.

Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

As no campsites would be removed or disturbed, and vast amounts of foraging habitat exists outside of the study area, the proposal 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 would not result in the establishment of invasive species, such as weeds, that would be harmful to *P. poiliocephalus.* It is unlikely that the proposal would result in an increased number of weeds due to the current disturbed nature of the site.

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

P. poiliocephalus are reservoirs for the Australian bat lyssavirus (ABL) and can cause clinical disease and mortality in GHFF (DECCW, 2009). The proposal is unlikely to present significant ecological stress on known individuals or camps utilizing the subject site and is therefore unlikely to affect this species. The proposal 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 Draft National Recovery Plan for the *P. poiliocephalus* was developed in 2009. As no maternity camps would be removed the proposal would only remove some potential resting habitat consisting of exotic trees it is unlikely that the proposal works interfere with the recovery of this species.

Conclusion

In consideration of the above, the proposed works are not considered likely to have a significant impact on the Grey-headed Flying-fox, and therefore, an EPBC Act referral is not required.

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