

# Biodiversity Development Assessment Report

CATHOLIC HEALTHCARE - LEWISHAM

AUGUST 2019



## Document Verification



Project Title:

Catholic Healthcare - Lewisham

Project Number:		17-017 Catholic Healthcare - Lewisham		
Project File Name:		17-017 West Street Lewisham BDAR_20190814		
Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final	13/08/19	Aleksei Atkin (BAAS 17093) Daniel Perkovic Elijah Elias	Mitch Palmer (BAAS 17051) Karen Jamieson	Mitch Palmer (BAAS 17051)

NGH Environmental prints all documents on environmentally sustainable paper including paper made from bagasse (a by-product of sugar production) or recycled paper.

NGH Environmental Pty Ltd (ACN: 124 444 622. ABN: 31 124 444 622)

[www.nghenvironmental.com.au](http://www.nghenvironmental.com.au)

e: [ngh@nghenvironmental.com.au](mailto:ngh@nghenvironmental.com.au)

**Sydney Region**  
18/21 mary st  
surry hills nsw 2010 (t 02 8202 8333)

**Newcastle - Hunter and North Coast**  
2/54 hudson st  
hamilton nsw 2303 (t 02 4929 2301)

**Canberra - NSW SE & ACT**  
8/27 yallourn st (po box 62)  
fyshwick act 2609 (t 02 6280 5053)

**Wagga Wagga - Riverina and Western NSW**  
suite 1, 39 fitzmaurice st (po box 5464)  
wagga wagga nsw 2650 (t 02 6971 9696)

**Bega - ACT and South East NSW**  
89-91 auckland st (po box 470)  
bega nsw 2550 (t 02 6492 8333)

**Brisbane**  
suite 4, level 5, 87 wickham terrace  
spring hill qld 4000 (t 07 3129 7633)

# CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>VII</b>
<b>1 INTRODUCTION .....</b>	<b>8</b>
1.1 THE PROPOSAL.....	8
1.2 THE DEVELOPMENT SITE.....	9
1.2.1 Site location .....	9
1.2.2 Site description .....	10
1.2.3 Trigger for a Biodiversity Development Assessment Report .....	12
1.3 STUDY AIMS .....	12
1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT .....	13
<b>2 LANDSCAPE FEATURES .....</b>	<b>14</b>
2.1 IBRA BIOREGIONS AND SUBREGIONS .....	14
2.2 NSW LANDSCAPE REGIONS AND AREA .....	14
2.3 NATIVE VEGETATION.....	14
2.4 CLEARED AREAS .....	14
2.5 RIVER AND STREAMS .....	14
2.6 WETLANDS .....	15
2.7 CONNECTIVITY FEATURES .....	15
2.8 AREAS OF GEOLOGICAL SIGNIFICANCE .....	15
2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE.....	15
2.10 SITE CONTEXT COMPONENTS .....	15
<b>3 NATIVE VEGETATION .....</b>	<b>17</b>
3.1 NATIVE VEGETATION EXTENT .....	17
3.2 PLANT COMMUNITY TYPES (PCTS).....	17
3.2.1 Methods to assess PCTS.....	17
3.2.2 PCTS identified on the development site.....	17
3.3 VEGETATION INTEGRITY ASSESSMENT .....	21
3.3.1 Vegetation zones and survey effort.....	21
3.3.2 Vegetation integrity assessment results.....	21
<b>4 THREATENED SPECIES .....</b>	<b>23</b>
4.1 ECOSYSTEM CREDIT SPECIES.....	23
4.1.1 Species excluded from the assessment .....	24
4.2 SPECIES CREDIT SPECIES.....	24

4.2.1	Candidate species to be assessed .....	24
4.2.2	Candidate species requiring confirmation of presence or absence .....	36
4.2.3	Survey Methods and Results .....	36
4.3	ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS .....	38
4.3.1	Occurrences of karst, caves, crevices and cliffs .....	38
4.3.2	Occurrences of rock .....	38
4.3.3	Occurrences of human made structures and non-native vegetation .....	38
4.3.4	Hydrological processes that sustain and interact with the rivers, streams and wetlands .....	38
<b>5</b>	<b>MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE.....</b>	<b>39</b>
5.1	WETLANDS OF INTERNATIONAL IMPORTANCE .....	39
5.2	THREATENED ECOLOGICAL COMMUNITIES .....	39
5.3	THREATENED SPECIES .....	40
5.4	MIGRATORY SPECIES .....	40
<b>6</b>	<b>AVOID AND MINIMISE IMPACTS .....</b>	<b>41</b>
6.1	AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT.....	41
6.1.1	Site selection – consideration of alternative locations/routes.....	41
6.1.2	Proposal components – consideration of alternate modes or technologies.....	41
6.1.3	Proposal planning phase – detailed design .....	41
<b>7</b>	<b>IMPACTS UNABLE TO BE AVOIDED .....</b>	<b>43</b>
7.1	DIRECT IMPACTS .....	43
7.1.1	Changes in vegetation integrity scores.....	43
7.1.2	Loss of species credit species habitat or individuals.....	44
7.1.3	Loss of hollow-bearing trees.....	44
7.2	INDIRECT IMPACTS.....	44
7.3	IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE .....	48
7.3.1	Threatened Ecological Communities .....	48
7.3.2	Threatened Species .....	48
7.3.3	Migratory species .....	48
<b>8</b>	<b>MITIGATING AND MANGAING IMPACTS .....</b>	<b>50</b>
8.1	MITIGATION MEASURES .....	50
8.1.1	Direct Impacts from the clearing of vegetation and habitats.....	50
8.1.2	Indirect impacts .....	50
<b>9</b>	<b>SERIOUS AND IRREVERSIBLE IMPACTS (SAII) .....</b>	<b>53</b>
9.1	POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES .....	53

9.1.1	Threatened ecological communities.....	53
9.1.2	Threatened species.....	53
9.1.3	Additional potential entities .....	53
<b>10</b>	<b>REQUIREMENT TO OFFSET .....</b>	<b>54</b>
10.1	IMPACTS REQUIRING AN OFFSET .....	54
10.1.1	Ecosystem credits .....	54
10.1.2	Species credits .....	54
10.1.3	Offsets required under the EPBC Act.....	54
<b>11</b>	<b>CONCLUSIONS.....</b>	<b>56</b>
<b>12</b>	<b>REFERENCES.....</b>	<b>57</b>
<b>APPENDIX A</b>	<b>PLOT FIELD DATA .....</b>	<b>A-I</b>
<b>APPENDIX B</b>	<b>EPBC ASSESSMENT OF SIGNIFICANT IMPACT .....</b>	<b>B-I</b>
<b>APPENDIX C</b>	<b>BAM CALCULATOR CREDIT REPORT .....</b>	<b>B-I</b>
<b>APPENDIX D</b>	<b>EPBC HABITAT ASSESSMENT .....</b>	<b>D-I</b>

## TABLES

Table 1-1	Biodiversity Offset Scheme Thresholds .....	12
Table 3-1	Vegetation zones for the development site.....	21
Table 3-2	Table of current vegetation integrity scores for each vegetation zone within the development site. ....	21
Table 4-1	Predicted Ecosystem Credit Species .....	23
Table 4-2	Predicted Species Credit Species .....	25
Table 4-3	Summary of species credit species surveyed at the development site .....	36
Table 7-1	Potential impacts to biodiversity during the construction and operational phases.....	43
Table 7-2	Table of current and future vegetation integrity scores for each vegetation zone within the development site. ....	43
Table 7-3	Summary of species credit species loss at the development site.....	44
Table 7-4	Potential impacts to biodiversity during the construction and operational phases.....	45
Table 8-1	Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat .....	51
Table 10-1	PCTs and vegetation zones that require offsets .....	54

Table 12-1 Assessment of Significance Grey-headed Flying-fox.....	B-I
Table 12-1 Assessment of important habitat: Migratory species, Fork-tailed Swift and White-throated Needletail.....	B-III
Table 12-2 Assessment of Significance: Migratory species, Fork-tailed Swift and White-throated Needletail .....	B-IV

## FIGURES

Figure 1-1 Site Map.....	11
Figure 2-2 Location Map .....	16
Figure 3-1 Example of vegetation designated as PCT 1281 within development site .....	19
Figure 3-2 PCTs and TECs within the Development Site .....	20
Figure 3-3 Vegetation Zones and Plot Locations .....	22
Figure 4-1 Threatened Species Survey Locations .....	37
Figure 6-1 Final project footprint.....	42
Figure 10-1 Impacts requiring an offset, not requiring an offset and not requiring assessment.....	55

## ACRONYMS AND ABBREVIATIONS

AHIMS	Aboriginal heritage information management system
ASL	Above sea level
AWS	Automatic weather station
BAM	Biodiversity Assessment Methodology
BC Act	<i>Biodiversity Conservation Act 2016</i>
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offset Scheme
CEMP	Construction environmental management plan
Cwth	Commonwealth
DECCW	Refer to OEH
DoEE	Department of Environment and Energy
DPIE	(NSW) Department of Planning, Infrastructure and Environment (formally OEH)
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIA	Environmental impact assessment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
ESD	Ecologically Sustainable Development
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
ha	hectares
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i> (NSW)
KFH	Key Fish Habitat
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
m	Metres
NES	Matters of National environmental significance under the EPBC Act (c.f.)
NPW Act	<i>National Parks And Wildlife Act 1974</i> (NSW)
NSW	New South Wales
OEH	See DPIE
REF	Review of Environmental Factors
REP	Regional Environmental Plan

SEPP	State Environmental Planning Policy (NSW)
SIS	Species Impact Statement
sp/spp	Species/multiple species
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)



## EXECUTIVE SUMMARY

NGH Environmental has prepared this BDAR for Artazan Property Group on behalf of Catholic Healthcare for the proposed aged care facility at Lewisham, NSW. The purpose of this BDAR was to address the requirements of the BAM.

The requirement to prepare a BDAR was triggered by the potential for the proposal to generate a significant impact to the *Perameles nasuta* endangered population in the inner west of Sydney. Signs indicating the presence of individuals of the population foraging within the site were identified during previous surveys, and a precautionary approach was taken.

A survey was conducted in August 2019, which identified the presence of exotic and planted gardens. While these do not conform to any Plant Community Type listed within the NSW Vegetation Information System, mapping undertaken by Benson et al. (2002) indicated that the site would have constituted PCT 1281 – *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* prior to clearing. As such, this PCT was selected to enable the generation of impact areas.

Two BAM plots were completed within the subject land, and the data were entered into the BAM calculator. Occasional foraging habitat for three federally listed species was identified during this assessment:

- Grey-headed Flying-fox *Pteropus poliocephalus*
- Fork-tailed Swift *Apus pacificus*
- White-throated Needletail *Hirundapus caudacutus*

In this BDAR, biodiversity impacts have been assessed through:

- Identification of PCTs on the development site;
- Comprehensive mapping and assessment completed in accordance with the BAM;
- Mitigation measures which have been outlined to reduce the impacts to biodiversity;
- The obligation to retire one Species Credit for impacts to Long-nosed Bandicoot population in inner western Sydney.

The retirement of this credit will be carried out in accordance with the NSW Biodiversity Offsets scheme, and will be achieved by either;

- a) The obligation to retire credits under the Biodiversity Offsets Scheme, or
- b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator.

The proposal is not considered to significantly impact upon federally listed entities, therefore, a referral to the Department of Environment and Energy is not required.

# 1 INTRODUCTION

This Biodiversity Development Assessment Report (BDAR) supports a detailed Development Application (DA) submitted to Inner West City Council (Council) for the purposes of a seniors' living development at 2B West Street, Lewisham (the proposal). This BDAR assesses the impacts of the proposal according to the NSW Biodiversity Assessment Methodology (BAM)

The site is currently used for aged care and seniors living facilities for 96 residents. Catholic Healthcare Limited (CHL) is seeking to secure approval for alterations, additions and associated conservation works to the heritage listed Anne Walsh and Novitiate buildings on site and redevelopment of the southern part of the site for the purposes of 135 Independent Living Units (ILUs) and 144 Residential Aged Care Facilities (RACF) beds in total.

The development will provide much needed additional aged care and self-contained seniors housing in a locality with an ageing population. It will also help meet the strategic need for additional housing diversity in an accessible location.

The preparation of this BDAR has been triggered by the potential for a significant effect on the threatened population of Long-nosed Bandicoot *Perameles nasuta* in Inner-western Sydney.

The following terms are used in this document;

- **Development footprint** – The area of land that is directly impacted on by the proposal including new buildings, footpaths, landscaping and car parking.
- **Development site** – The area of land that is subject to a proposed development and the area surveyed for this assessment.
- **Subject land** – All land within affected lot boundaries
- **Buffer area** – All land within 1500m of the outside edge of the boundary of the development site.

## 1.1 THE PROPOSAL

The DA seeks approval for the following:

- a) Site preparation works and excavation;
- b) Retention of the Anne Walsh building with alterations and additions to create accommodation for Independent Living Units and ancillary uses;
- c) Retention of the Novitiate Building with alterations and additions to create accommodation for ILUs and ancillary uses;
- d) Demolition of the existing Aged Care Hostel on the southern part of the site and construction of:
  - A 5 storey podium along the southern portion of the site which includes 144 RACF beds. Above the podium is a communal roof terrace and two building elements which include an additional 7 storeys (Building 1) and an additional 4 storeys (Building 2) comprised of accommodation for ILUs;
  - A 7 storey building (Building 3) along West Street including accommodation for ILUs. It is noted that the upper three levels are setback from the building edge; and
  - Two basement levels for car parking which are accessible via the new internal vehicular access route.

- Internal vehicle access driveway with connection points to West Street and Charles O’Niell Way, and drop off zone;
  - New cycle way/access path along rail corridor; and
- e) Landscaping works, including ground level landscaping and public facilities for the creation of a communal open space area for future residents.

## **1.2 THE DEVELOPMENT SITE**

### **1.2.1 Site location**

The site is located at 2B West Street, Lewisham and is within the Inner West (formally Marrickville) Local Government Area. The site is legally described as Lot 1 DP 1116995. It is irregular in shape and is approximately 12,065m<sup>2</sup> in area.

The site was formerly part of Lewisham Hospital and is currently occupied by the Lewisham Aged Care which is owned by the Catholic Health Care and is a stand-alone facility. The site incorporates a complex of buildings including:

- i. Ann Walsh Building: a 3-storey building to the north of the site which is currently unoccupied and was a former out patients building;
- ii. Former Novitiate building: a 5-storey square building with a central courtyard in the centre of the site, which is used as an aged care facility with 46 standard rooms and 5 shared rooms with common bathroom facilities;
- iii. Aged care hostel: located in the southern part of the site and incorporates a series of 2-storey buildings which offer low care accommodation for 40 residents.

The site is heritage listed as having local heritage significance for ‘Former Lewisham Hospital, Convent and grounds, including interiors’, and is adjacent to the local Petersham North Heritage Conservation Area to the east, opposite West Street.

It is approximately 6km south-west of the Sydney CBD and 16km south-east of Parramatta CBD. The site has primary street frontage to West St on the eastern boundary and is bounded by a private road, Charles O’Niell Way, to the west, and the railway line for the T1 North Shore, Northern & Western and T2 Inner West & Leppington lines directly south of the site.

The surrounding context includes:

- a) North: the former Lewisham Hospital site which is now being used by St Vincent de Paul Society.
- b) South: a cycleway and a railway line and further to the south is Petersham Public School, Petersham TAFE College West St Campus and a Presbyterian Church.
- c) East: Across West Street is Petersham Park and Fanny Durack Aquatic Centre. Further to the east is Fort Street High School which fronts Parramatta Road.
- d) West: Trinity Grammar School and St Thomas Becket Church and further to the west is Lewisham Train Station. APG has been commissioned by Catholic Healthcare Ltd (CHL) to request a Site Compatibility Certificate (SCC) under SEPP (Housing for Seniors or People with a Disability) 2004 for 2B West Street (“the proposal site”), as part of a proposed seniors housing development.

### **1.2.2**    *Site description*

The development site is approximately 1.2 ha within the broader subject land, and comprises the southern portion of the subject land. The vegetation within the subject land comprises entirely planted native and exotic landscaping species, and occurs in the form of garden beds, planted canopy trees and mown lawns. No native species were identified which would likely be remnant to the locality or the original vegetation within the development site. One canopy species native to the Sydney region, Sydney Blue Gum *Eucalyptus saligna*, has been identified on the boundary of the subject land but is not impacted by the development.

Mapping of previously occurring vegetation undertaken by Benson et al. (1999) within the Cook's River valley indicated that the ridge on which the development site occurs would likely have previously been vegetated by Sydney Turpentine Ironbark Forest.

No aquatic or other features such as rock outcropping are present.

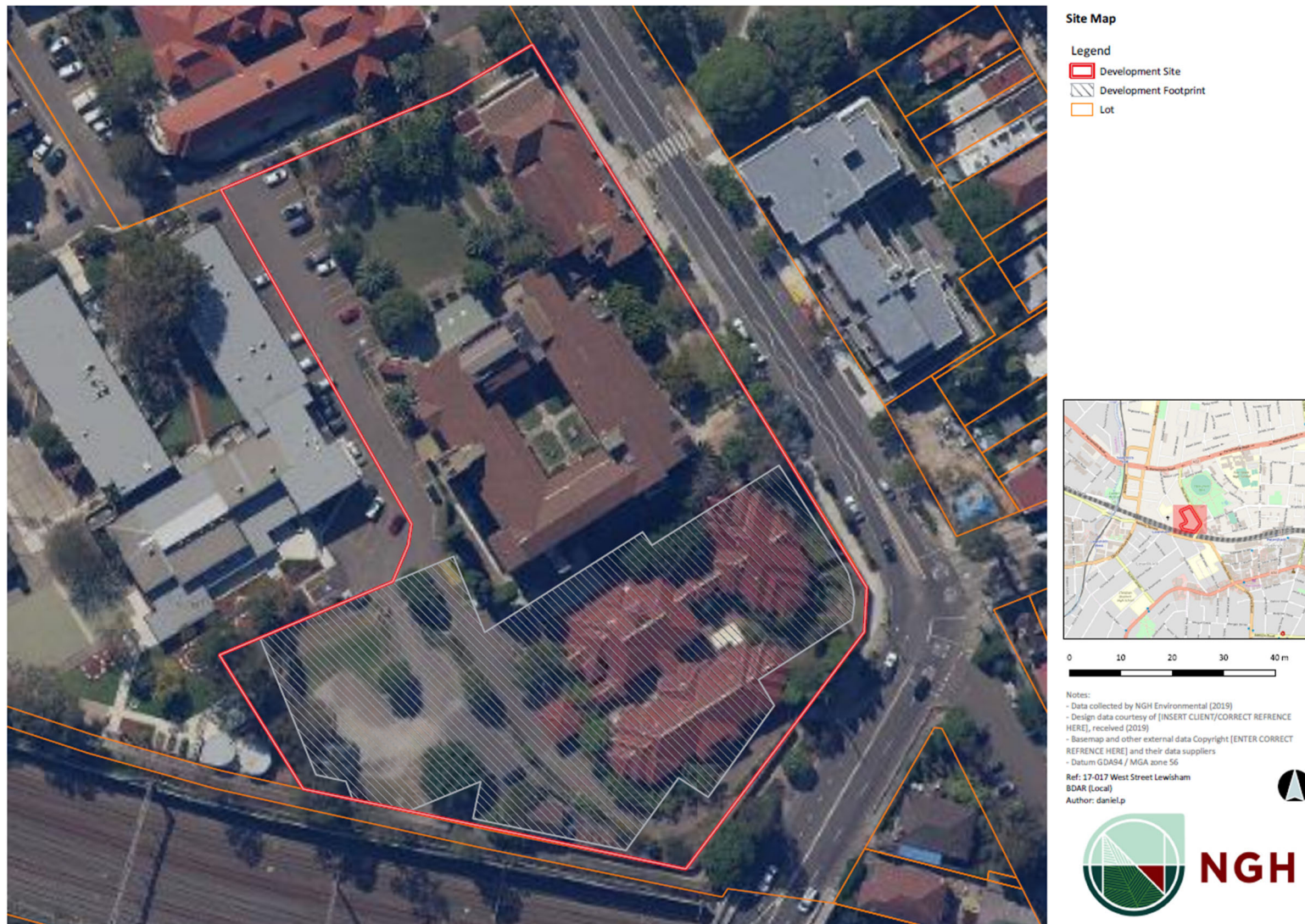


Figure 1-1 Site Map



### 1.2.3 Trigger for a Biodiversity Development Assessment Report

No native vegetation is considered to occur within the development site, as vegetation within the site comprises entirely planted and predominantly exotic species. There is no minimum lot size associated with Lot 1 DP 1116995. A previous survey identified the presence of, and suitable habitat for the Long-nosed Bandicoot *Perameles nasuta*, which constitutes an Endangered Population within the Inner West. As such, a precautionary approach has been taken, and a significant effect to the population as a result of the works has been assumed, due to the removal of potential shelter and breeding habitat in addition to the removal of potential foraging habitat through the removal of grassland and vegetated garden beds. As such, this triggers the requirement for the preparation of a BDAR.

The total amount of vegetation clearing proposed to be undertaken is approximately 0.14 ha. As the amount of clearing of native vegetation is less than 1 ha and not within an area classed as high biodiversity on the biodiversity values map (DPIE 2019), the development meets the requirements of a small area development and a streamlined BDAR is required.

Table 1-1 Biodiversity Offset Scheme Thresholds

Threshold		Application to the Proposal	Threshold Exceeded?
<b>Minimum lot size associated with the property</b>	<b>Threshold for clearing of native vegetation</b>	No minimum lot size set for the zoning. Actual lot size is 1 ha therefore threshold of clearing of native vegetation is > 0.5 ha and 1 ha to utilise streamline module	No.
<b>Less than 1 ha</b>	0.25 ha or more		
<b>1 ha to less than 40 ha</b>	0.5 ha or more		
<b>40 ha to less than 1000 ha</b>	1 ha or more		
<b>1000 ha or more</b>	2 ha or more		
Areas of Outstanding Biodiversity Value		None occur in the development site.	No
Significant impact on threatened species, populations or ecological communities		Significant impact on Long-nosed Bandicoot population in the Inner West	Yes, BDAR required
Activity on land identified as being of high biodiversity value on the Biodiversity Values Map		The development site does not impact on any land classed as land of high biodiversity value	No

## 1.3 STUDY AIMS

This BDAR has been prepared by NGH for Artazan Property Group on behalf of the Catholic Healthcare.

The aim of this BDAR is to address the requirements of the BAM, as required by the Biodiversity Offset Scheme (BOS). The report has followed the streamlined assessment methodology for small area development.

## **1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT**

The following information sources were used in this BDAR:

- Proposal layers, construction methodology and concept designs provided by Artazan Property Group
- Marrickville Local Environment Plan 2011
- NSW OEH's Threatened Species Profiles  
<http://www.environment.nsw.gov.au/threatenedspeciesapp/>
- Australian Government's Species Profiles and Threats (SPRAT) database  
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- Commonwealth Department of Environment and Energy Protected Matters Search Tool accessed online at <http://environment.gov.au/epbc/protected-matters-search-tool>
- NSW OEH's Biodiversity Assessment Method (BAM) calculator  
(<http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx>).
- NSW OEH's BioNet threatened biodiversity database accessed online via login at <http://www.bionet.nsw.gov.au/>.
- OEH BioNet Vegetation Classification Database (OEH 2019) accessed online via login at <http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx>
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW Government SEED Mapping  
[https://geo.seed.nsw.gov.au/Public\\_View/index.html?viewer=Public\\_View&locale=en-AU](https://geo.seed.nsw.gov.au/Public_View/index.html?viewer=Public_View&locale=en-AU)
- NSW Biodiversity Values Map  
<https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap>

## 2 LANDSCAPE FEATURES

### 2.1 IBRA BIOREGIONS AND SUBREGIONS

The development site falls within the Sydney Basin East Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and the Cumberland IBRA subregion.

The Cumberland subregion was entered into the BAM Calculator for this assessment.

### 2.2 NSW LANDSCAPE REGIONS AND AREA

The development site falls within the Ashfield Plains landscape (DECC, 2002). This landscape is characterised by:

Undulating hills and valleys on horizontal Triassic shale and siltstone, occasional quartz sandstones especially near the margin of the Port Jackson landscape. General elevation 0 to 45m, local relief <20 m. Coastal extension of the Cumberland Plain landscape. Red and brown texture-contrast soils on crests grading to yellow harsh texture-contrast soils in valleys. Open forest of broad-leaved ironbark (*Eucalyptus fibrosa* ssp. *fibrosa*), grey box (*Eucalyptus moluccana*), with tea-tree (*Leptospermum* sp.) along creeks and forests of turpentine (*Syncarpia glomulifera*), red mahogany (*Eucalyptus resinifera*), grey gum (*Eucalyptus punctata*), Sydney blue gum (*Eucalyptus saligna*) and blackbutt (*Eucalyptus pilularis*) with a grassy understorey of kangaroo grass (*Themeda triandra*) on moister sites.

### 2.3 NATIVE VEGETATION

As determined by aerial imagery, existing vegetation mapping (OEH, 2016) and GIS Mapping, approximately 3.63 ha of native vegetation occurs in the surrounding 1500 m buffer area. This vegetation in the landscape surrounding the development site is predominantly planted exotic and native street trees, including Brush Box *Lophostemon confertus*, Camphor Laurel *Cinnamomum camphora*, Canary Island Date Palm *Phoenix canariensis* and Black Tea Tree *Melaleuca bracteata*.

As the native vegetation cannot be clearly differentiated from exotic vegetation using aerial imagery, a conservative approach has been taken whereby all mapped vegetation (OEH, 2016) occurring within the 1500 m buffer area has been included and considered to constitute native vegetation cover.

### 2.4 CLEARED AREAS

Within the 1500 m buffer area around the development site, 739.22 ha occurs as cleared areas. This is comprised of residential and urban areas and cleared open space such as sporting fields.

### 2.5 RIVER AND STREAMS

No natural rivers and streams occur within the development site. However, Hawthorne Canal, which is a natural waterway that is fully concreted, occurs approximately 500 m west of the development site. Watershed from the development site is likely to flow into Hawthorne Canal during rain events.



## 2.6 WETLANDS

No wetlands occur in or adjacent to the development site. The nearest important wetland listed under the EPBC Act is Towra Point Nature Reserve located over 12 km south of the development site. There is no apparent connectivity to this or any other wetland.

## 2.7 CONNECTIVITY FEATURES

The development site occurs within a highly cleared urban environment. As such, no remnant vegetation is considered to be present in proximity to the site. The vegetation forms part of a larger vegetation patch incorporating Petersham Park and Fort Street High School, totalling an area of approximately 2.9 ha, which was entered as 3 ha within the BAM calculator.

As this patch is bounded by residential and commercial development, connectivity is not contiguous with other native vegetation in the surrounding area but is part of a network of patches that forms a steppingstone pattern of connectivity in the landscape. Through this network of patches, it is foreseeable for highly mobile fauna, predominantly birds, to traverse the landscape from larger remnants of native vegetation along the Greenway to the west.

## 2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

## 2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE

The development site is not listed as an area of outstanding biodiversity value under the BC Act.

## 2.10 SITE CONTEXT COMPONENTS

### Method applied

The proposal conforms to the definition of a *site-based development* under the Biodiversity Assessment Methodology. The site-based streamlined development assessment methodology has been used in this BAM assessment.

### Percent Native Vegetation Cover

The 1500 m buffer area around the development site comprises an area of 775 ha. Native vegetation mapped within the 1500 m buffer area is calculated to be an area of 36.63 ha. This determines the percent native vegetation cover in the landscape to be 4.72%. This value was entered into the BAM Calculator for the assessment.

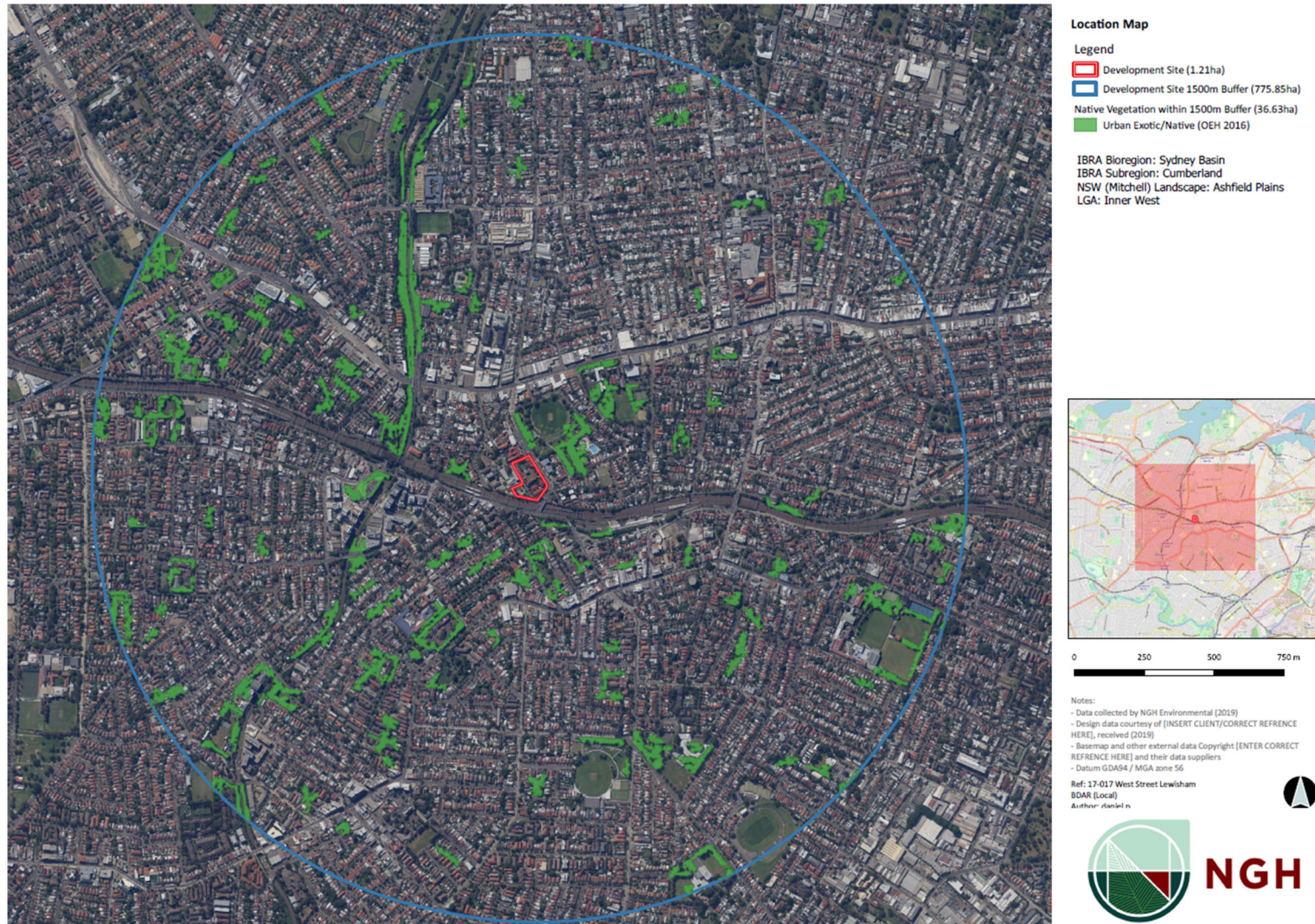


Figure 2-1 Location Map

## 3 NATIVE VEGETATION

### 3.1 NATIVE VEGETATION EXTENT

The study area occurs within a highly modified urban landscape and contains no remnant native vegetation. The native vegetation that is present consists of planted horticultural or non-local native species. As such, none of the vegetation identified within the development site is considered to conform with a Plant Community Type (PCT). However, as vegetation within the development site is known habitat for the Long-nosed Bandicoot population in inner western Sydney (*Perameles nasuta* - *endangered population*), and that threatened species polygons cannot be assigned to non-native vegetation, with exception to assessment of prescribed impacts, the area has been assigned a PCT considered to be a best fit for the regional area to enable threatened species polygons to be assigned and entered into the BAM calculator.

### 3.2 PLANT COMMUNITY TYPES (PCTS)

#### 3.2.1 Methods to assess PCTs

##### Review of existing information

A review of existing information on native vegetation within the locality was undertaken including *The Native Vegetation of the Sydney Metropolitan Area – Version 3* (OEH 2016) and *Missing Jigsaw Pieces: The Bushplants of the Cooks River Valley* (Benson et al. 1999).

##### Floristic survey

A Random Meander (Cropper 1993) and two (2) vegetation integrity plots under the BAM were undertaken on the 9<sup>th</sup> of August 2019 to survey vegetation within the development site. These methods allow for the coverage of the entire development site and maximises opportunities for detecting microhabitats and rare or sparsely distributed species.

PCTs were identified according to the OEH BioNet Vegetation Classification (OEH 2019). Botanical nomenclature follows Harden (1990-2002) and the PlantNet website, updated with recent changes recognised in Angiosperm Phylogeny Group (2016) and the Australian Plant Census.

#### 3.2.2 PCTs identified on the development site

No native PCTs were identified as occurring within the development site. However, Turpentine-Ironbark Forest has been mapped as historically occurring approximately 350 m to the south of the development site on more elevated and well-drained areas (Benson et al. 1999). Due to similar topography within the development site and its proximity to historically mapped Turpentine-Ironbark Forest, the following PCT has been ascribed to the vegetation present:

- *PCT 1281: Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*



PCT name		
<b>Vegetation formation</b>	Wet Sclerophyll Forests (Grassy sub-formation)	
<b>Vegetation class</b>	Northern Hinterland Wet Sclerophyll Forests	
<b>Vegetation type</b>	<b>PCT ID</b>	1281
	<b>Common Community Name</b>	Sydney Turpentine - Ironbark forest
<b>Approximate extent within the development site</b>	Zone 1: 0.14 ha	
<b>Species relied upon for PCT identification</b>	<b>Species name</b>	<b>Relative abundance</b>
	Sydney Blue Gum <i>Eucalyptus saligna</i>	0%
	Native Wandering Jew <i>Commelina cyanea</i>	0.1%
	Spiny-headed Mat-rush <i>Lomandra longifolia</i>	0%
	Sweet Pittosporum <i>Pittosporum undulatum</i>	1%
<b>Justification of evidence used to identify the PCT</b>	<p>Two (2) PCTs were shortlisted based on species identified within the development site and reference to local and historical mapping (OEH 2016; Benson et al. 1999). These were:</p> <ul style="list-style-type: none"> <li>a) <i>PCT 1281: Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion</i></li> <li>b) <i>PCT 835: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion</i></li> </ul> <p>The plot data collected reflected the highly modified nature of the landscaped areas containing vegetation (gardens and lawns). None of the data corresponded to the assemblage or structure of any PCT. However, PCT 1281 was allocated due to the reasons given in Section 3.2.2 above. PCT 835 was also considered due to the presence of planted <i>Eucalyptus saligna</i> which is noted as a canopy component of the community towards the eastern extent of its range (OEH 2019). However, the relatively high landscape position of the development site made this PCT less appropriate than PCT 1281.</p>	
<b>TEC Status</b>	<p>This PCT is associated with Sydney Turpentine-Ironbark Forest under the BC Act and EPBC Act. It is listed as a CEEC under both Acts. However, the vegetation within the development site is not considered to be a TEC due to PCT 1281 being allocated on the basis of historical mapping and topography rather than existing native vegetation.</p>	

PCT name		
Estimate of percent cleared		90%
Examples	<div></div> <div></div>	
Figure 3-1 Example of vegetation designated as PCT 1281 within development site		





Figure 3-2 PCTs and TECs within the Development Site

### 3.3 VEGETATION INTEGRITY ASSESSMENT

#### 3.3.1 Vegetation zones and survey effort

The vegetation within the development site was clipped to the development footprint and stratified into one (1) zone based on condition:

- a) Zone 1: PCT 1281/landscaped areas including lawn and gardens containing a mix of native and exotic species. This zone is 0.14 ha in size. According to the BAM, a minimum of one vegetation integrity plot is required to be undertaken in a zone of this size. Two vegetation integrity plots and a random meander were undertaken on the 9<sup>th</sup> of August 2019.

Table 3-1 Vegetation zones for the development site

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)
1-1281_Garden	1281	Urban exotic/native plantings	0.14	2	2.97

#### 3.3.2 Vegetation integrity assessment results

The results of the plot field data can be found in **Error! Reference source not found.**. The plot data from the vegetation integrity survey plots was entered into the BAM calculator by an accredited assessor. The results of the vegetation integrity assessment are provided in **Error! Reference source not found.**

Table 3-2 Table of current vegetation integrity scores for each vegetation zone within the development site.

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
1-1281_Garden	8.3	11.1	11.9	10.3





Figure 3-3 Vegetation Zones and Plot Locations



## 4 THREATENED SPECIES

### 4.1 ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site:

Table 4-1 Predicted Ecosystem Credit Species

Common Name	Scientific Name	Associated PCT
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Flame Robin	<i>Petroica phoenicea</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Little Bentwing-bat	<i>Miniopterus australis</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Little Lorikeet	<i>Glossopsitta pusilla</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Regent Honeyeater	<i>Anthochaera phrygia</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion

Common Name	Scientific Name	Associated PCT
Scarlet Robin	<i>Petroica boodang</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Speckled Warbler	<i>Chthonicola sagittata</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Swift Parrot	<i>Artamus cyanopterus cyanopterus</i>	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion

#### 4.1.1 Species excluded from the assessment

All species listed above were considered to have the potential to occur in the development site on occasion and were included in the assessment. A number of species were considered unlikely to occur on the site due to the lack of suitable habitat available on site and the lack of connectivity with suitable habitat containing recent records of the species. These include:

- a) Koala *Phascolarctos cinereus*
- b) Spotted-tailed Quoll *Dasyurus maculatus*

## 4.2 SPECIES CREDIT SPECIES

#### 4.2.1 Candidate species to be assessed

The BAM Calculator predicted the following species credit species to occur at the development site (Table 4-2). Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if, following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). Species excluded based on the absence or degradation of suitable habitat within the development site are identified in Table 4-2.

Table 4-2 Predicted Species Credit Species

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
<b>FAUNA</b>							
<i>Calyptorhynchus lathamii</i> Glossy Black-cockatoo (Breeding)	In spring and summer, tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, lower altitudes in drier, more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages. Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground	High	Vulnerable	Not listed	No hollow-bearing trees within development site	Excluded	No suitable breeding habitat.
<i>Pommerhelix duralensis</i> Dural Woodland Snail	The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris.	High	Endangered	Endangered	Site comprises predominantly soils on fill with no native cover and limited woody debris	Excluded	Habitat not preferential and highly degraded.
<i>Lathamus discolor</i> Swift Parrot (Breeding)	Mapped Important Areas	Moderate	Endangered	Critically Endangered	Development site not within mapped important areas.	Excluded	Not within mapped important areas
<i>Litoria aurea</i> Green and Golden Bell Frog	Within 1km of Semi-permanent/ephemeral wet areas Within 1km of swamp Within 1km of waterbody	High	Endangered	Vulnerable	Development site occurs within 1km of waterbody (Hawthorne Canal) however no suitable waterbodies and limited shelter habitat and connectivity within site.	Excluded	No suitable waterbodies and limited shelter habitat and connectivity within site.

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	Primarily inhabits Cumberland Plain Woodland. This community is a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest, which are also listed communities. The species is reliant on a good cover of coarse woody debris and uses soil cracks for shelter.	High	Endangered	Not listed	No Cumberland Plain Woodland on site, limited suitable habitat and connectivity to areas containing suitable habitat or known records	Excluded	No suitable habitat or connectivity with suitable habitat on site.
<i>Miniopterus australis</i> Little Bent-winged Bat (Breeding)	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally well-timbered areas. Roost in caves, tunnels, abandoned mines, stormwater drains, culverts, bridges and buildings during the day. Breed in caves, tunnels, mines or culverts.	Very High	Vulnerable	Not listed	No breeding habitat.	Excluded	No suitable breeding or roosting habitat.
<i>Miniopterus schreibersii oceanensis</i> Eastern Bent Wing Bat (Breeding)	Caves are primary roosting habitat, but also use derelict mines, stormwater tunnels, buildings and other man-made structures. Breed in central maternity caves. Hunt in forested areas, catching moths and other flying insects above canopy.	Very High	Vulnerable	Not listed	No breeding habitat.	Excluded	No suitable breeding or roosting habitat.
<i>Myotis macropus</i> Southern Myotis	Roost close to water in caves, mine shafts, hollow-bearing trees,	High	Vulnerable	Not listed	One abandoned building present, however no	Excluded	Habitat components not present.

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
(Breeding)	stormwater channels, buildings, under bridges and in dense foliage. Forage over streams and pools. Breed in central maternity caves. Hunt in forested areas, catching moths and other flying insects above canopy.				suitable roosting habitat due to light ingress, greater than 200 m from waterway		
<i>Perameles nasuta</i> endangered population Long-nosed Bandicoot population in inner western Sydney	Shelter mostly under older houses and buildings, forage in parkland and back-yards.	High	Endangered Population	Not listed	Old buildings present, garden beds present	Included	Suitable habitat on site, records from site
<i>Petaurus norfolcensis</i> Squirrel Glider	Mature or old-growth Box, Box-Ironbark woodlands and River Red Gum forest. Mixed species stands with a shrub or Acacia mid-storey. Requires abundant tree hollows. Large HBTs, <50 m apart.	High	Vulnerable	Not listed	No old growth or mature vegetation on site, no connectivity to any areas containing suitable habitat	Excluded	No suitable habitat
<i>Phascolarctos cinereus</i> Koala (Breeding)	Inhabits eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	High	Vulnerable	Vulnerable	No preferred feed trees present within development site or connectivity to areas of suitable habitat	Excluded	No suitable habitat
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Breeding)	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, urban gardens and fruit crops. Camps < 20 km from food	High	Vulnerable	Vulnerable	No breeding camps present.	Excluded	No suitable habitat.

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	source, close to water, in vegetation with dense canopy, often in gullies.						
<i>Anthochaera phrygia</i> Regent Honeyeater (Breeding)	There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria.	High	Critically Endangered	Critically Endangered	Site not within key breeding areas, no suitable breeding habitat present	Excluded	No suitable habitat.
<b>FLORA</b>							
<i>Acacia bynoeana</i> <i>Bynoe's Wattle</i>	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	High	Endangered	Vulnerable	No heath or dry sclerophyll forests on sandy soils on site.	Excluded	No suitable habitat present
<i>Acacia pubescens</i> Downy Wattle	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest,	High	Vulnerable	Vulnerable	No Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest or Cumberland Plain Woodland found on site.	Excluded	No suitable habitat present

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	Shale/Gravel Transition Forest and Cumberland Plain Woodland.						
<i>Caladenia tessellata</i> Thick Lip Spider Orchid	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Moderate	Endangered	Vulnerable	No grassy sclerophyll woodland on clay loam or sandy soils found on site.	Excluded	No suitable habitat present
<i>Camarophyllopsis kearneyi</i>	Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region.	High	Endangered	Not listed	Not in the correct LGA	Excluded	No suitable habitat present
<i>Epacris purpurascens</i> <i>var. purpurascens</i>	Found in a range of habitat types, most of which have a strong shale soil influence.	Moderate	Vulnerable	Not listed	Vegetation and soil type on site does not support species	Excluded	No suitable habitat present
<i>Grevillea parviflora</i> <i>subsp. parviflora</i> Small-flower Grevillea	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Occurs in a range of vegetation types from heath and shrubby woodland to open forest.	High	Vulnerable	Vulnerable	Soil type not supported on site	Excluded	No suitable habitat present
<i>Grevillea parviflora</i> <i>subsp. supplicans</i>	Occurs in heathy woodland associations on skeletal sandy soils over massive sandstones. Local observations do not support the description of its habitat as "wet heath", rather that this taxon is	High	Endangered	Not listed	No heathy woodland identified on site	Excluded	No suitable habitat present

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	strongly associated with clay-capped ridged of the Lucas Heights and Faulconbridge soil landscapes, but that it is quite restricted within these areas, suggesting it has a preference for yellow clays with periodically impeded drainage.						
<i>Gyrostemon thesioides</i>	Grows on hillsides and riverbanks and may be restricted to fine sandy soil.	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hibbertia puberula</i>	Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied.	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hibbertia superans</i>	The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with	High	Vulnerable	Not listed	No associated vegetation present	Excluded	No suitable habitat present



Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	alluvial sandy soils of the Hawkesbury Soil Landscapes						
<i>Hygrocybe aurantipes</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	High	Vulnerable	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hygrocybe austropratensis</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hygrocybe collucera</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
<i>Hygrocybe griseoramosa</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hygrocybe lanecovens</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	High	Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Hygrocybe reesia</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly ( <i>Acmena smithii</i> ), Grey Myrtle ( <i>Backhousia myrtifolia</i> ), Cheese Tree ( <i>Glochidion ferdinandi</i> ) and Sweet Pittosporum ( <i>Pittosporum undulatum</i> ). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	High	Vulnerable	Not listed	No associated vegetation present	Excluded	No suitable habitat present
<i>Acacia prominens</i> - endangered population Gosford Wattle, Hurstville and Kogarah	Grows in open situations on clayey or sandy soils.	Moderate	Endangered Population	Not listed	Site not located in Hurstville or Kogarah	Excluded	No suitable habitat present

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Local Government Areas							
<i>Pomaderris prunifolia</i> - endangered population <i>P. prunifolia</i> in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	Occurs in Rydalmere along a road reserve near a creek, among grass species on sandstone. Occurs at Rookwood Cemetery in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils.	High	Endangered Population	Not listed	Site not located in Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	Excluded	No suitable habitat present
<i>Wahlenbergia multicaulis</i> - endangered population Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Occurs in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs in damp, disturbed sites (with natural or human disturbance of various forms), typically amongst other herbs rather than in the open.	High	Endangered Population	Not listed	Site not located in Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta or Strathfield LGA.	Excluded	No suitable habitat present
<i>Persoonia hirsuta</i> Hairy Geebung	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	High	Endangered	Endangered	No associated vegetation or soil type present	Excluded	No suitable habitat present
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain.	High	Vulnerable	Vulnerable	No associated vegetation or soil type present	Excluded	No suitable habitat present

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Moderate	Endangered	Vulnerable	Not the correct area	Excluded	No suitable habitat present
<i>Tetratheca glandulosa</i>	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge.  Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops	High	Vulnerable	Not listed	No associated vegetation or soil type present	Excluded	No suitable habitat present
<i>Hygrocybe rubronivea</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly <i>Acmena smithii</i> , Grey Myrtle <i>Backhousia myrtifolia</i> , Cheese Tree <i>Glochidion ferdinandi</i> and Sweet Pittosporum <i>Pittosporum undulatum</i> . Associated with alluvial	High	Vulnerable	Not listed	No associated vegetation present	Excluded	No suitable habitat present

Species credit species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National Listing Status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	sandy soils of the Hawesbury Soil Landscapes.						
<i>Rhodamnia rubescens</i> Scrub Turpentine	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	High	Critically Endangered	Not listed	No associated vegetation present	Excluded	No suitable habitat present

#### 4.2.2 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-3 are those that are considered to have habitats present at the development site. One (1) of these species is assumed to be present on the site. Details of the survey methodologies and results are provided for each surveyed species are provided below. Targeted survey locations are mapped on **Error! Reference source not found..**

Species polygons have been defined for the species present on the site as mapped on **Error! Reference source not found..**

Table 4-3 Summary of species credit species surveyed at the development site

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
<i>Perameles nasuta</i> endangered population Long-nosed Bandicoot population in inner western Sydney	2	Surveyed	Present	0.14 ha

#### 4.2.3 Survey Methods and Results

*Perameles nasuta* endangered population Long-nosed Bandicoot population in inner western Sydney

##### SURVEY EFFORT

Searches for diggings throughout development site and subject land during May 2018 and August 2019. Detailed searches within BAM plots. Identification of habitat within garden beds.

##### SURVEY RESULTS

Three (3) individual diggings were identified during surveys, two within the subject land and one within the development site, indicating the presence of the species and the use of the site as a foraging resource by the species.



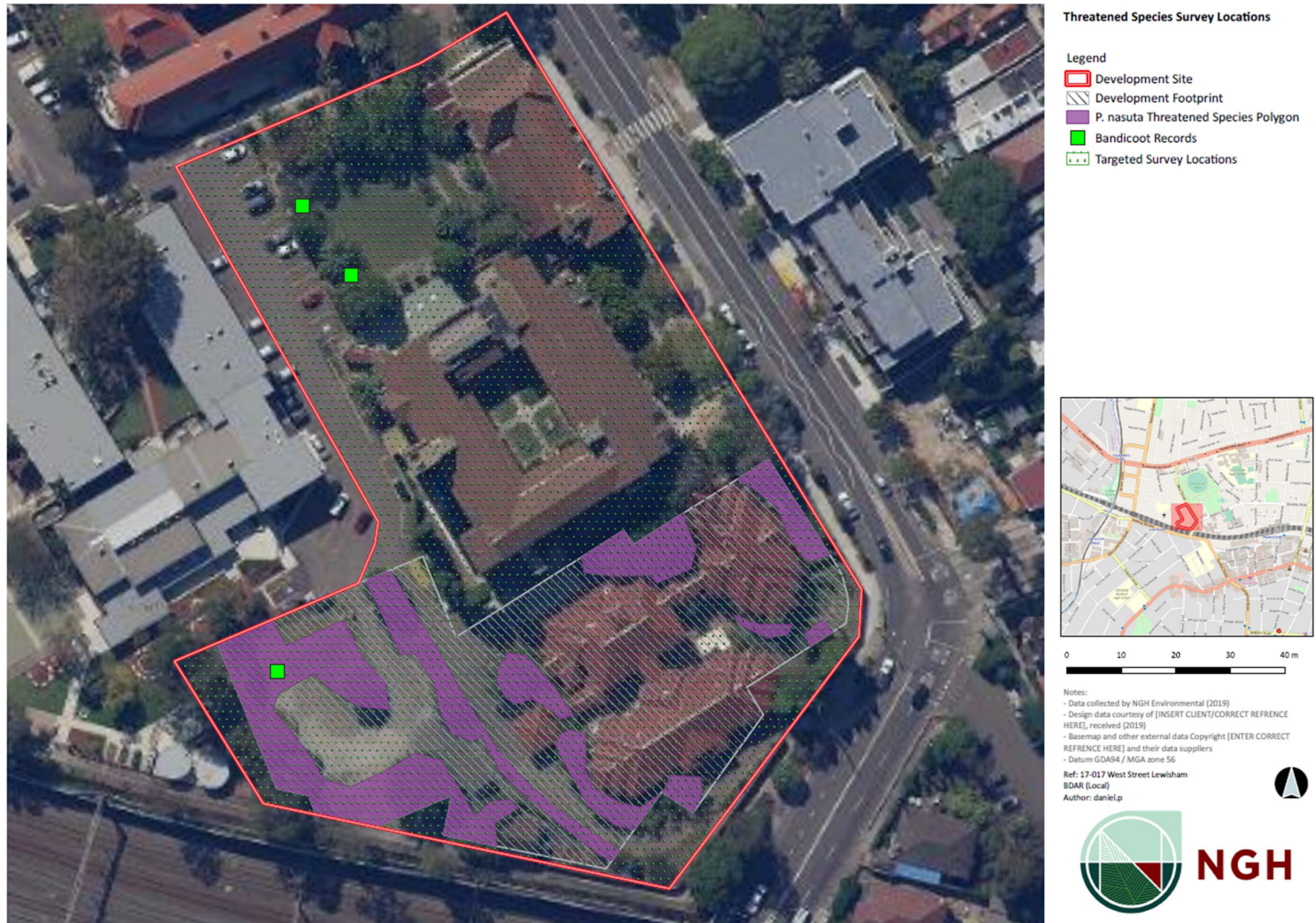


Figure 4-1 Threatened Species Survey Locations

## 4.3 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

### 4.3.1 Occurrences of karst, caves, crevices and cliffs

No karsts, caves, crevices or cliffs occur within the development site.

### 4.3.2 Occurrences of rock

No rocky outcrops occur within the development site.

### 4.3.3 Occurrences of human made structures and non-native vegetation

Human structures are present in the form of the existing buildings and associated infrastructure.

The entire vegetated portion of the site constitutes non-native vegetation. All species present within the development site are planted individuals, with limited naturally occurring species present. Examples of species which may have occurred within the previous vegetation but are planted individuals used as landscaping species include Spiny-headed Mat-rush *Lomandra longifolia* and Sweet Pittosporum *Pittosporum undulatum*. The majority of the species within the site are planted exotic landscaping species.

Although not native vegetation, areas of garden bed and grassland constitute known foraging habitat for the Long-nosed Bandicoot *Perameles nasuta*, which form part of an Endangered Population.

### 4.3.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands

No natural rivers and streams occur within the development site. However, Hawthorne Canal, which is a natural waterway that is fully concreted, occurs approximately 500 m west of the development site. Watershed from the development site is likely to flow into Hawthorne Canal during rain events.



## 5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 13 August 2018 (10km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (Appendix D). Relevant to Biodiversity these include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

The potential for these MNES to occur at the site are discussed below.

### 5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Three wetlands of international importance were returned from the protected matters report. These include:

- Bicentennial Park
- Botany Wetlands
- Eve St. Marsh, Arncliffe

The nearest of these (within 100km of the development site) is the Eve St. Marsh, Arncliffe, located approximately 5 km south east of the site. There is no apparent connectivity between any waterways in proximity to the site and this wetland.

### 5.2 THREATENED ECOLOGICAL COMMUNITIES

Eight threatened ecological communities were identified in the EPBC Act protected matters search as having potential to occur within the development site. These included:

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- Blue Gum High Forest in the Sydney Basin Bioregion
- Sydney Turpentine-Ironbark Forest
- Shale Sandstone Transition Forest of the Sydney Basin Bioregion
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion
- Eastern Suburbs Banksia Scrub of the Sydney Region Subtropical and Temperate Coastal Saltmarsh
- Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion

None of these communities are considered to occur within the development site or in proximity to the site. The vegetation within the development site comprises entirely planted species on modified soils.

### 5.3 THREATENED SPECIES

19 threatened flora species and 49 threatened fauna species were returned from the protected matters report as occurring within a 10 km radius of the site. Of these, one (1) species is considered to have the potential to utilise the habitats at the development site:

- Grey-headed Flying-fox *Pteropus poliocephalus*

No camps of the species were identified within the development site, however suitable occasional foraging habitat exists in the form of planted fruiting and flowering trees. The species would likely utilise the site on occasion as part of a broader foraging range.

### 5.4 MIGRATORY SPECIES

Fourteen listed migratory species were returned from the protected matters report. Based on a habitat assessment, two of these species could occur on the site on occasion:

- Fork-tailed Swift
- White-throated Needletail

However, as these species are almost exclusively aerial, they are considered unlikely to rely on the habitats present within the development site and are unlikely to be impacted by the proposal.

## 6 AVOID AND MINIMISE IMPACTS

### 6.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

#### 6.1.1 Site selection – consideration of alternative locations/routes

The proposal has been designed so as to utilise previously cleared lands, including existing buildings and car parks, thus limiting impacts to vegetation. The proposal also seeks to retain the best quality areas of vegetation within the subject land and enhance the connectivity between these areas. Other site locations would potentially require a greater level of vegetation clearing or removal, and have the potential to generate greater indirect impacts. As such, the location is considered to constitute the best possible use of the land, avoiding impacts to native vegetation by building on previously cleared land.

#### 6.1.2 Proposal components – consideration of alternate modes or technologies

The proposal will include the renovation of existing buildings, and includes the construction of new buildings on existing cleared car parks and building footprints. As such, this is considered to constitute the best possible method of developing on the land.

#### 6.1.3 Proposal planning phase – detailed design

An Arborist survey (TreeIQ, 2019) was undertaken to assess the health of the trees.

The final site layout has not been able to completely avoid clearing of vegetation due to the small area of the development site providing limited scope for movement of buildings, carparks or infrastructure.

Vegetation constituting the highest ecological constraints such as mature Eucalyptus trees and the higher quality garden beds would be avoided and minimised as far as practical by:

- Retaining large significant trees that will continue to provide habitat for fauna species
- Landscaping plans incorporating the existing trees and using the natural environment for nature education areas.
- Making provisions for the landscaping of new plantings.

The final design footprint is detailed in Figure 6-1.



Figure 6-1 Final project footprint

## 7 IMPACTS UNABLE TO BE AVOIDED

### 7.1 DIRECT IMPACTS

The construction and operational phases of the proposal have the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and existence of infrastructure. Direct impacts are listed in Table 7-1.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
<b>Direct impacts</b>				
Habitat clearance for permanent and temporary construction facilities	1.21 ha (0.14 ha of vegetation)	Once	Construction Phase; Long term	<ul style="list-style-type: none"> <li>Direct loss of native flora and fauna habitat</li> <li>Injury and mortality of fauna during clearing of fauna habitat and habitat trees</li> </ul>
Displacement of resident fauna	Unknown	Regular	Construction Phase; Short Term	<ul style="list-style-type: none"> <li>Direct loss of native fauna</li> <li>Decline in local fauna populations</li> </ul>
Injury or death of fauna	Unknown	Regular	Construction Phase; Short Term	<ul style="list-style-type: none"> <li>Direct loss of native fauna</li> <li>Decline in local fauna populations</li> </ul>

#### 7.1.1 Changes in vegetation integrity scores

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 7-2 below.

Table 7-2 Table of current and future vegetation integrity scores for each vegetation zone within the development site.

Zone	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score
<b>1</b>	10.3	0	<b>-10.3</b>

### 7.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7-3 below.

Table 7-3 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost
<i>Perameles nasuta</i> - endangered population	2.00	0.14 ha

### 7.1.3 Loss of hollow-bearing trees

No hollow-bearing trees were identified within the development site or development footprint. The proposal will not impact on any hollow-bearing trees.

## 7.2 INDIRECT IMPACTS

Indirect impacts can occur when the activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities or threatened species habitat beyond the development footprint. Table 7-4 below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal.



Table 7-4 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Impact	Reason	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
<b>Indirect impacts (those listed below are included in the BAM)</b>				
Inadvertent impacts on adjacent habitat or vegetation	Possible	The development site contains vegetation adjacent to the vegetation within the development footprint.	None	None
Reduced viability of adjacent habitat due to edge effects	Possible	The development site contains vegetation adjacent to the vegetation within the development footprint.	None	None
Reduced viability of adjacent habitat due to noise, dust or light spill	Possible	The development site contains vegetation adjacent to the vegetation within the development footprint.	None	None
Transport of weeds and pathogens from the site to adjacent vegetation	Unlikely	The development site contains a high level of weed cover. Any pathogens present within the development site are also likely to be present within surrounding areas.	N/A	N/A
Increased risk of starvation, exposure and loss of shade or shelter	Unlikely	The development site is in close proximity to Petersham Park. It is unlikely the proposal would exacerbate this impact given adjacent resource availability.	N/A	N/A
Loss of breeding habitats	Possible	The proposal will remove some planted ground-cover vegetation and buildings that may provide	<i>Perameles nasuta</i> - endangered population	Unlikely to affect the persistence of the population within the bioregion, proposal will

Nature of impact	Impact	Reason	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
<b>Indirect impacts (those listed below are included in the BAM)</b>				
		habitat for the Long-nosed Bandicoot <i>Perameles nasuta</i>		increase site permeability for species and will include the installation of new garden beds
Trampling of threatened flora species	Unlikely	No threatened flora known to be present at the development site.	N/A	N/A
Inhibition of nitrogen fixation and increased soil salinity	Unlikely	No nitrogen fixing species are located within the development site.	N/A	N/A
Fertiliser drift	Unlikely	Fertilisers may be applied during the landscaping stage of the proposal, but drift is unlikely due to fragmentation of vegetation patches.	N/A	N/A
Rubbish dumping	Unlikely	Development site within a highly populated school ground/nursing home.	N/A	N/A
Wood collection	Unlikely	Development site surrounded by urban areas.	N/A	N/A
Bush rock removal and disturbance	Unlikely	Development site surrounded by urban areas. No bush rock present.	N/A	N/A
Increase in predatory species populations	Potential	Development site within urban environment, potential for increase in feral predators such as cats resulting in potential increase in pest species around rubbish	<i>Perameles nasuta</i> - endangered population	Unlikely to affect the persistence of the population within the bioregion, proposal will include pest management actions



Nature of impact	Impact	Reason	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
<b>Indirect impacts (those listed below are included in the BAM)</b>				
Increase in pest animal populations	Potential	Development site within urban environment, potential for increase in pest species around rubbish	<i>Perameles nasuta</i> - endangered population	Unlikely to affect the persistence of the population within the bioregion, proposal will include pest management actions
Increased risk of fire	Unlikely	Development site within urban environment. No increased risk of fire expected.	N/A	N/A
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds	Likely	The development site contains known <i>Perameles nasuta</i> - endangered population foraging habitat.	<i>Perameles nasuta</i> - endangered population	The proposal will not remove all suitable habitat within the development site or affect known habitat in Petersham Park. The proposal will also create suitable habitat for the endangered population. The proposal will not lead to the extinction of the endangered population with the LGA.
Barriers to fauna movement	Unlikely	Development site in urban environment with poor connectivity. The proposal is unlikely to exacerbate this, and will create greater connectivity between habitats.	N/A	N/A

## 7.3 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

### 7.3.1 Threatened Ecological Communities

No EPBC listed communities are considered to occur within the development site.

### 7.3.2 Threatened Species

#### Grey-headed Flying-fox *Pteropus poliocephalus*

An area of up to 0.14 ha of vegetation constituting occasional foraging habitat for the Grey-headed Flying-fox *Pteropus poliocephalus* would be removed as a result of the proposal. The species is assumed to be present on the site on occasion due to the presence of nearby records and suitable foraging habitat within the development site.

The habitat on site would constitute occasional foraging habitat in the form of planted flowering and fruiting tree and shrub species. This habitat would form part of a larger foraging range, and the species is not known or considered likely to camp on the site.

An Assessment of Significance was undertaken for the Grey-headed Flying-fox (Appendix B) and determined that a significant impact was not considered likely to the species. The removal of 0.14 ha of occasional foraging habitat was not considered likely to:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

No referral is considered necessary to the Federal Department of Environment and Energy for the species.

### 7.3.3 Migratory species

Two migratory species, the Fork-tailed Swift and the White-throated Needletail could occur on the site on occasion. These species are almost exclusively aerial and the habitat within the development site is not considered important habitat for these species.

An assessment of significance was undertaken (Appendix B) for these species and concluded that a significant impact was unlikely, on the basis that the proposal would not:

- Substantially modify, destroy or isolate an area of important habitat for these species
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for these species

- Seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

No referral is considered necessary to the Federal Department of Environment and Energy for these migratory species.

## 8 MITIGATING AND MANAGING IMPACTS

### 8.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8-1.

#### 8.1.1 *Direct Impacts from the clearing of vegetation and habitats*

- a) Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, with the presence of a trained ecologist or wildlife handler; and
- b) Appropriate landscape plantings of local indigenous species and non-invasive species;
- c) If removed, install hollows of felled trees onto younger trees in retained vegetation; and
- d) Enforce site speed limits to reduce impacts of vehicle strikes on fauna.

#### 8.1.2 *Indirect impacts*

- a) Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed;
- b) Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment;
- c) Temporary fencing to protect significant environmental features such as trees to be retained;
- d) Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas; and
- e) Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
<b>Displacement of resident fauna through vegetation clearing and habitat removal</b>						
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecologist or licensed wildlife handler during clearing events	<ul style="list-style-type: none"> <li>Pre-clearing checklist</li> <li>Tree clearing procedure</li> </ul>	Construction	Regular	Contractor	Low	Species not detected during pre-clearing surveys may be impacted.
<b>Impacts on native vegetation and habitat</b>						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	<ul style="list-style-type: none"> <li>Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing</li> <li>No stockpiling or storage within dripline of any mature trees</li> <li>In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance</li> </ul>	Construction	Regular	Contractor	Low	Impacts to retained vegetation if protocols not followed (low risk)
Temporary fencing to protect vegetation to be retained	<ul style="list-style-type: none"> <li>Prior to construction commencing, exclusion fencing and signage would be installed around vegetation to be retained</li> </ul>	Construction	Regular	Contractor	Low	Impacts to retained vegetation if protocols not followed (low risk)
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	<ul style="list-style-type: none"> <li>Site Weed hygiene protocol in relation to plant, machinery, and fill</li> </ul>	Construction, Operation	Regular	Contractor	Low	Weed encroachment (low risk)

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	<ul style="list-style-type: none"> <li>• Site induction</li> <li>• Toolbox talks</li> </ul>	Construction	Regular	Contractor	Low	Impacts to native vegetation if staff training not being followed (low risk)

## 9 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

### 9.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

The principles used to determine if a development will have serious and irreversible impacts include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

#### 9.1.1 *Threatened ecological communities*

No threatened ecological communities listed as potential SAII entities are considered to occur in the development site.

#### 9.1.2 *Threatened species*

No threatened flora or fauna species listed as potential SAII entities are considered to occur in the development site.

#### 9.1.3 *Additional potential entities*

There are no further species considered to be potential SAII entities.

## 10 REQUIREMENT TO OFFSET

### 10.1 IMPACTS REQUIRING AN OFFSET

#### 10.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

- a vegetation zone that has a vegetation integrity score  $\geq 15$  where the PCT is representative of an endangered or critically endangered ecological community, or
- a vegetation zone that has a vegetation integrity score of  $\geq 17$  where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
- a vegetation zone that has a vegetation integrity score  $\geq 20$  where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 10-1 and shown on Figure 10-1. The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix C.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
1	1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	0.14	10.3	0

#### 10.1.2 Species credits

One (1) species credit species was detected on site (Long-nosed Bandicoot population in inner western Sydney) and one (1) species offset credit is required for the development.

#### 10.1.3 Offsets required under the EPBC Act

No species listed on the EPBC Act have been identified as having the potential to be significantly impacted by the development. As such, the proposal is not considered to require offsets in accordance with the EPBC Offsets Policy.



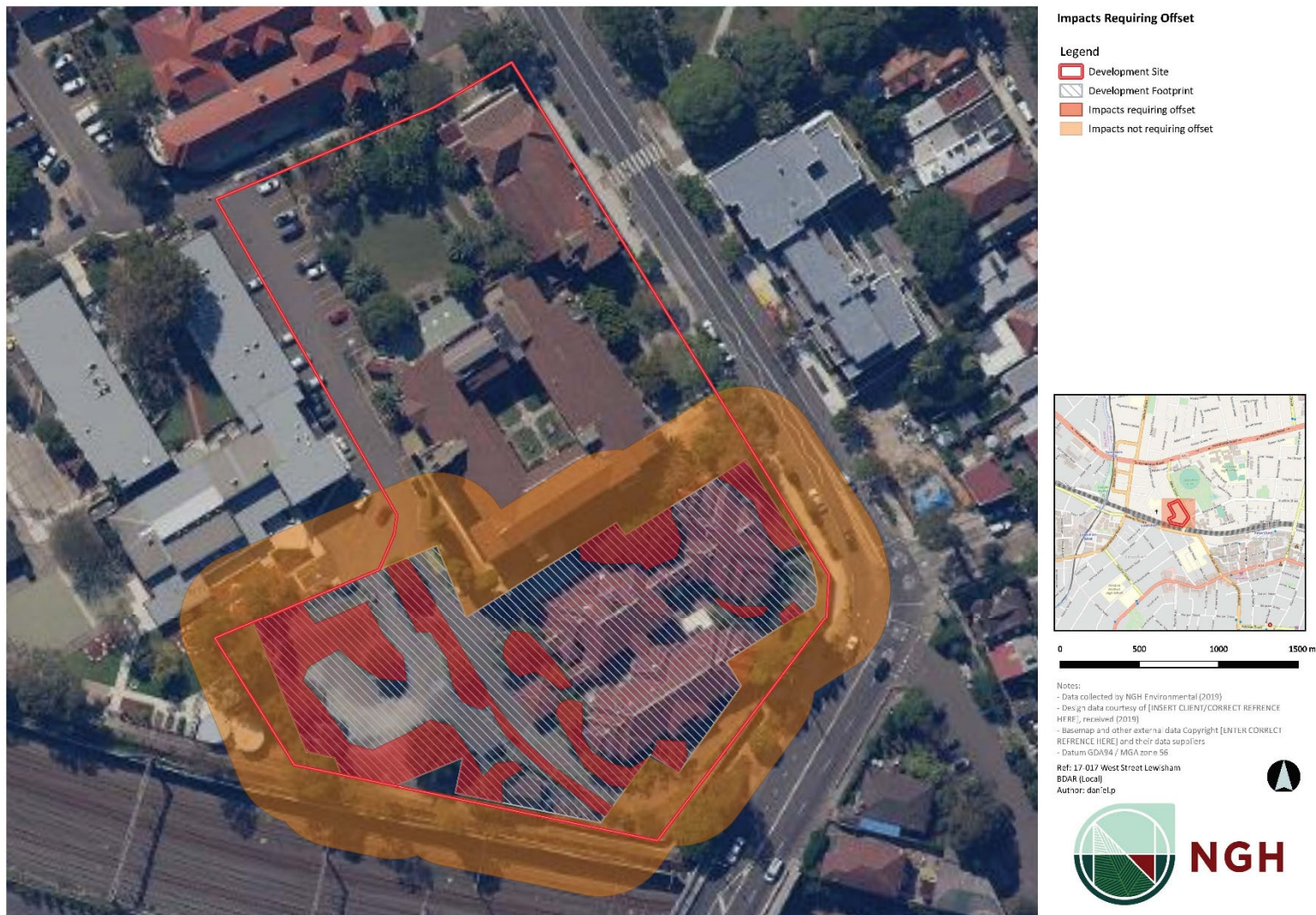


Figure 10-1 Impacts requiring an offset, not requiring an offset and not requiring assessment

# 11 CONCLUSIONS

NGH has prepared this BDAR for Artazan Property Group on behalf of Catholic Healthcare for the proposed aged care facility at Lewisham, NSW. The purpose of this BDAR was to address the requirements of the BAM. In this BDAR, biodiversity impacts have been assessed through:

- Identification of PCTs on the development site;
- Comprehensive mapping and assessment completed in accordance with the BAM;
- Mitigation measures which have been outlined to reduce the impacts to biodiversity;
- The obligation to retire one (1) Species Credit for impacts to Long-nosed Bandicoot population in inner western Sydney.

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets scheme, and will be achieved by either;

- c) The obligation to retire credits under the Biodiversity Offsets Scheme, or
- d) Making payments into the Biodiversity Conservation Fund using the offset payments calculator.

The proposal is not considered to significantly impact upon federally listed entities, therefore, a referral to the Department of Environment and Energy is not required.

## 12 REFERENCES

- Arcadia Landscape Architecture (2019) Landscape Design Masterplan - Catholic Healthcare Lewisham Development Application
- Benson, D. (1999) Missing jigsaw pieces: the bushplants of the Cooks River Valley. Royal Botanic Gardens Sydney, Sydney.
- DECC (2002) Descriptions for NSW (Mitchell) Landscapes Version 2. NSW Department of Environment and Climate Change.
- DoE (2016). Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: <http://www.environment.gov.au/sprat>.
- DoE (2018) National Flying-fox monitoring viewer, Accessed at <http://www.environment.gov.au/biodiversity/threatened/species/flying-fox-monitoring>
- DPIE (2019) Biodiversity Values Map. Online, accessed <https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap>
- Environment Australia (2001) A Directory of Important Wetlands in Australia. 3rd Edition. Environment Australia, Canberra.
- NSW Scientific Committee (2008) Final Determination - Long-nosed Bandicoot *Perameles nasuta* Geoffroy, 1804 in inner western Sydney - endangered population listing. <http://www.environment.nsw.gov.au/determinations/longnosedbandicootfd.htm>
- Office of Environment and Heritage (OEH) (2016) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles (Version 3.0)
- Office of Environment and Heritage (OEH) (2017) Biodiversity Assessment Methodology (BAM). Office of Environment and Heritage for the NSW Government, Sydney, NSW.
- Office of Environment and Heritage (OEH) (2019) BioNet Vegetation Information System: Classification Database. Accessed online at <http://www.environment.nsw.gov.au/research/Visclassification.htm>
- Office of Environment and Heritage (2019) Threatened Populations of a Species. <http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/threatened-populations>
- Jackson Teese (2019) Catholic Healthcare – Lewisham Development Application Drawings Revision FOR DISCUSSION 09-08-2019
- Leary, T., Kwok, A., Khan, B., Ibbetson, P. (2010) *Yuppie bandicoots of inner western Sydney – in hiding or urban renewal?* pp. 415 - 425 in The Natural History of Sydney, edited by Daniel Lunney, Pat Hutchings and Dieter Hochuli. Royal Zoological Society of NSW, Mosman, NSW, Australia. 2010
- TreeIQ (2019) Arboricultural Impact Assessment Tree Protection Specification – Catholic Healthcare Lewisham 2B West Street Lewisham

## APPENDIX A PLOT FIELD DATA

Survey results are presented for the Plant Community Type (PCT) identified within the development site:

- *PCT 1281: Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*

The foliage cover of species is based on visual estimates of foliage cover within a standard 20 metre x 20 metre plot.

Where uncertainty exists due to the unavailability of reproductive material, the taxon is identified to genus level only. Scientific nomenclature follows Harden (1990-2002) and the Sydney Royal Botanic Gardens PlantNet website, updated with recent changes accepted by the except where recent changes accepted by the Angiosperm Phylogeny Group (2016) and the Australian Plant Census (2017)

Plot 1

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	Sum		Tape length	% cover	Average %
Count of Native Richness	Tree (TG)	3	Litter Cover	5m	5%	2%
	Shrub (SG)	0		15m	0%	
	Forb (FG)	1		25m	5%	
	Grass & grass like (GG)	2		35m	0%	
	Fern (EG)	0		45m	0%	
	Other (OG)	0	Bare ground cover	5m	0%	43%
	TOTAL	6		15m	15%	
BAM Attribute (20x20m plot) Structure				25m	0%	
	Stratum	Sum		35m	100%	
Count of cover abundance ( <u>native</u> vascular plants)	Tree (TG)	13	Cryptogam cover	45m	100%	0%
	Shrub (SG)	0		5m	0%	
	Forb (FG)	0.1		15m	0%	
	Grass & grass like (GG)	20.1		25m	0%	
	Fern (EG)	0		35m	0%	
	Other (OG)	0		45m	0%	
	TOTAL Native	33.2	Rock Cover	5m	0%	17%
	TOTAL 'HTE'	0		15m	85%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts - Function			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29		2	
10-19		3	
5-9			
<5			N/A
Length of logs (m)		0	

### Structure and Composition

Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	High Threat	EPBC Status	BCA Status	Native Growth Form
<i>Bidens pilosa</i>	Cobbler's Pegs	Asteraceae	*	1	20	Yes			
<i>Callistemon viminalis</i>	Weeping Bottlebrush	Myrtaceae		1	0	No			Tree (TG)
<i>Cenchrus clandestinus</i>	Kikuyu Grass	Poaceae	*	10	100+	No			
<i>Chloris gayana</i>	Rhodes Grass	Poaceae	*	1	10	No			
<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	*	0.1	1	No			
<i>Commelina cyanea</i>	Native Wandering Jew	Commelinaceae		0.1	1	No			Forb (FG)
<i>Conyza spp.</i>	Fleabane	Asteraceae	*	0.1	5	No			
<i>Corymbia citriodora</i>	Lemon-scented Gum	Myrtaceae	*	2	0	No			Tree (TG)
<i>Cynodon dactylon</i>	Common Couch	Poaceae		20	100+	No			Grass & grasslike (GG)
<i>Dietes spp.</i>	Iris	Iridaceae	*	0.1	1	No			



Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	High Threat	EPBC Status	BCA Status	Native Growth Form
<i>Ehrharta erecta</i>	Panic Veldtgrass	Poaceae	*	1	5	No			
<i>Eucalyptus saligna</i>	Sydney Blue Gum	Myrtaceae		10	0	No			Tree (TG)
<i>Hypochaeris radicata</i>	Catsear	Asteraceae	*	0.2	5	No			
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Lomandraceae		0.1	0	No			Grass & grasslike (GG)
<i>Lotus spp.</i>		Fabaceae (Faboideae)	*	0.1	1	No			
<i>Medicago spp.</i>	Medic	Fabaceae (Faboideae)	*	20	100+	No			
<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	*	5	20	No			
<i>Nothoscordum gracile</i>	Onion Weed	Alliaceae	*	0.1	1	No			
<i>Passiflora caerulea</i>	Blue Passionflower	Passifloraceae	*	0.1	0	No			
<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	*	0.5	10	No			
<i>Sida rhombifolia</i>	Paddy's Lucerne	Malvaceae	*	0.1	1	No			
<i>Soliva sessilis</i>	Bindyi	Asteraceae	*	5	100+	No			
<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	*	0.5	20	No			
<i>Stenotaphrum secundatum</i>	Buffalo Grass	Poaceae	*	10	100+	No			
<i>Taraxacum officinale</i>	Dandelion	Asteraceae	*	2	50	No			
<i>Vicia sativa</i>	Common vetch	Fabaceae (Faboideae)	*	0.1	1	No			

Plot 2

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	Sum		Tape length	% cover	Average %
Count of Native Richness	Tree (TG)	5	Litter Cover	5m	5%	4%
	Shrub (SG)	0		15m	0%	
	Forb (FG)	1		25m	20%	
	Grass & grass like (GG)	1		35m	1%	
	Fern (EG)	1		45m	0%	
	Other (OG)	1	Bare ground cover	5m	100%	41%
	TOTAL	8		15m	100%	
BAM Attribute (20x20m plot) Structure				25m	5%	
	Stratum	Sum		35m	0%	
Count of cover abundance ( <u>native</u> vascular plants)	Tree (TG)	26	Cryptogam cover	45m	0%	0%
	Shrub (SG)	0		5m	0%	
	Forb (FG)	0		15m	0%	
	Grass & grass like (GG)	5		25m	0%	
	Fern (EG)	1		35m	0%	
	Other (OG)	0.1		45m	0%	
	TOTAL Native	32.1	Rock Cover	5m	0%	00%
	TOTAL 'HTE'	0		15m	85%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts - Function			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49		2	
20-29		3	
10-19		5	
5-9			
<5			N/A
Length of logs (m)		0	

#### Structure and Composition

Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	High Threat	EPBC Status	BCA Status	Native Growth Form
<i>Aechmea fasciata</i>	Silver Vase	Bromeliaceae	*	2	10	No			
<i>Agapanthus praecox</i>	Blue Lily	Amaryllidaceae	*	15	20	No			
<i>Alpinia zerumbet</i>	Shell Ginger	Zingiberaceae	*	0.5	1	No			
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	Arecaceae		10	4	No		P	Other (OG)
<i>Asparagus aethiopicus</i>	Asparagus Fern	Asparagaceae	*	1	5	Yes			
<i>Asparagus plumosus</i>	Climbing Asparagus Fern	Asparagaceae	*	0.1	1	Yes			
<i>Aspidistra elatior</i>	Cast Iron Plant	Liliaceae	*	2	20	No			
<i>Asplenium australasicum</i>	Bird's Nest Fern	Aspleniaceae		1	1	No		P	Fern (EG)
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	Malvaceae		5	1	No			Tree (TG)

Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	High Threat	EPBC Status	BCA Status	Native Growth Form
<i>Carpobrotus glaucescens</i>	Pigface	Aizoaceae		0.1	1	No			Forb (FG)
<i>Celtis sinensis</i>	Japanese Hackberry	Ulmaceae	*	0.1	1	No			
<i>Chlorophytum comosum</i>	Spider Plant	Anthericaceae	*	0.1	1	No			
<i>Cinnamomum camphora</i>	Camphor Laurel	Lauraceae	*	0.1	5	No			
<i>Conyza spp.</i>	Fleabane	Asteraceae	*	0.1	5	No			
<i>Cordyline spp.</i>		Asteliaceae	*	1	5	No			
<i>Crassula ovata</i>	Jade Plant	Crassulaceae	*	0.1	1	No			
<i>Cynodon dactylon</i>	Common Couch	Poaceae		5	100+	No			Grass & grasslike (GG)
<i>Dietes spp.</i>	Iris	Iridaceae	*	10	50	No			
<i>Ehrharta erecta</i>	Panic Veldtgrass	Poaceae	*	0.1	5	No			
<i>Hedera helix</i>	English Ivy	Araliaceae	*	0.5	1	No			
<i>Jacaranda mimosifolia</i>	Jacaranda	Bignoniaceae	*	0.1	1	No			
<i>Lagerstroemia indica</i>		Lythraceae	*	0	1	No			
<i>Liriope spicata</i>	Lily Turf	Asparagaceae	*	1	10	No			
<i>Livistona australis</i>	Cabbage Palm	Arecaceae		5	1	No		P	Other (OG)
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Myrtaceae		1	1	No			Tree (TG)
<i>Monstera deliciosa</i>	Fruit Salad Plant	Araceae	*	1	1	No			
<i>Ochna serrulata</i>	Mickey Mouse Plant	Ochnaceae	*	0.1	5	No			
<i>Oxalis spp.</i>		Oxalidaceae	*	0.1	5	No			
<i>Pelargonium spp.</i>		Geraniaceae	*	0.1	1	No			
<i>Philodendron selloum</i>	Philodendron	Araceae	*	0.1	1	No			
<i>Phoenix canariensis</i>	Canary Island Date Palm	Arecaceae	*	1	1	No			

Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	High Threat	EPBC Status	BCA Status	Native Growth Form
<i>Pittosporum undulatum</i>	Sweet Pittosporum	Pittosporaceae		5	1	No			Shrub (SG)
<i>Plumbago auriculata</i>	Cape leadwot	Plumbaginaceae	*	0.1	1	No			
<i>Rhododendron spp.</i>	Azalea	Ericaceae	*	2	2	No			
<i>Stenotaphrum secundatum</i>	Buffalo Grass	Poaceae	*	5	100+	No			
<i>Strelitzia spp.</i>		Strelitziaceae	*	0.5	1	No			
<i>Syagrus romanzoffiana</i>	Cocos Palm	Arecaceae	*	1	1	No			
<i>Yucca spp.</i>		Agavaceae	*	1	3	No			

## APPENDIX B EPBC ASSESSMENT OF SIGNIFICANT IMPACT

### Grey-headed Flying-fox

The assessment of significance for a vulnerable species considers whether an important population occurs within the development site.

An important population is defined as 'a population that is necessary for a species long-term survival and recovery.

This includes populations identified in recovery plans and/or

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity
- Populations that are near the limit of the species range

Records exist of the species in proximity to the site, and suitable foraging habitat occurs within the development site in the form of planted garden plants and trees. As suitable habitat occurs within the development site, the Grey-headed Flying-fox may forage within the development site on occasion.

An important population of Grey-headed Flying-fox is not considered to occur within the development site based on the following factors;

- The entire species is treated as a single population (SPRAT, 2019), thus any individuals within the site would not constitute a source population for breeding and dispersal.
- The species is highly mobile and undertake regular seasonal movements. Therefore, the development site is not necessary for maintaining genetic diversity.
- The area of the development site is known as an area where the species is likely to occur. It is not near the limit of the species range.

Table 12-1 Assessment of Significance Grey-headed Flying-fox

Criteria	Significant Impact Likely
<b>a) Will the action lead to a long-term decrease in the size of an important population of a species?</b>	
Based on limited habitat features within the site, no important population of Grey-headed Flying-fox is considered to occur within the development site. The development would not lead to a long-term decrease in the size of an important population of a species.	No
<b>b) Will the action reduce the area of occupancy of an important population?</b>	
Based on limited habitat features within the site, no important population of Grey-headed Flying-fox is considered to occur within the development site. The development would not reduce the area of occupancy of an important population.	No
<b>c) Will the action fragment an existing important population into two or more populations?</b>	



no important population of Grey-headed Flying-fox is considered to occur within the development site. The development would not fragment an existing important population into two or more populations.	No
<b>d) Will the action adversely affect habitat critical to the survival of a species?</b>	
<p>Habitat critical to the survival of the Grey-headed Flying-fox includes foraging and roosting habitat. The species is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary food source is blossom from Eucalyptus and related genera but in some areas it also utilises a wide range of rainforest fruits.</p> <p>The species roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of Melaleuca, mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban areas</p> <p>The development site contains occasional foraging habitat, and no known roosting habitat. The habitat on site is unlikely to be critical to the survival of the species.</p>	No
<b>e) Will the action disrupt the breeding cycle of an important population?</b>	
Based on limited habitat features within the site, no important population of Grey-headed Flying-fox is considered to occur within the development site. Additionally, as no camps of the species exist within the development site, the action is not considered likely to disturb the breeding cycle of an important population of the species.	No
<b>f) Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?</b>	
The proposal would impact on 0.14 ha of planted vegetation. The quality of the habitat is poor, existing as a small isolated patch in the midst of an urban area surrounded by houses. The majority of the overstory eucalyptus trees would remain, keeping any 'stepping stone' connectivity that may be used for the Grey-headed Flying-fox to move across the landscape. Based on these factors, the removal of 0.14 ha of poor quality habitat would be unlikely to cause a decline in the Grey-headed Flying-fox..	No
<b>g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat</b>	
The development site occurs within the midst of an urban area surrounded by houses and schools. Invasive species such as cats that may harm the Grey-headed Flying-fox are likely to already be present in the environment. The development site would maintain its current land use as an aged care facility and unlikely cause an increase in invasive species becoming established.	No
<b>h) Will the action introduce disease that may cause the species to decline?</b>	
The proposal will not generate the introduction of any disease that may cause the species to decline.	No
<b>i) Will the action interfere substantially with the recovery of the species?</b>	
No recovery plan has been prepared for the species. The Action Plan for Australian Bats includes a number of Recovery Objectives:	No

- Stabilise the population at its 1999 level.
- Define patterns of landscape use, and identify and protect essential habitat.
- Develop non-destructive methods for crop protection.
- Develop non-destructive methods for management of camps in problem areas.
- Ensure consistent management of the species across relevant States (Queensland, NSW and Victoria).

The proposal does not interfere substantially with any of these actions.

The project site area contains habitat that could potentially be used by the Grey-headed Flying-fox. Of the nine criteria for significant impact for a vulnerable species, the project is unlikely to cause a significant impact to any criteria. The proposal is therefore considered unlikely to significantly impact the Grey-headed Flying-fox.

### Migratory Species

An assessment of significance for migratory species must establish whether the habitat on the proposed site is considered "important habitat" as defined in the EPBC Act. Table 12-2 outlines an assessment of important habitat under the EPBC Act for the two migratory species for which suitable habitat was identified at the proposed project site.

"Important habitat" for migratory species is described as:

1. Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
2. Habitat that is of critical importance to the species at particular life-cycle stages; and/or
3. Habitat utilised by a migratory species which is at the limit of the species range; and/or
4. Habitat within an area where the species is declining.

Table 12-2 Assessment of important habitat: Migratory species, Fork-tailed Swift and White-throated Needletail

Criteria	Considered Important habitat
<b>a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species.</b>	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The area is not considered to support an ecologically significant proportion of the population of the species. Therefore the habitat is unlikely to be utilised by the species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species.	No
<b>b) Habitat that is of critical importance to the species at particular life-cycle stages.</b>	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. Therefore the habitat is unlikely to be of critical importance to the species at particular life-cycle stages.	No
<b>c) Habitat utilised by a migratory species which is at the limit of the species range.</b>	

The habitat is not located at the limit of the species range for the Fork-tailed Swift or the White-throated Needletail.	No
<b>d) Habitat within an area where the species is declining.</b>	
The Fork-tailed Swift and the White-throated Needletail are not known to be declining in the area of the proposed project.	No

As per the criteria discussed in the above table, the habitat within the proposal site is not considered important habitat for the Fork-tailed Swift or the White-throated Needletail.

Table 12-3 outlines an assessment of significance for migratory under the EPBC Act for the two migratory species for which suitable habitat was identified at the proposed project site, the Fork-tailed Swift and the White-throated Needletail.

Table 12-3 Assessment of Significance: Migratory species, Fork-tailed Swift and White-throated Needletail

Criteria	Significant Impact Likely
<b>a) Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species?</b>	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. As outlined in Table 12-2, the habitats within the proposal site are not considered important habitat. Therefore the action is unlikely to substantially modify, destroy or isolate an area of important habitat for either species.	No
<b>b) Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?</b>	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. As outlined in Table 12-2, the habitats within the proposal site are not considered important habitat. Therefore the action is unlikely to substantially modify, destroy or isolate an area of important habitat for either species.	No
<b>c) Will the action seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species?</b>	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The area is not considered to support an ecologically significant proportion of the population of the species. Therefore the action is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of either species.	No

The project site area contains habitat that could potentially be used by the Fork-tailed Swift or the White-throated Needletail. Of the four criteria for significant impact for a migratory species, the project is unlikely to cause a significant impact to any criteria. The proposal is therefore considered unlikely to significantly impact the Fork-tailed Swift or the White-throated Needletail.

## APPENDIX C BAM CALCULATOR CREDIT REPORT

# BAM Predicted Species Report

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017039/BAAS17093/19/00017040	Catholic Healthcare - Lewisham	04/07/2019
Assessor Name	Report Created	BAM Data version *
	14/08/2019	12
Assessor Number	Assessment Type	BAM Case Status
	Part 4 Developments (General)	Open
	Assessment Revision	Date Finalised
	0	To be finalised

\* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

**Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.**

Common Name	Scientific Name	Vegetation Types(s)
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Eastern Bentwing-bat	Miniopterus schreibersii oceanensis	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Eastern Freetail-bat	Mormopterus norfolkensis	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Flame Robin	Petroica phoenicea	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Koala	Phascolarctos cinereus	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Little Bentwing-bat	Miniopterus australis	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion

## BAM Predicted Species Report

Little Lorikeet	Glossopsitta pusilla	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Regent Honeyeater	Anthochaera phrygia	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Scarlet Robin	Petroica boodang	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Speckled Warbler	Chthonicola sagittata	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion
Swift Parrot	Lathamus discolor	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion



# BAM Candidate Species Report

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017039/BAAS17093/19/00017040	Catholic Healthcare - Lewisham	04/07/2019
Assessor Name	Report Created	BAM Data version *
	14/08/2019	12
Assessor Number	Assessment Type	BAM Case Status
	Part 4 Developments (General)	Open
	Assessment Revision	Date Finalised
	0	To be finalised

\* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

## List of Species Requiring Survey

Name	Presence	Survey Months
<b><i>Perameles nasuta</i> - endangered population</b> Long-nosed Bandicoot population in inner western Sydney	Yes (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>

## List of Species Not On Site

Name
<b><i>Acacia bynoeana</i></b> Bynoe's Wattle
<b><i>Acacia pubescens</i></b> Downy Wattle
<b><i>Caladenia tessellata</i></b> Thick Lip Spider Orchid
<b><i>Calyptorhynchus lathami</i></b> Glossy Black-Cockatoo
<b><i>Camarophyllopsis kearneyi</i></b> Camarophyllopsis kearneyi
<b><i>Epacris purpurascens</i> var. <i>purpurascens</i></b> Epacris purpurascens var. purpurascens
<b><i>Grevillea parviflora</i> subsp. <i>parviflora</i></b> Small-flower Grevillea
<b><i>Grevillea parviflora</i> subsp. <i>supplicans</i></b> Grevillea parviflora subsp. supplicans
<b><i>Gyrostemon thesioides</i></b> Gyrostemon thesioides

<b><i>Hibbertia puberula</i></b>	Hibbertia puberula
<b><i>Hibbertia superans</i></b>	Hibbertia superans
<b><i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i></b>	Hygrocybe anomala var. ianthinomarginata
<b><i>Hygrocybe aurantipes</i></b>	Hygrocybe aurantipes
<b><i>Hygrocybe austropratensis</i></b>	Hygrocybe austropratensis
<b><i>Hygrocybe collucera</i></b>	Hygrocybe collucera
<b><i>Hygrocybe griseoramosa</i></b>	Hygrocybe griseoramosa
<b><i>Hygrocybe lanecovens</i></b>	Hygrocybe lanecovens
<b><i>Hygrocybe reesia</i></b>	Hygrocybe reesia
<b><i>Pommerhelix duralensis</i></b>	Dural Woodland Snail
<b><i>Acacia prominens</i> - endangered population</b>	Gosford Wattle, Hurstville and Kogarah Local Government Areas
<b><i>Pomaderris prunifolia</i> - endangered population</b>	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas
<b><i>Wahlenbergia multicaulis</i> - endangered population</b>	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield
<b><i>Lathamus discolor</i></b>	Swift Parrot
<b><i>Litoria aurea</i></b>	Green and Golden Bell Frog
<b><i>Meridolum corneovirens</i></b>	Cumberland Plain Land Snail
<b><i>Miniopterus australis</i></b>	Little Bentwing-bat
<b><i>Miniopterus schreibersii oceanensis</i></b>	Eastern Bentwing-bat
<b><i>Myotis macropus</i></b>	Southern Myotis
<b><i>Persoonia hirsuta</i></b>	Hairy Geebung
<b><i>Petaurus norfolcensis</i></b>	Squirrel Glider
<b><i>Phascolarctos cinereus</i></b>	Koala
<b><i>Pimelea curviflora</i> var. <i>curviflora</i></b>	Pimelea curviflora var. curviflora
<b><i>Pteropus poliocephalus</i></b>	Grey-headed Flying-fox
<b><i>Syzygium paniculatum</i></b>	Magenta Lilly Pilly
<b><i>Tetratheca glandulosa</i></b>	Tetratheca glandulosa
<b><i>Anthochaera phrygia</i></b>	Regent Honeyeater

## BAM Candidate Species Report

<b><i>Hygrocybe rubronivea</i></b> Hygrocybe rubronivea
<b><i>Rhodamnia rubescens</i></b> Scrub Turpentine

# BAM Vegetation Zones Report

## Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00017039/BAAS17093/19/00017040	Catholic Healthcare - Lewisham	04/07/2019
Assessor Name	Report Created	BAM Data version *
	14/08/2019	12
Assessor Number	Assessment Type	BAM Case Status
	Part 4 Developments (General)	Open
* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.		Date Finalised
		To be finalised
	Assessment Revision	
	0	

## Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	1281_Garden	1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Garden	0.14	1	



## BAM Biodiversity Credit Report (Like for like)

### Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017039/BAAS17093/19/00017040	Catholic Healthcare - Lewisham	04/07/2019
Assessor Name	Assessor Number	BAM Data version *
		12
Proponent Names	Report Created	BAM Case Status
	14/08/2019	Open
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (General)	To be finalised

### Potential Serious and Irreversible Impacts

Nil

Nil

\* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

### Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

# BAM Biodiversity Credit Report (Like for like)

Predicted Threatened Species Not On Site

No Changes

## Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Not a TEC	0.1	0.00

<b>1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion</b>	<b>Like-for-like credit retirement options</b>			
	Class	Trading group	HBT	IBRA region
	Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 1281, 1845	Northern Hinterland Wet Sclerophyll Forests - ≥ 90% cleared group (including Tier 2 or higher).	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

## Species Credit Summary

## BAM Biodiversity Credit Report (Like for like)

Species	Area	Credits
<b>Perameles nasuta - endangered population</b> / Long-nosed Bandicoot population in inner western Sydney	0.1	1.00

<b>Perameles nasuta - endangered population/</b> Long-nosed Bandicoot population in inner western Sydney	1281_Garden	<b>Like-for-like credit retirement options</b>	
		Spp	IBRA region
		<b>Perameles nasuta - endangered population/</b> Long-nosed Bandicoot population in inner western Sydney	Any in NSW





## BAM Biodiversity Credit Report (Variations)

### Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017039/BAAS17093/19/00017040	Catholic Healthcare - Lewisham	04/07/2019
Assessor Name	Assessor Number	BAM Data version *
		12
Proponent Name(s)	Report Created	BAM Case Status
	14/08/2019	Open
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (General)	To be finalised

\* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

### Potential Serious and Irreversible Impacts

Nil

Nil

### Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

## BAM Biodiversity Credit Report (Variations)

Predicted Threatened Species Not On Site

No Changes

### Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Not a TEC	0.1	0.00

<b>1281-Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion</b>	<b>Like-for-like credit retirement options</b>			
	Class	Trading group	HBT	IBRA region
	Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 1281, 1845	Northern Hinterland Wet Sclerophyll Forests - ≥ 90% cleared group (including Tier 2 or higher).	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	<b>Variation options</b>			
	Formation	Trading group	HBT	IBRA region

## BAM Biodiversity Credit Report (Variations)

	Wet Sclerophyll Forests (Grassy sub-formation)	Tier 2 or higher	No	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
--	------------------------------------------------	------------------	----	------------------------------------------------------------------------------------------------------------------------------

### Species Credit Summary

Species	Area	Credits
<b>Perameles nasuta - endangered population</b> / Long-nosed Bandicoot population in inner western Sydney	0.1	1.00

<b>Perameles nasuta - endangered population/</b> Long-nosed Bandicoot population in inner western Sydney	1281_Garden	<b>Like-for-like options</b>		
		Spp		IBRA region
		<b>Perameles nasuta - endangered population/</b> Long-nosed Bandicoot population in inner western Sydney		Any in NSW
		<b>Variation options</b>		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

## BAM Biodiversity Credit Report (Variations)

		Fauna	Endangered Population	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
--	--	-------	-----------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00017039/BAAS17093/19/00017040	61	0	14/08/2019
Assessor Name	Assessor Number	Proposal Name	BAM Case Status
		Catholic Healthcare - Lewisham	Open

<b>PCT list</b>	Assessment Type	Date Finalised
	Part 4 Developments (General)	To be finalised

Include	PCT common name	Credits
Yes	<b>1281 - Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion</b>	0

### Species list

Include	Species	Credits
Yes	<b><i>Perameles nasuta - endangered population</i></b> (Long-nosed Bandicoot population in inner western Sydney)	1

### Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

## Biodiversity payment summary report

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	<b>1281</b> - Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion <b>Note: This PCT has trades recorded</b>	\$ 10,008.69	0.85991810	1.29971600	19.99%	\$26.27	1.0000	\$ 12,149.02	0	\$0.00
Subtotal (excl. GST)										<b>\$0.00</b>
GST										<b>\$0.00</b>
Total ecosystem credits (incl. GST)										<b>\$0.00</b>

### Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
20107	<b><i>Perameles nasuta</i> - endangered population</b> (Long-nosed Bandicoot population in inner western Sydney)		\$506.66	19.9900%	\$20.00	1	\$627.94
Subtotal (excl. GST)							<b>\$627.94</b>



## Biodiversity payment summary report

	GST	\$62.79
Total species credits (incl. GST)		\$690.73
Grand total		\$690.73



## APPENDIX D EPBC HABITAT ASSESSMENT

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed for the locality identified as potentially occurring in the area according to the Commonwealth EPBC *Protected Matters Search Tool*.

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

### Presence of habitat:

- Present: Potential or known habitat is present within the study area.
- Marginal: Habitat present that could be used by the species on occasion but not preferred.
- Absent: No potential or known habitat is present within the study area.

### Likelihood of occurrence

- Recorded: The species was observed in the study area during the current survey
- High: It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
- Moderate: Potential habitat is present in the study area. Species Low to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is known to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
- Low: It is Low that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.

### Potential to be impacted

- Low: The proposal would not impact this species or its habitats. No Assessment of Significance (AoS) is necessary for this species.
- Moderate: The proposal could impact this species or its habitats however the impacts are considered manageable such that no direct or indirect impacts are likely. No Assessment of Significance (AoS) is necessary for this species.
- High: The proposal is likely to impact this species or its habitats. An Assessment of Significance (AoS) has been applied to these entities

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<b>Flora</b>	<b>EPBC</b>				
<i>Acacia bynoeana</i> Bynoe's Wattle, Tiny Wattle	V	Bynoe's Wattle is a semi-prostrate shrub to a metre high. This species is confined to the northern portion of the Sydney Basin Bioregion and the southern portion of the north coast Bioregion. Occurs in heath or dry sclerophyll forest on sandy clay soils, often containing ironstone gravels. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Bynoe's Wattle is a semi-prostrate shrub to a metre high. The single flower heads, on short hairy stems, appear anytime from September to March. Its seedpods are mature from September to January. The hairy branchlets distinguish the species from the similar and more common Three-veined Wattle <i>Acacia trinervata</i> . It is more likely to occur in sclerophyllous heath or woodland on Sandstone based substrates in association with <i>Corymbia gummifera</i> , <i>Eucalyptus sclerophylla</i> , <i>Banksia serrata</i> & <i>Angophora bakeri</i> , none of which occur in Cumberland Plain Woodland. It has been recorded in Castlereagh Nature Reserve	Absent	Low	Low

---

<sup>1</sup> Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

OEH threatened species database: <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>

SPRAT: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Acacia pubescens</i> Downy Wattle	V	A spreading shrub, 1 - 5 m high with brilliant yellow flowers, bipinnate leaves (divided twice pinnately) and conspicuously hairy branchlets. Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. The topography of the habitat of the species is flat to gently undulating, a characteristic of the Cumberland Plain region. The sites of <i>A. pubescens</i> range in altitude from 0 to 650 metres a.s.l. The species often associated with <i>A. pubescens</i> include <i>Melaleuca nodosa</i> , <i>M. styphelioides</i> , <i>Angophora bakeri</i> , <i>Ozothamnus diosmifolius</i> , <i>Acacia parramattensis</i> , <i>Dillwynia sieberi</i> , <i>Pultenaea villosa</i> , <i>Bursaria spinosa</i> , <i>Acacia falcata</i> , <i>Exocarpos cupressiformis</i> , <i>Themeda australis</i> , <i>Lomandra longifolia</i> , <i>Microlaena stipoides</i> , <i>Aristida vagans</i> , <i>Austrodanthonia tenuior</i> , <i>Dianella longifolia</i> , <i>Lepidosperma laterale</i> and other species characteristic of the above plant communities. Stands of <i>A. pubescens</i> have been recorded in open, disturbedLongevity is unknown, but clonal species have been known to survive for many decades. Flowers from August to October. Pollination of Acacia flowers is usually by insects and birds. The pods mature in October to December. Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low. Acacia species generally have high seed dormancy and long-lived persistent soil seedbanks. It is thought that the species needs a minimum fire free period of 5 - 7 years to allow an adequate seedbank to develop	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Acacia terminalis</i> subsp. <i>terminalis</i> <i>Sunshine Wattle</i>	E	An erect or spreading shrub, 1-5 metres tall, with pale yellow flowers and seed pods 3-11 cm long. Very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent collections have only been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated. Most sites are highly modified or disturbed due to surrounding urban development. Flowers in autumn. Small birds and bees are natural pollinators. Seeds mature in November and are dispersed by ants. Seed viability is high and recruitment occurs mainly after fire. A fire temperature of 60 degrees is required for optimum germination. Although plants are killed by fire, they have been recorded sprouting from the base.	Absent	Low	Low
<i>Allocasuarina glareicola</i>	E	An erect, often depauperate she-oak shrub 1-2 m high, with 20 cm branchlets. Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> . Common associated understorey species include <i>Melaleuca nodosa</i> , <i>Hakea dactyloides</i> , <i>Hakea sericea</i> , <i>Dillwynia tenuifolia</i> , <i>Micromyrtus minutiflora</i> , <i>Acacia elongata</i> , <i>Acacia brownei</i> , <i>Themeda australis</i> and <i>Xanthorrhoea minor</i> . Not killed outright by fire but resprouts from the rootstock. Spreads by vegetative means, such that clumps of up to 100s of stems may be a single individual. The time taken for the plants to flower and set seed is not known, but only those plants growing in areas unburnt for some time produced substantial numbers of fruit	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Asterolasia elegans</i>	E	<p>A tall, thin shrub to 3 m high. Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid-to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>), Smooth-barked Apple (<i>Angophora costata</i>), Sydney Peppermint (<i>Eucalyptus piperita</i>), Forest Oak (<i>Allocasuarina torulosa</i>) and Christmas Bush (<i>Ceratopetalum gummiferum</i>). Ecological knowledge about this species is very limited. The species is considered to be fire sensitive and reliant on seed germination after disturbance to maintain populations. A soil seedbank appears to be established by this species, so for a number of years following fire or other disturbance the species may not be apparent, but be present only as seed in the soil. The size of the seedbank depends not only on the amount of seed contributed by mature plants each season, but on the level of dormancy of the seed which can vary from year to year. The longevity of each crop of seed in the soil is probably relatively short (perhaps 5 - 10 years).</p>	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Caladenia tessellata</i> Thick-lipped Spider-orchid, Daddy Long-legs	V	The Tessellated Spider Orchid is from a group of orchids characterised by five long spreading petals and sepals around a broad down-curved labellum ('lip'). Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. In NSW current populations occur in Morton NP, Munmorah State Recreation Area, Braidwood (private property), South Pacific Heathland Reserve, Wyrabalong NP, and Porter Creek Wetland Reserve. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	Absent	Low	Low
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	V	The Leafless Tongue Orchid has no leaf. It produces an upright flower-stem to 45 cm tall, bearing five to 10 flowers between November and February. The species occurs mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. It prefers open areas in the understorey of forested communities. The soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. The larger populations typically occur in woodland dominated by Scribbly Gum ( <i>Eucalyptus sclerophylla</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ) and Black Sheoak ( <i>Allocasuarina littoralis</i> ); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid ( <i>C. subulata</i> ) and the Tartan Tongue Orchid ( <i>C. erecta</i> ).	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Darwinia biflora</i>	V	An erect to spreading shrub to 80cm high. Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. The largest and most significant areas of habitat occur around the North Turramurra - North Wahroonga areas. Seventy-one of the 216 known sites (33%) occur in Ku-Ring-Gai Chase, Marramarra and Lane Cove National Parks and Berowra Valley Regional Park. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. In addition, the species appears to occur frequently on sheet rock which often contains moss beds. The species occurs in Sandstone Ridgetop Woodland, which is equivalent to Sydney Sandstone Ridge-top Woodland/ Open Forest and Sydney Sandstone Scrub-heath complex. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . It is often associated with the Vulnerable <i>Tetratheca glandulosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath. Longevity is thought to be 15-20 years. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August. Self-pollination is the usual form of pollination. Flowers and fruit are produced 18 months after germination, though at this stage few reach maturity. Maturation rates are higher for plants older than 5 years. Seed viability is high (up to 99%). Fire is an important factor in the life cycle of this species. Fire kills all plants, but also produces a flush of germination from seed stored in the soil. The number of individuals at a site then declines with time since fire, as the surrounding vegetation develops.	Absent	Low	Low



Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Deyeuxia appressa</i>	E	An erect perennial grass to 0.9 m high. A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas. Given that <i>D. appressa</i> hasn't been seen in over 60 years, almost nothing is known of the species' habitat and ecology. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: Shale/Sandstone Transition Forest, Cumberland Plain Woodlands, and Turpentine-Ironbark Forest in the Sydney Basin Bioregion. Flowers spring to summer and is mesophytic (grows in moist conditions).	Absent	Low	Low
<i>Eucalyptus camfieldii</i> Camfield's Stringybark	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Grows in coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of <i>E. oblonga</i> Narrow-leaved Stringybark, <i>E. capitellata</i> Brown Stringybark and <i>E. haemastoma</i> Scribbly Gum.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Genoplesium baueri</i> <i>Yellow Gnat-Orchid</i>	E	A terrestrial orchid 6-15 cm high, fleshy, brittle, yellowish-green or reddish. The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers December to March	Absent	Low	Low
<i>Leptospermum deanei</i> <i>Deane's Tea-tree</i>	V	Shrub to 5 m, with bark peeling in long strips. Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. It occurs along Lane Cove River, upper Middle Harbour Creek, Calna Creek, Marramarr Creek, Devlins Creek (Pennant Hills Park) and Galston Gorge Woodland on lower hill slopes or near creeks. Grows on sandy alluvial soil or sand over sandstone. Associated vegetation communities include riparian shrubland, woodland and open forest. Associated species in; Riparian scrub - <i>Tristaniopsis laurina</i> , <i>Baechea myrtifolia</i> ; Woodland - <i>Eucalyptus haemstoma</i> ; and Open Forest - <i>Angophora costata</i> , <i>Leptospermum trinervium</i> , <i>Banksia ericifolia</i> . Flowers October-November. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: Blue Gum High Forest of the Sydney Basin Bioregion, and Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Melaleuca biconvexa</i> Biconvex Paperbark	V	Biconvex Paperbark is a shrub or small tree, usually up to 10 m tall, though occasionally as high as 20 m. The bark is that of a typical paperbark. The leaves are small, to 18 mm long and 4 mm wide; each leaf has a centre-vein in a groove and the leaf blade curves upwards on either side of this centre-vein. Leaf placement is distinctive, with each pair of leaves emerging at right angles from the branch. Each pair is offset at right angles to the previous pair so the branch has a squarish appearance when looked at 'end-on'. This species' white flowers are usually clustered in dense heads and the fruit is urn-shaped and 3 - 5 mm in diameter. Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October and Resprouting occurs following fire.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Persicaria elatior</i> Knotweed, Tall Knotweed	V	An erect herb to 90 cm tall. Has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. Normally grows in damp places, especially beside streams and lakes. Occasionally found in swamp forest or associated with disturbance. Grows on sandy, alluvial soil in swampy areas and riparian herblands along watercourses and lake edges. Associated plant species include <i>Melaleuca linearifolia</i> , <i>M. quinquenervia</i> , <i>Pseudognaphalium luteoalbum</i> , <i>Persicaria hydropiper</i> , <i>Floydia praealta</i> and <i>Cyperus semifertilis</i> . The distribution of this species overlaps with the "White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland" EPBC Act-listed threatened ecological community	Absent	Low	Low
<i>Persoonia hirsuta</i> Hairy Geebung, Hairy Persoonia	E	Has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. <i>Persoonia hirsuta</i> has a large area of occurrence, but occurs in small populations, increasing the species fragmentation in the landscape. The Hairy Geebung has been recorded in the Sydney coastal area (subsp. <i>hirsuta</i> - Gosford to Berowra to Manly to Royal National Park), the Blue Mountains area (subsp. <i>evoluta</i> - Springwood, Lithgow, Putty) and the Southern Highlands (subsp. <i>evoluta</i> - Balmoral, Buxton, Yanderra and Hill Top areas). The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone from near sea level to 600m altitude. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other <i>Persoonia</i> species are) but will regenerate from seed. Flowering is generally in summer.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	A much-branched subshrub or shrub 20 to 120cm high with hairy stems. Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Found in the Baulkham Hills, Blacktown, Hornsby, Parramatta, and Warringah Local Government Areas. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots	Absent	Low	Low
<i>Pimelea spicata</i> <i>Spiked Rice-flower</i>	E	A shrub to 50 cm tall that may be erect or somewhat prostrate in habit. Once widespread on the Cumberland Plain, Spiked Rice-flower occurs in two disjunct areas, the Cumberland Plain (Narellan, Marayong, Prospect Reservoir, Freemans Reach, Georges Hall areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. Associated species include: Grey Box ( <i>Eucalyptus moluccana</i> ), Forest Red Gum ( <i>E. tereticornis</i> ), Narrow-leaved Ironbark ( <i>E. crebra</i> ), Blackthorn ( <i>Bursaria spinosa</i> ), and Kangaroo Grass ( <i>Themeda australis</i> ). On the inland Cumberland Plain sites it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a more well developed shrub and grass understorey. Has been recorded from both shale hills and shale plains woodland. Cryptic and difficult to detect. Flowers sporadically throughout the year (but mostly in summer), with flowering likely to depend upon climatic conditions, particularly rainfall.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Pterostylis saxicola</i> Sydney Plains Greenhood	E	A cryptic ground orchid with reddish brown and green translucent flowers on a slender stem to 35 cm tall. Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Localities include: Georges River National Park (near Yeramba Lagoon), Ingleburn, Holsworthy, Peter Meadows Creek and St Marys Towers near Douglas Park. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions. The above ground parts of the plant wither and die following seed dispersal and the plant persists as a tuberoid until the next year.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	V	A tree to 15 m tall but is generally 3–8 m high and shrubby in form. Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. Has been recorded in widely scattered small populations along the NSW coast from Booti Booti (near Forster) in the north to Conjola State Forest (near Jervis Bay) in the south. Found in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas. Rainforests are often remnant stands of littoral or gallery rainforest. Associated species include <i>Alphitonia excelsa</i> , <i>Acmena smithii</i> , <i>Cryptocarya glaucescens</i> , <i>Toona ciliata</i> , <i>Eucalyptus saligna</i> , <i>Ficus fraseri</i> , <i>Syzygium oleosum</i> , <i>Acmena smithii</i> , <i>Cassine</i> sp., <i>F. blique</i> , <i>Glochidion ferdinandi</i> , <i>Endiandra sieberi</i> , <i>Synoum glandulosum</i> , <i>Podocarpus elatus</i> , <i>Notelaea longifolia</i> , <i>Guioa semiglauca</i> and <i>Pittosporum undulatum</i> . Is thought to tolerate wet and dry conditions on sands. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. Flowers December to March, with fruit ripe from March to May, occasionally to September.	Absent	Low	Low



Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Thesium australe</i> Austral Toadflax	V	Austral Toadflax is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. The fruit is small and nut-like, developing in summer. This species is often hidden amongst grasses and herbs. Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass ( <i>Themeda australis</i> ). Flowering spring and summer.	Absent	Low	Low
Ecological Communities					

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Cumberland Plain Woodland in the Sydney Basin Bioregion	CE	Grey Box <i>Eucalyptus moluccana</i> and Forest Red Gum <i>E. tereticornis</i> are the dominant canopy trees, with Narrow-leaved Ironbark <i>E. crebra</i> , Spotted Gum <i>Corymbia maculata</i> and Thin-leaved Stringybark <i>E. eugenioides</i> occurring less frequently. The shrub layer is dominated by Blackthorn <i>Bursaria spinosa</i> , and it is common to find abundant grasses such as Kangaroo Grass <i>Themeda australis</i> and Weeping Meadow Grass <i>Microlaena stipoides</i> var <i>stipoides</i> . Contains many more species and other references should be consulted to identify these. Before European settlement, was extensive across the Cumberland Plain, western Sydney. Today, only 9 percent of the original extent remains intact, with the remnants scattered widely across the Cumberland Plain: in an area bounded by Scheyville (north), Penrith (west), Parramatta (east) and Thirlmere (south). Cumberland Plain Woodland occurs in the Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly local government areas. Good examples can be seen at Scheyville National Park and Mulgoa Nature Reserve. Occurs on heavy clay soils derived from Wianamatta Shale, and throughout the driest part of the Sydney Basin. Well adapted to drought and fire, and the understorey plants often rely on underground tubers or profuse annual seed production to survive adverse conditions.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Blue Gum High Forest in the Sydney Basin Bioregion	CE	A low woodland community with Scribbly Gum ( <i>Eucalyptus sclerophylla</i> ), Narrow-leaved Apple ( <i>Angophora bakeri</i> ) and Old Man Banksia ( <i>Banksia serrata</i> ) as the dominant canopy trees. Diverse understorey shrubs include Wallum Banksia ( <i>Banksia aemula</i> ), <i>Banksia oblongifolia</i> , Coneseed ( <i>Conospermum taxifolium</i> ), Wedding Bush ( <i>Ricinocarpos pinifolius</i> ), Showy Parrot Pea ( <i>Dillwynia sericea</i> ) and Nodding Geebung ( <i>Persoonia nutans</i> ). Contains many more species and other references should be consulted to identify these. Originally restricted to the ridgelines in Sydney's north from Crows Nest to Hornsby, and extending west along the ridges between Castle Hill and Eastwood. In 2000 there was less than 200 ha remaining (about 4.5% of its original extent). It only occurs in small remnants of which the largest is less than 20 ha. The remnants mainly occur in the Lane Cove, Willoughby, Kuring-gai, Hornsby, Baulkham Hills, Ryde and Parramatta local government areas. An example of Blue Gum High Forest can be seen at the Dalrymple-Hay Nature Reserve, St Ives. The community also occurs on soils associated with localised volcanic intrusions, 'diatremes'. Occurs only in areas where rainfall is high (above 1100 millimetres per year) and the soils are relatively fertile and derived from Wianamatta shale. In lower rainfall areas, it grades into Sydney Turpentine-Ironbark Forest. The rainforest understorey species rely on birds and mammals to disperse their seeds and are vulnerable to fire. Along the drier ridgelines, fire would have been more frequent and an important factor in maintaining understorey diversity.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Sydney Turpentine- Ironbark Forest	CE	Open forest, with dominant canopy trees including Turpentine <i>Syncarpia glomulifera</i> , Grey Gum <i>Eucalyptus punctata</i> , Grey Ironbark <i>Eucalyptus paniculata</i> and Thin-leaved Stringybark <i>E. eugenoides</i> . In areas of high rainfall (over 1050 mm per annum) Sydney Blue Gum <i>E. saligna</i> is more dominant. The shrub stratum is usually sparse and may contain mesic species such as Sweet Pittosporum <i>Pittosporum undulatum</i> and Elderberry <i>Panax Polyscias sambucifolia</i> . Occurs in Sydney and is heavily fragmented, with only 0.5 percent its original extent remaining intact. Remnants mostly occur in the Baulkham Hills, Hawkesbury, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Wollondilly local government areas. Good examples can be seen in small reserves such as Wallumatta Nature Reserve and Newington Nature Reserve. 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 plateaus. A transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges. Is reported to be a rich habitat for mammals and birds, providing nest hollows for species such as hollow-dependent fauna including the Powerful Owl and Glossy Black-Cockatoo.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Shale Sandstone Transition Forest of the Sydney Basin Bioregion</i>	CE	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. The main tree species include Forest Red Gum ( <i>Eucalyptus tereticornis</i> ), Grey Gum ( <i>E. punctata</i> ), stringybarks ( <i>E. globoidea</i> , <i>E. eugenioides</i> ) and ironbarks ( <i>E. fibrosa</i> and <i>E. crebra</i> ). Areas of low sandstone influence (more clay-loam soil texture) have an understorey that is closer to Cumberland Plain Woodland. Shale Sandstone Transition Forest in the Sydney Basin Bioregion contains many more species than described for the canopy (above) and other references should be consulted to identify these.	Absent	Low	Low
Coastal Swamp Oak ( <i>Casuarina glauca</i> ) Forest of New South Wales and South East Queensland ecological community	E	This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> (Swamp Oak) is the dominant species northwards from Bermagui. Other trees including <i>Acmena smithii</i> (Lilly Pilly), <i>Glochidion</i> spp. (Cheese Trees) and <i>Melaleuca</i> spp. (Paperbarks) may be present as subordinate species and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and <i>Melaleuca ericifolia</i> is the only abundant tree in this community south of Bermagui. Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally, occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Often fringes treeless floodplain lagoons or wetlands with semi-permanent standing water.	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	CE	Ranges from open forest to low woodland, with a canopy dominated by Broad-leaved Ironbark <i>Eucalyptus fibrosa</i> and Paperbark <i>Melaleuca decora</i> . The canopy may also include other eucalypts such as Woollybutt <i>E. longifolia</i> . The dense shrubby understorey consists of <i>Melaleuca nodosa</i> and Peach Heath <i>Lissanthe strigosa</i> , with a range of 'pea' flower shrubs, such as <i>Dillwynia tenuifolia</i> , <i>Pultenaea villosa</i> and <i>Daviesia ulicifolia</i> (can be locally abundant). The sparse ground layer contains a range of grasses and herbs. Contains many more species and other references should be consulted to identify these. Occurs in western Sydney, and the extent of intact remnants is now reduced to 1011 ha, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in the Kemps Creek area and in the eastern section of the Cumberland Plain. Good examples can be seen at the Castlereagh and Windsor Downs Nature Reserves, and Cox Creek Nature Reserve. Has a very restricted natural distribution and mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales. Can intergrade into Shale-Gravel Transition Forest (where the alluvium is shallow), Castlereagh Swamp Woodland (in moist depressions) and Castlereagh Scribbly Gum Woodland (on sandier soils).	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Eastern Suburbs Banksia Scrub of the Sydney Region	E	<p>Eastern Suburbs Banksia Scrub is the accepted name for a plant community on nutrient poor sand deposits in the eastern and south eastern suburbs of Sydney. It has a structural form predominately of sclerophyllous heath or scrub occasionally with small areas of woodland or low forest. The characteristic assemblage of plants in the community includes tree, shrub and heath species, including some but not all of the following components: <i>Allocasuarina distyla</i>, <i>Acacia longifolia</i>, <i>A. suaveolens</i>, <i>A. terminalis</i>, <i>Actinotus minor</i>, <i>Banksia aemula</i>, <i>B. ericifolia</i>, <i>B. integrifolia</i>, <i>B. serrata</i>, <i>Baekea imbricata</i>, <i>Bauera rubioides</i>, <i>Boronia parvifolia</i>, <i>Bossiaea heterophylla</i>, <i>Brachyloma daphnoides</i>, <i>Darwinia</i> spp., <i>Epacris</i> spp., <i>Eucalyptus gummifera</i>, <i>Hakea teretifolia</i>, <i>Kunzea ambigua</i>, <i>Lambertia formosa</i>, <i>Leptospermum</i> spp., <i>Melaleuca squamea</i>, <i>Monotoca</i> spp., <i>Persoonia lanceolata</i>, <i>Ricinocarpus pinifolius</i>, and <i>Styphelia viridis</i>. Species in the understorey include the fern <i>Pteridium esculentum</i> and the monocotyledons <i>Caustis pentandra</i>, <i>Dianella revoluta</i>, <i>Eragrostis brownii</i>, <i>Haemodorum planifolium</i>, <i>Hypolaena fastigiata</i>, <i>Lepidosperma laterale</i>, <i>Leptocarpus tenax</i>, <i>Lepyrodia scariosa</i> and <i>Xanthorrhoea resinifera</i>.</p>	Absent	Low	Low

Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Subtropical and Temperate Coastal Saltmarsh	V	The Subtropical and Temperate Coastal Saltmarsh (hereafter Coastal Saltmarsh) ecological community occurs within a relatively narrow margin of the Australian coastline, within the subtropical and temperate climatic zones south of the South-east Queensland IBRA bioregion boundary. The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence. In southern latitudes saltmarsh is often the main vegetation-type in the intertidal zone and commonly occurs in association with estuaries. The Coastal Saltmarsh ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate and vegetation is generally of less than 0.5 m height (with the exception of some reeds and sedges) (Adam, 1990; see also Sainty et al., 2012a, b for pictorial field guide). Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms and cyanobacterial mats (Adam, 2002; Fotheringham and Coleman, 2008; Green et al., 2012; Millar, 2012)	Absent	Low	Low



Species	Status	Description of habitat <sup>1</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	E	The Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion are generally tall open eucalypt forests found on igneous rock (predominately Tertiary basalt and microsyenite) in, or adjacent to, the Sydney Basin Bioregion. The ecological community occurs in areas of high rainfall, generally ranging from 950 to 1600 mm/year (NSW Scientific Committee, 2001; Tozer et al., 2010). The ecological community typically occurs at elevations between 650 and 1050 m above sea level (Keith & Benson, 1988, 1990; Fisher et al., 1995; Tozer et al., 2006), although it has been recorded at elevations as low as 350 m at the back of the Illawarra Escarpment in the Upper Nepean Sydney Catchment Authority (SCA) lands where proximity to the coast provides higher rainfall at lower elevations. The ecological community may occur at elevations of 1200 m or more within its range, such as on the Boyd Plateau in the western Blue Mountains. In the eastern and southern parts of the Southern Highlands (e.g. Robertson, Moss Vale, Bundanoon and Wingello NSW), the ecological community is found on fertile soils derived from basalts (predominately Robertson basalt, Sutton Forest basalt, and Kangaroo Valley basanite) (NSW Scientific Committee, 2001; Bowie, 2006). In the central-north parts of the Southern Highlands, the ecological community occurs on clay soils derived from microsyenite intrusions (Fisher et al., 1995; NSW Scientific Committee, 2001b). In the east of the Southern Tablelands, the ecological community occurs as fragmented patches on Tertiary basalt in and around the township of Sassafras and Morton National Park.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<b>Birds</b>					
<i>Anthochaera phrygia</i> Regent Honeyeater	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example, the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks.	Absent	Low	Low

---

<sup>2</sup> Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

OEH threatened species database: <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>

SPRAT: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Apus pacificus</i> Fork-tailed Swift	M	<p>The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.</p> <p>In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water. They often occur in areas of updraughts, especially around cliffs. They are said to search along edges of low-pressure systems, which assist flight. Low-flying Swifts are said to be precursors of unsettled weather, possibly because insect prey fly at a lower altitude when the air is humid and when the air density is low.</p>	Aerial Present	Habitat Moderate occasional	– Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Botaurus poiciloptilus</i> Australasian Bittern	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes ( <i>Typha</i> spp.) and spikerushes ( <i>Eleocharis</i> spp.)	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Calidris canutus</i> Red Knot	E	The Red Knot is a non-breeding migratory visitor from Arctic regions of Siberia. It is capable of flying non-stop between north-eastern China and northern Australia. Birds arrive between September and October and leave between March and April, with a small number of individuals overwintering. In NSW it is recorded in small numbers along some of the major river estuaries and sheltered embayments of the coastline, in particular the Hunter River estuary. This environment is used as a staging area for birds to rest and replenish fat resources; large numbers arrive in September then most move south to Victoria by October. The Red Knot is a rare visitor to wetlands away from the coast with a few records (mostly during southward migration) as far west as Lake Menindee and the Riverina. Mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps. Birds roost on sandy beaches, spits, islets and mudflats close to feeding grounds, usually in open areas. Rarely found on inland lakes or swamps.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Calidris ferruginea</i> Curlew Sandpiper	CE	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Absent	Low	Low
<i>Calidris tenuirostris</i> Great Knot	CE	A medium-sized bulky wader with a straight, dark-brown bill and yellowish-brown legs. It has a striped crown with an indistinct white eyebrow. Its upperparts are grey, with dark feather tips; its underparts are white. The rump is pure white, the tail is tipped with grey. Breeding plumage consists of darker upperparts with black and chestnut markings. In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Charadrius leschenaultii</i> Greater Sand Plover	V	The non-breeding Greater Sand-plover (i.e. as expected in Australia) has a grey-brown crown, nape, back and breast patches. The lores, bill and upper wing are dark, with dusky ear-coverts. There is prominent white plumage on the forehead, chin, throat and underparts, including the underwing. The legs and feet are greenish-grey; this helps distinguish it from the very similar Lesser Sand-plover, which has dark grey legs. Birds have a hunched, horizontal stance when relaxed, and a more upright extended stance when alert. When breeding in the Northern Hemisphere, the plumage on the breast, crown and nape changes to a dull brick-red and the ear coverts become black. Elements of this plumage may be visible in some Australian birds just after arrival in spring or prior to departure in autumn, and in some overwintering birds. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Charadrius mongolus</i> Lesser Sand Plover	E	Found along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	Absent	Low	Low
<i>Dasyornis brachypterus</i> Eastern Bristlebird	E	There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species. The Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, habitat in northern NSW requires frequent fires to maintain habitat condition and suitability. The northern fire regimes is between 3-6 years and of variable intensity depending on the habitat condition.	Absent	Low	Low



Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Diomedea antipodensis</i> Antipodean Albatross	V	A large Albatross species, with breeding confined to New Zealand. Juveniles are very similar in appearance to juvenile Wandering Albatross. Breeding females have chocolate-brown upperparts with white 'waves' on their back, a white face mask and throat, a broad brown breast-band with a white lower breast and belly with brown undertail-coverts, and a white underwing with a dark tip. Breeding males are whiter than the females but never as white as the whitest Wandering Albatross. Both sexes have a pink bill. The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Dimoedeia antipodensis gibsoni</i> Gibsons Albatross	V	A large Albatross species, with breeding confined to New Zealand. Similar plumage to the Wandering Albatross although it is rare for Gibson's Albatross to get as white. Gibson's Albatross is also smaller than the Wandering Albatross, with males reaching up to 7.5kg and females reaching up to 5.5kg. Females are also browner than males. Bill length ranges from 138-162mm. Plumage varies widely, with the amount of white dependent upon the sex, age and population characteristics at its breeding site island. Males are white above and below, including crown. They have white upperparts; breast has varying densities of fine black wavy lines. Tail white, sometimes tipped black. Outer wing and trailing edge black. Underwing white, extreme tips always black. Legs and webbed feet are a pale flesh colour, while the bill is pink, tipped yellow. Females are similar to males however have brown speckles or striations on the crown. Essentially endemic to the Auckland Islands of New Zealand. The non-breeding range is poorly known however the species probably disperses across the southern Pacific. The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Diomedea exulans</i> Wandering Albatross	E	The Wandering Albatross is the largest of albatrosses with the greatest wingspan of living birds (up to 3.5m). Plumage varies widely, with the amount of white dependent upon the sex, age (generally whiter with age) and population characteristics at its breeding island. Males are white above and below, including crown. They have white upperparts; breast has varying densities of fine black wavy lines. Tail white, sometimes tipped black. Outer dorsal wing and trailing edge black. Underwing white, extreme tip always black. Legs and webbed feet are a pale flesh colour, while the powerful bill is pink, tipped yellow. Females are similar to males however always have brown speckles or striations on the crown. A series of plumage phases are passed through as young birds reach full adult plumage, which can take up to nine years. The Wandering Albatross visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. It has been recorded along the length of the NSW coast. At other times birds roam the southern oceans and commonly follow fishing vessels for several days.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Diomedea sanfordi</i> Northern Royal Albatross	E	Adult Northern Royal Albatross have a white head, neck, body and tail, sharply contrasting against the black wings. The underwing is white except for a dark trailing edge and a large dark tip. Juvenile Northern Royal Albatrosses have indistinct brown mottling on the crown and pronounced black mottling on the lower back and rump, and a narrow black terminal band on the tail. The bill is large, with a bulbous tip, pinkish coloured horn and a diagnostic black cutting edge on the upper mandible. In breeding birds, the bill may flush to a brighter pink. The iris is brown, and the feet and legs are pinkish to blueish-white, with blueish webs. The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia. The Northern Royal Albatross feeds regularly in Tasmanian and South Australian waters, and less frequently in NSW waters.	Absent	Low	Low
<i>Fregetta grallaria</i> White-bellied Storm-Petrel	V	A small, compact storm-petrel with a square cut tail, white forehead, face and underparts and a broad dark mark through the eye. Upperparts are dark grey. Various colour phases have been observed, including a dark phase, having sooty plumage, with only the rump and belly showing white. A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. Known to breed at various island groups including Lord Howe Island.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Grantiella picta</i> Painted Honeyeater	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall ( <i>Acacia pendula</i> ), Brigalow ( <i>A. harpophylla</i> ) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> . Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Hirundapus caudacutus</i> White-throated Needletail	V	White-throated Needletails often occur in large numbers over eastern and northern Australia. They arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. They are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity. The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. White-throated Needletails are non-breeding migrants in Australia.	Aerial present	Moderate occasional	- Low
<i>Lathamus discolor</i> Swift Parrot	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. No breeding in NSW. 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.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Limosa lapponica baueri</i> Bar-tailed Godwit	V	A large long-necked wader (up to 39 cm) with a distinctive very long and upturned bill which is dark with a pinkish base. The head has a distinct brown eye-stripe bordered above by a white to off-white band extending past the eye. The crown and upper parts are pale brownish-grey narrowly streaked black and white. The under body is white with a pale brownish wash and fine dark streaks on the breast. In flight the upper wing is greyish-brown with dark brown and off-white streaks. In spring or autumn individuals may be in full or part breeding plumage where the head, neck and underparts are mostly rufous brown with black streaks on sides of breast and some wing and mantle feathers are strongly patterned rufous-brown and buff. Identified from the Black-tailed Godwit by the upturned bill, larger size, striped and scalloped neck and underparts and in flight the lack of conspicuous white wing bar and white rump stripe. It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Limosa lapponica menzbieri</i> Northern Siberian Godwit	CE	The bar-tailed godwit (northern Siberian) is a large migratory shorebird. It has a length around 37-39 cm, a wingspan of 62-75 cm and body mass between 250 - 450 g. It has a long neck with a very long upturned bill which is characterized by a dark tip and pinkish base. All non-breeding plumages have a uniform upper pattern, with a dark back and upper rump. It is distinguishable from other godwits by the dark barring on the lower white rump, upper-tail and lining of the underwing. The sexes differ with females being larger and with longer bills than males and having a duller breeding plumage. Males and females exhibit marked variation in plumages with males having a deep rufous head and neck. Juveniles are similar to non-breeding adults with the exception that the crown is more heavily streaked. Found in coastal areas of NSW.	Absent	Low	Low
<i>Macronectes giganteus</i> Southern Giant Petrel	E	A large seabird up to 100cm in length with a wingspan between 150 and 210cm. The species is sexually dimorphic, with males larger than females. Within populations, two colour morphs occur. The most common is the dark morph with a white head and neck, and a dark grey-brown body. There is also a white morph with scattered black feathers. The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW.	Absent	Low	Low



Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Macronectes halli</i> Northern Giant-Petrel	V	A large seabird up to 95cm in length with a wingspan of 150-210cm. The species is sexually dimorphic, with males markedly larger and heavier-billed than females. A single colour morph exists, comprising white about the bill and face, a dark grey-brown body, and mottling at the borders. The Northern Giant-Petrel has a circumpolar pelagic distribution, usually between 40-64°S in open oceans. Their range extends into subtropical waters (to 28°S) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn.	Absent	Low	Low

<p><i>Neophema chrysogaster</i></p> <p>Orange-bellied Parrot</p>	CE	<p>The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW, with the most recent records from Shellharbour and Maroubra in May 2003. It is expected that NSW habitats may be being more frequently utilised than observations suggest. Typical winter habitat is saltmarsh and strandline/foredune vegetation communities either on coastlines or coastal lagoons. Spits and islands are favoured but they will turn up anywhere within these coastal regions. The species can be found foraging in weedy areas associated with these coastal habitats or even in totally modified landscapes such as pastures, seed crops and golf courses. On the mainland, the Orange-bellied Parrot spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. The species also inhabits small islands and peninsulas and occasionally saltworks and golf courses. Birds forage in low samphire herbland or taller coastal shrubland. Diet mainly comprises seeds and fruits of sedges and salt-tolerant coastal and saltmarsh plants. Occasionally, flowers and stems are eaten. Orange-bellied Parrots are known to forage among flocks of Blue-winged Parrots. Recent records from unexpected places, including Shellharbour and Maroubra suggest that the species may be expanding their selection of habitats and foraging plant species. Birds seen in NSW in 2003 were foraging on weed species several hundred metres from the coast</p>	Absent	Low	Low
------------------------------------------------------------------	----	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------	-----	-----

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Numenius madagascariensis</i> Eastern Curlew	CE	In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	Absent	Low	Low
<i>Pachyptila turtur subantarctica</i> Fairy Prion (southern)	V	The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. There are 80 to 250 breeding pairs in Australia and a global population of 80 000. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. The population may have been larger prior to the arrival of black rats on Macquarie Island. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Feeds by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Pterodroma leucoptera leucoptera</i> Gould's Petrel	E	Has a body length of 30 cm and a wingspan of 75 cm. The upper surface of their long narrow wings has a distinctive 'M' pattern. This together with a darker head, distinguishes them from other petrels of similar size. The underside of the wings and body are white with a dark edge to the wing that terminates in a diagonal bar. Both sexes are identical and immature birds fledge in adult plumage. Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown.	Absent	Low	Low
<i>Pterodroma neglecta neglecta</i> Kermadec Petrel	V	A medium-sized petrel. Several colour phases from dark brown over the whole body, with a few flecks of grey on the face to a lighter form which is sooty brown above with pale grey head and white underparts. The darker form is characteristic at Lord Howe Island. Tail short and square cut. White markings on upper wings. Bill short and black and legs and feet flesh-coloured. Eyes dark brown.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Rostratula australis</i> Australian Painted Snipe	E	The Australian Painted Snipe is small freshwater wader, with a long bill that droops slightly at the tip. The female has a chestnut-black hood with a bold white eye-patch and a cream stripe along the middle of the crown. The back and wings are patterned bronzy-greenish-grey with a few cream streaks and the underparts are white. The male is slightly smaller and has greyer, less contrasting patterns, but also has large cream spots on the wings. The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. 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. The nest consists of a scrape in the ground, lined with grasses and leaves.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Sternula nereis nereis</i> Australian Fairy Tern		A small piscivorous (fish-eating) bird, the Fairy Tern is approximately 22–27 cm in length, 70 g in weight and has a wingspan of 44–53 cm. The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. The bird roosts on beaches at night.	Absent	Low	Low
<i>Thalassarche bulleri</i> Buller's Albatross	V	One of the smallest albatrosses with a wingspan of 205 to 213 cm. The Buller's Albatross is similar to other grey-headed albatross, but has a striking black and yellow bill, a white forecap, black patch before the eye, a thin white crescent to the rear of and below the eye, and a mostly white underwing with a moderately broad sharply defined leading edge. Immature individuals are separated from the immature Grey-headed Albatross by the underwing pattern and lighter bill with a contrasting dark sub-terminal spot. This albatross only nests on islands off New Zealand. The northern subspecies (platei) nests on islands off Chatham Island with an estimated population of around 18,200 breeding pairs. The southern subspecies (bulleri) breeds on the Snares and Solander islands with a total population of around 13,600 breeding pairs. After breeding both subspecies migrate to the seas off Peru and Chile. In NSW waters it is a relatively common visitor between March and October, with few sightings outside this period.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Thalassarche bulleri platei</i> Northern Buller's Albatross	V	The Pacific Albatross is a small, rather lightly built albatross, with a wingspan of 205–213 cm. The Pacific Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland. Occurrence within the Australian Fishing Zone is likely, however, the threat from longline injury is considered low.	Absent	Low	Low
<i>Thalassarche cauta cauta</i> Shy Albatross	V	The Shy Albatross (formerly <i>Diomedea cauta</i> ) has a predominantly white body with dark grey wings and back. The brow is dark-grey or black and the sides of the head, neck and throat are grey. Having a wingspan up to 2.6m, the underwing is white with black edges and tip, with a characteristic black patch where the wing joins the body. The bill is grey with a yellow tip and black nasal groove, while the feet, toes and web are blue-grey. Juveniles have darker feet and greyer heads than adults. This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and New Zealand provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in Queensland along the entire south coast of the continent to Carnarvon in Western Australia. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Thalassarche cauta steadi</i> White-capped Albatross	V	The White-capped Albatross was formerly regarded as a subspecies of the Shy Albatross with this species complex readily identified from other Southern Ocean albatross by being the largest black-backed albatross with proportionally longer wings, slightly fuller body, stouter bill and less manoeuvrable flight. This species is virtually inseparable from the closely related Shy Albatross in the field. This species is slightly larger, with a longer bill, legs, tail and wings as well as the bill being overall duller and greyer in colouration with limited yellowish pigment (i.e. lacks yellow at the base of the upper bill) and the tendency to have a slightly darker tip. It can be separated from the Salvin's Albatross by lacking the grey hood and the grey-green bill, with a paler top and bottom. This species breeds on a number of islands in New Zealand waters. Virtually the entire population nests in the Auckland Islands, comprising between 75,000 and 117,000 breeding pairs. A small number of pairs nest on Bollons Island in the Antipodes Islands and occasionally on The Forty-Fours in the Chatham Islands. After breeding most birds remain in Australasian waters with some adults migrating across the Indian Ocean to seas off South Africa and Namibia. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Shy Albatross. However, it appears to be a regular visitor principally occurring between March and December.	Absent	Low	Low



Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Thalassarche eremita</i> Chatham Albatross	E	The Chatham Albatross is a medium sized albatross, with a wing-span less than 2.1 m. The bright yellow bill has a distinctive black spot near the tip of the lower mandible, allowing discrimination from the similar Shy Albatross. The Chatham Albatross has a sooty grey wash over the crown, cheeks and neck, and a dark back and wings. Its blackish notch at the front of the wing, next to the body, is the darkest of the Shy Albatross complex. Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Thalassarche impavida</i> Campbell Albatross	V	This species was formerly regarded as a subspecies of the Black-browed Albatross. It is similar to the more regularly encountered Black-browed Albatross but adults can be separated by the pale yellow (not dark brown) eyes, the heavier black brow (more extensive in front of the eye), the underwing having broad black margin, and the bill being a bright orange-yellow that may be reddish on the sides. Most immature individuals have darker underwings, a heavier black brow and a pale iris. This species nests only at Campbell Island and the adjacent Isle de Jeanette Marie south of New Zealand, with a total population estimated at 24,600 pairs. It ranges widely in Australasian seas. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Black-browed Albatross. However, it appears to be a regular visitor occurring in most months of the year with peaks in winter during the non-breeding season.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Thalassarche melanophris</i> Black-browed Albatross	V	The Black-browed Albatross (formerly <i>Diomedea melanophris</i> ) is a large seabird with a wingspan of up to 2.4m. The upper wings, back and tail are black and the rest of the body and head is white. There is a small black brow over the dark eye and the bill is yellow, tipped with pink. The underwings are white with broad black margins. They are superb gliders, consistently flying in a wheeling pattern. They also rest on the sea and may be confused with sitting gannets. The Black-browed Albatross has a circumpolar range over the southern oceans and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park.	Absent	Low	Low

<i>Thalassarche salvini</i> Salvin's Albatross	V	Salvin's Albatross was formerly regarded as a subspecies of the Shy Albatross with this species complex readily identified from other Southern Ocean albatross by being the largest black-backed albatross with proportionally longer wings, slightly fuller body, stouter bill and less manoeuvrable flight. Adults can readily be identified by having a grey head and neck, wholly dark primaries on the underside of the wing resulting in lacking the white wedge shape close to the tip of the underwing, and an olive-brown beak which is ivory-coloured on the top and bottom and has a black spot near the tip of the lower bill. Juveniles are difficult to separate from other members of the group but tend not to occur in NSW waters as they fly across the Pacific Ocean to seas off Chile and Peru as soon as they fledge. The Buller's Albatross juvenile is similar but is smaller and slimmer with a less robust bill. This species principally nests on the Bounty Islands, with small numbers on the Western Chain Islets in the Snares Islands and a few pairs nesting on Pyramid Rock and The Forty-Fours in the Chatham Islands of New Zealand. A small number of pairs also nest on Iles Crozet in the French Southern Territories. The total population is estimated between 350,000 and 380,000 individuals, with 99% nesting on the Bounty Islands. It ranges widely through the South Pacific Ocean, particularly in the Humboldt Current off western South America. In NSW waters it is an uncommon visitor principally occurring between June and October, with the majority of sightings from waters south of Sydney.	Absent	Low	Low
---------------------------------------------------	---	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------	-----	-----

<p><i>Thinornis rubricollis rubricollis</i></p> <p>Hooded Plover</p>	V	<p>The Hooded Plover is endemic to southern Australia and is nowadays found mainly along the coast from south of Jervis Bay, NSW, south through Victoria and Tasmania to the western side of the Eyre Peninsula in South Australia. In south-west Western Australia the Hooded Plover is not restricted to the coast, and can also live and breed around inland salt lakes. Presently the Hooded Plover occurs north to Sussex Inlet. Occasionally, individual birds are sighted slightly further north to the Shoalhaven River and Comerong Beach and one bird was sighted at Lake Illawarra in March 2001. In south-eastern Australia Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Occasionally Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh. Hooded Plovers forage in sand at all levels of the zone of wave wash during low and mid-tide or among seaweed at high-tide, and occasionally in dune blowouts after rain. At night they favour the upper zones of beaches for roosting. When on rocks they forage in crevices in the wave-wash or spray zone, avoiding elevated rocky areas and boulder fields. In coastal lagoons they forage in damp or dry substrates and in shallow water, depending on the season and water levels. Hooded Plovers are seen singly, in pairs, family groups or small flocks, with 16 birds at Cudmirrah Beach being the largest group</p>	Absent	Low	Low
----------------------------------------------------------------------	---	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------	-----	-----

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
		recorded in NSW in recent years. During winter, very few birds are seen in pairs. The Hooded Plover diet consists mainly of marine worms, molluscs, crustaceans, insects, water plants and seeds. In eastern Australia, Hooded Plovers usually breed from August to March on sandy ocean beaches strewn with beachcast seaweed, in a narrow strip between the high-water mark and the base of the fore-dunes. They often nest within 6 m of the fore-dune, mostly within 5 m of the high-water mark, but occasionally among or behind dunes. The nest is a scrape in the sand near debris, making it vulnerable to predators and beach disturbance. On mainland Australia, nests may be 2-5 km apart. Surveys conducted over the past 15 years to determine the total population in NSW have made a maximum count of 64 adults. The estimated population for all of Australia is approximately 5000 birds			
Frogs					

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Heleioporus australiacus</i> Giant Burrowing Frog	V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. Males show strong territoriality at breeding sites. This species breeds mainly in autumn but has been recorded calling throughout the year.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Litoria aurea</i> Green and Golden Bell Frog	E	A relatively large, stout frog, ranging in size from approximately 45 mm to approximately 100 mm snout to vent length. Diagnostic features are a gold or creamish white stripe running along the side, extending from the upper eyelids almost to the groin, with a narrow dark brown stripe beneath it, from nostril to eye. It also has blue or bluish-green colour on the inside of the thighs. The colour of the body varies. Usually a vivid pea-green, splotched with an almost metallic brassy brown or gold. The backs of some individuals may be almost entirely green; in others golden-brown markings may dominate. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes ( <i>Typha</i> spp.) or spikerushes ( <i>Eleocharis</i> spp.), Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow ( <i>Gambusia holbrooki</i> ), have a grassy area nearby and diurnal sheltering sites available.	Absent	Low	Low



<p><i>Litoria raniformis</i></p> <p>Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog</p>	V	<p>In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few yet unconfirmed records have also been made in the Murray Irrigation Area in recent years. The species is also found in Victoria, Tasmania and South Australia, where it has also become endangered. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. The species has been known to breed anytime from early spring through to late summer/early autumn (Sept to April) following a rise in water levels. During the breeding season animals are found floating amongst aquatic vegetation (especially cumbungi or Common Reeds) within or at the edge of slow-moving streams, marshes, lagoons, lakes, farm dams and rice crops. Tadpoles require standing water for at least 4 months for development and metamorphosis to occur but can take up to 12 months to develop. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. Prey</p>	Absent	Low	Low
--------------------------------------------------------------------------------------------------------------------------	---	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------	-----	-----

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
		includes a variety of invertebrates as well as other small frogs, including young of their own species.			
<i>Mixophyes balbus</i> Stuttering Frog, Southern Barred Frog (In Victoria)		Stuttering Barred Frogs occur along the east coast of Australia from southern Queensland to the north-eastern Victoria. The species has suffered a marked decline in distribution and abundance, particularly in south-east NSW. It is the only <i>Mixophyes</i> species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Feed on insects and smaller frogs. Breed in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. As the tadpoles grow they move to deep permanent pools and take approximately 12 months to metamorphose.	Absent	Low	Low
<b>Reptiles</b>					

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	V	The Broad-headed Snake is restricted to the Sydney Basin and within a radius of about 200km of Sydney on Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges. Four key distribution areas; Blue Mountains, southern Sydney, an area north west of the Cumberland Plain and the Nowra hinterland. The sites where they occur are typified by exposed sandstone outcrops and benching and in these locations the vegetation is mainly woodland, open woodland and/or heath. They shelter in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. These rocky outcrops typically face north or west. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer. Some of the canopy tree species found to regularly co-occur at known sites include <i>Corymbia eximia</i> , <i>C. gummifera</i> , <i>Eucalyptus sieberi</i> , <i>E. punctata</i> and <i>E. piperita</i> . Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce young from January to March. Nocturnal.	Absent	Low	Low
<b>Mammals</b>					

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin ( <i>Petrochelidon ariel</i> ), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	Absent	Low	Low
<i>Dasyurus maculatus maculatus</i> Spot-tailed Quoll	E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Isoodon obesulus obesulus</i> Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)	E	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees <i>Xanthorrhoea sp.</i> , blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest. Mating occurs any time of the year, usually following heavy rain. Two or three litters of 2-4 young may be produced annually. The gestation period of 11-12 days is the shortest known of any marsupial while young remarkably become independent around 60 days after being born.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Petauroides volans</i> Greater Glider	V	Arboreal nocturnal marsupial largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Absent	Low	Low
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	V	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Throughout their range, Brush-tailed Rock-wallabies feed on a wide variety of grasses and shrubs and have flexible dietary requirements. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night.	Absent	Low	Low
<i>Phascolarctos cinereus</i> Koala	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and subordinate males on the periphery.	Absent	Low	Low

Species	Status	Description of habitat <sup>2</sup>	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Pseudomys novaehollandiae</i> New Holland Mouse	V	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire.	Absent	Low	Low
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	The Grey-headed Flying-fox is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle. Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November.	Marginal, low quality forage only.	Moderate	Low, no camps impacted.

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