

A photograph of a squirrel climbing a tree trunk, positioned on the left side of the cover. The squirrel is facing upwards, with its front paws reaching higher and its hind legs pushing off the bark. The bark is rough and textured. The background of the cover is a solid blue gradient.

---

Travers

bushfire & ecology

---

# Biodiversity Development Assessment Report

Proposed Development  
1113 Oxford Falls Road  
Frenchs Forest

April 2019  
(REF: 18HEN02BDAR)



# Biodiversity Development Assessment Report

**Proposed Residential Development  
Lot 1113 DP 752038, 1113 Oxford Falls Road,  
Frenchs Forest**

|                       |                                                                                                                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accredited Assessors: | Michael Sheather-Reid B. Nat. Res. (Hons.) – Managing Director<br>Accredited Assessor no. BAAS17085<br>George Plunkett B. Sc. (Hons.), PhD – Botanist – Accredited Assessor<br>no. BAAS19010 |
| Supporting Staff      | Robert Sansom B. Sc. (Hons.) - Botanist<br>Corey Mead B. App. Sc. – Senior Fauna Ecologist                                                                                                   |
| Plans prepared:       | Bronte Talbot B. Env. Sci. Mgmt.<br>Alexandra Scott B. Sc.                                                                                                                                   |
| Approved by:          | Michael Sheather-Reid (Accredited Assessor no. BAAS17085)                                                                                                                                    |
| Date:                 | 12/04/19                                                                                                                                                                                     |
| File:                 | 18HEN02BDAR                                                                                                                                                                                  |

This document is copyright © Travers bushfire & ecology 2019

## Disclaimer:

*This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.*

*The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.*

TBE Environmental Pty Ltd  
ABN 85 624 419 870  
PO Box 7138  
Kariong NSW 2250

38A The Avenue  
Mt Penang Parklands  
Central Coast Highway  
Kariong NSW 2250

t: 02 4340 5331  
e: [info@traverseecology.com.au](mailto:info@traverseecology.com.au)  
[www.traverseecology.com.au](http://www.traverseecology.com.au)

# Table of Contents

|            |                                                                               |           |
|------------|-------------------------------------------------------------------------------|-----------|
| <b>1.0</b> | <b>Background.....</b>                                                        | <b>1</b>  |
| 1.1        | Proposed development .....                                                    | 2         |
| 1.2        | Site description .....                                                        | 3         |
| <b>2.0</b> | <b>Biodiversity Offsets Scheme (BOS).....</b>                                 | <b>6</b>  |
| 2.1        | Threshold assessment.....                                                     | 6         |
| 2.2        | Serious and irreversible impacts on biodiversity values .....                 | 7         |
| <b>3.0</b> | <b>Flora.....</b>                                                             | <b>7</b>  |
| 3.1        | Survey .....                                                                  | 7         |
| 3.2        | Vegetation communities.....                                                   | 9         |
| 3.3        | Threatened flora species.....                                                 | 12        |
| 3.4        | Endangered flora populations .....                                            | 13        |
| 3.5        | Threatened ecological communities.....                                        | 13        |
| 3.6        | State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017..... | 13        |
| <b>4.0</b> | <b>Fauna.....</b>                                                             | <b>14</b> |
| 4.1        | Survey / Habitat assessment .....                                             | 14        |
| 4.2        | Hollow-bearing trees .....                                                    | 22        |
| 4.3        | SEPP 44 Koala Habitat Protection .....                                        | 22        |
| 4.4        | Threatened fauna species.....                                                 | 23        |
| 4.6        | Endangered fauna populations .....                                            | 24        |
| 4.7        | Connectivity .....                                                            | 24        |
| <b>5.0</b> | <b>Watercourses and wetlands .....</b>                                        | <b>26</b> |
| 5.1        | Endangered wetland communities .....                                          | 26        |
| 5.2        | Groundwater dependent ecosystems (GDEs) .....                                 | 26        |
| <b>6.0</b> | <b>Conclusions .....</b>                                                      | <b>27</b> |
| 6.1        | Biodiversity Conservation Act .....                                           | 28        |
| 6.2        | Recommendations .....                                                         | 28        |

# Figures

|                                                                                           |    |
|-------------------------------------------------------------------------------------------|----|
| <b>Figure 1</b> – Study area.....                                                         | 1  |
| <b>Figure 2</b> – Proposed development.....                                               | 2  |
| <b>Figure 3</b> – Flora and fauna survey effort and results.....                          | 5  |
| <b>Figure 4</b> – Biodiversity value land (purple) relative to the study site (blue)..... | 6  |
| <b>Figure 5</b> – Local connectivity.....                                                 | 26 |

# Tables

|                                                                              |    |
|------------------------------------------------------------------------------|----|
| <b>Table 1</b> – Site features .....                                         | 3  |
| <b>Table 2</b> – Flora survey effort.....                                    | 9  |
| <b>Table 3</b> – Threatened flora species with suitable habitat present..... | 12 |
| <b>Table 4</b> – Fauna survey effort.....                                    | 19 |
| <b>Table 5</b> – Hollow-bearing tree data.....                               | 22 |
| <b>Table 6</b> – Threatened fauna species with suitable habitat present..... | 23 |
| <b>Table A1.1</b> – Flora species recorded.....                              | 31 |
| <b>Table A1.2</b> – Fauna species recorded.....                              | 35 |
| <b>Table A2.1</b> – Threatened flora species habitat assessment.....         | 39 |
| <b>Table A2.2</b> – Threatened fauna species habitat assessment.....         | 46 |
| <b>Table A2.3</b> – Migratory fauna habitat assessment.....                  | 58 |

# Appendices

Appendix 1 – Flora Species List

Appendix 2 – Threatened Flora and Fauna Species Habitat Assessment

Appendix 3 – Significance of Impact test

# List of abbreviations

|          |                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------|
| APZ      | asset protection zone                                                                                   |
| BC Act   | <i>Biodiversity Conservation Act (2016)</i>                                                             |
| BCR      | <i>Biodiversity Conservation Regulation (2017)</i>                                                      |
| BAR      | Biodiversity Assessment Report                                                                          |
| BDAR     | Biodiversity Development Assessment Report                                                              |
| BPA      | bushfire protection assessment                                                                          |
| CLUMP    | conservation land use management plan                                                                   |
| DCP      | Development Control Plan                                                                                |
| DEC      | NSW Department of Environment and Conservation (superseded by DECC from April 2007)                     |
| DECC     | NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)                |
| DECCW    | NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)             |
| DEWHA    | Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)               |
| DOEE     | Commonwealth Department of Environment and Energy                                                       |
| EEC      | endangered ecological community                                                                         |
| EPA      | Environmental Protection Agency                                                                         |
| EP&A Act | <i>Environmental Planning and Assessment Act (1979)</i>                                                 |
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act (1999)</i>                                  |
| ESMP     | ecological site management plan                                                                         |
| FF       | flora and fauna assessment                                                                              |
| FM Act   | <i>Fisheries Management Act (1994)</i>                                                                  |
| FMP      | fuel management plan                                                                                    |
| HTA      | habitat tree assessment                                                                                 |
| IPA      | inner protection area                                                                                   |
| LEP      | Local Environment Plan                                                                                  |
| LGA      | local government area                                                                                   |
| NES      | national environmental significance                                                                     |
| NPWS     | NSW National Parks and Wildlife Service                                                                 |
| NSW DPI  | NSW Department of Primary Industries                                                                    |
| OEH      | Office of Environment and Heritage (Part of the NSW Department of Premier and Cabinet)                  |
| OPA      | outer protection area                                                                                   |
| PBP      | <i>Planning for bushfire protection (2006)</i>                                                          |
| POM      | plan of management                                                                                      |
| RF Act   | <i>Rural Fires Act (1997)</i>                                                                           |
| RFS      | NSW Rural Fire Service                                                                                  |
| ROTAP    | rare or threatened Australian plants                                                                    |
| SEPP 44  | <i>State Environmental Protection Policy No 44 – Koala Habitat Protection</i>                           |
| SEWPAC   | Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE) |
| SIS      | species impact statement                                                                                |
| SULE     | safe useful life expectancy                                                                             |
| TEC      | threatened ecological community                                                                         |
| TPO      | tree preservation order                                                                                 |
| TPZ      | tree preservation zone                                                                                  |
| TRRP     | tree retention and removal plan                                                                         |
| VMP      | vegetation management plan                                                                              |



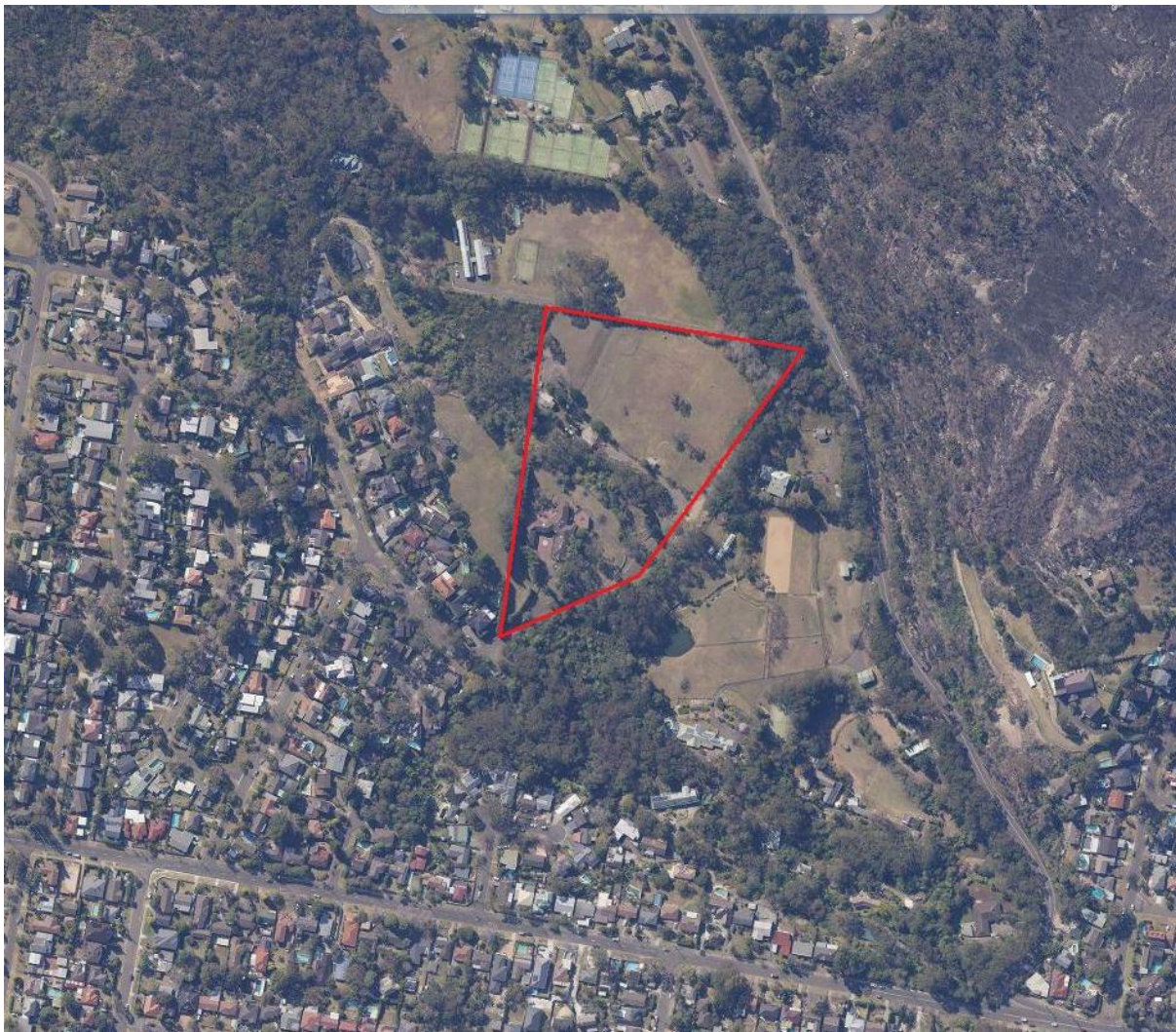


# Biodiversity Assessment

## 1.0 Background

*Travers bushfire & ecology* has been engaged to undertake a biodiversity development assessment report within Lot 1113, DP752038, at 1113 Oxford Falls Road, Frenchs Forest within Warringah local government area (LGA). The extent of this entire lot is shown in Figure 1. This lot is subject to a proposed development application and will hereafter be referred to as the 'study area'.

The area containing the proposed development, associated services, infrastructure and APZs is hereafter referred to as the 'subject site' (see Figure 2).



**Figure 1 – Study area**

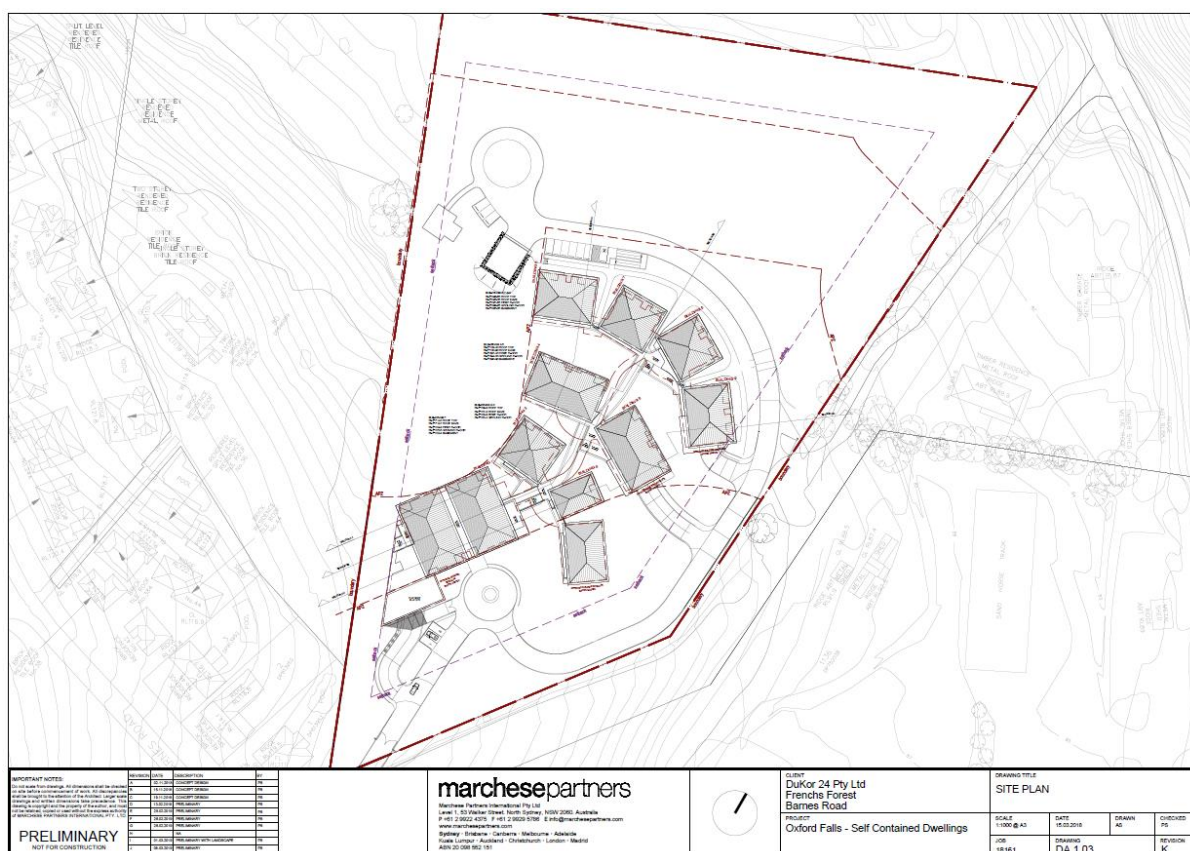
## 1.1 Proposed development

Development consent for the residential care facility was issued in 2018, reference no. DA2017/0206. The RFS issued their consent on the 21<sup>st</sup> June 2017.

The new proposal involves the demolition of the existing dwelling and the development of an independent living complex consisting of 41 self-contained units within 10 individual buildings. Car parking will be provided for residents and visitors.

Access to the site will be provided via the existing private access road from Barnes Road in the south.

Whilst the building footprint has been slightly amended they are not materially different to the previous approval.



**Figure 2 – Proposed development – Revision K**  
(Source: Marchese Partners International Pty Ltd, 08.03.2019)

## 1.2 Site description

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

**Table 1 – Site features**

|                               |                                                                                                                                                                                                                                  |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Location</b>               | 1113 Oxford Falls Road, Frenchs Forest, Lot 1113, DP752038                                                                                                                                                                       |
| <b>Size</b>                   | Approximately 3.38ha                                                                                                                                                                                                             |
| <b>Local government area</b>  | Warringah                                                                                                                                                                                                                        |
| <b>Grid reference</b>         | 337750E 66264650N                                                                                                                                                                                                                |
| <b>Elevation</b>              | Approximately 75–106m AHD                                                                                                                                                                                                        |
| <b>Topography</b>             | Situated on flat to undulating land. Gradients are generally 0-15%, with steeper grades of up to approximately 70% in the west.                                                                                                  |
| <b>Geology and soils</b>      | Soils; Oxford Falls – Moderate to deep soils in valleys with underlying Sandstone. Lambert – Generally shallow soils over Hawkesbury Sandstone.<br>Hawkesbury – Steep inclines, shallow soils.<br>Geology; Hawkesbury Sandstone. |
| <b>Catchment and drainage</b> | Surface flows within the subject site flow into an unnamed tributary that cuts within the north eastern portion of the subject site, Middle Creek.                                                                               |
| <b>Vegetation</b>             | Remnant vegetation occurs within the centre of the study area, and in the far north-eastern corner. The remainder of the site is pasture and planted vegetation.                                                                 |
| <b>Existing land use</b>      | Residential (rural) and grazing by horses                                                                                                                                                                                        |
| <b>Clearing</b>               | 80% of the original canopy vegetation has been previously cleared.                                                                                                                                                               |

### 1.2.3 Zoning

The site is currently zoned DM – Deferred Matter under the Warringah LEP of 2011 (Figure 1.11). Within the Warringah LEP (2011) Schedule 6.1. Amendment states that “*Land identified as ‘Deferred Matter’ on the Land Application Map...is for the purposes of this Policy, taken to be in Zone E3 Environmental Management.*”

The objectives of E3 – Environmental Management zoning is as follows:

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.
- To provide for a limited range of development that does not have an adverse effect on those values.
- To ensure that development, by way of its character, design, location and materials of construction, is integrated into the site and natural surroundings, complements and enhances the natural environment and has minimal visual impact.
- To protect and enhance the natural landscape by conserving remnant bushland and rock outcrops and by encouraging the spread of an indigenous tree canopy.
- To protect and enhance visual quality by promoting dense bushland buffers adjacent to major traffic thoroughfares.

#### Permitted without consent

Home-based child care; Home occupations

### Permitted with consent

Aquaculture; Bed and breakfast accommodation; Building identification signs; Business identification signs; Community facilities; Dwelling houses; Emergency services facilities; Environmental facilities; Environmental protection works; Extensive agriculture; Farm buildings; Home businesses; Home industries; Horticulture; Recreation areas; Roads.

### Prohibited

Industries; Multi dwelling housing; Residential flat buildings; Retail premises; Seniors housing; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3.

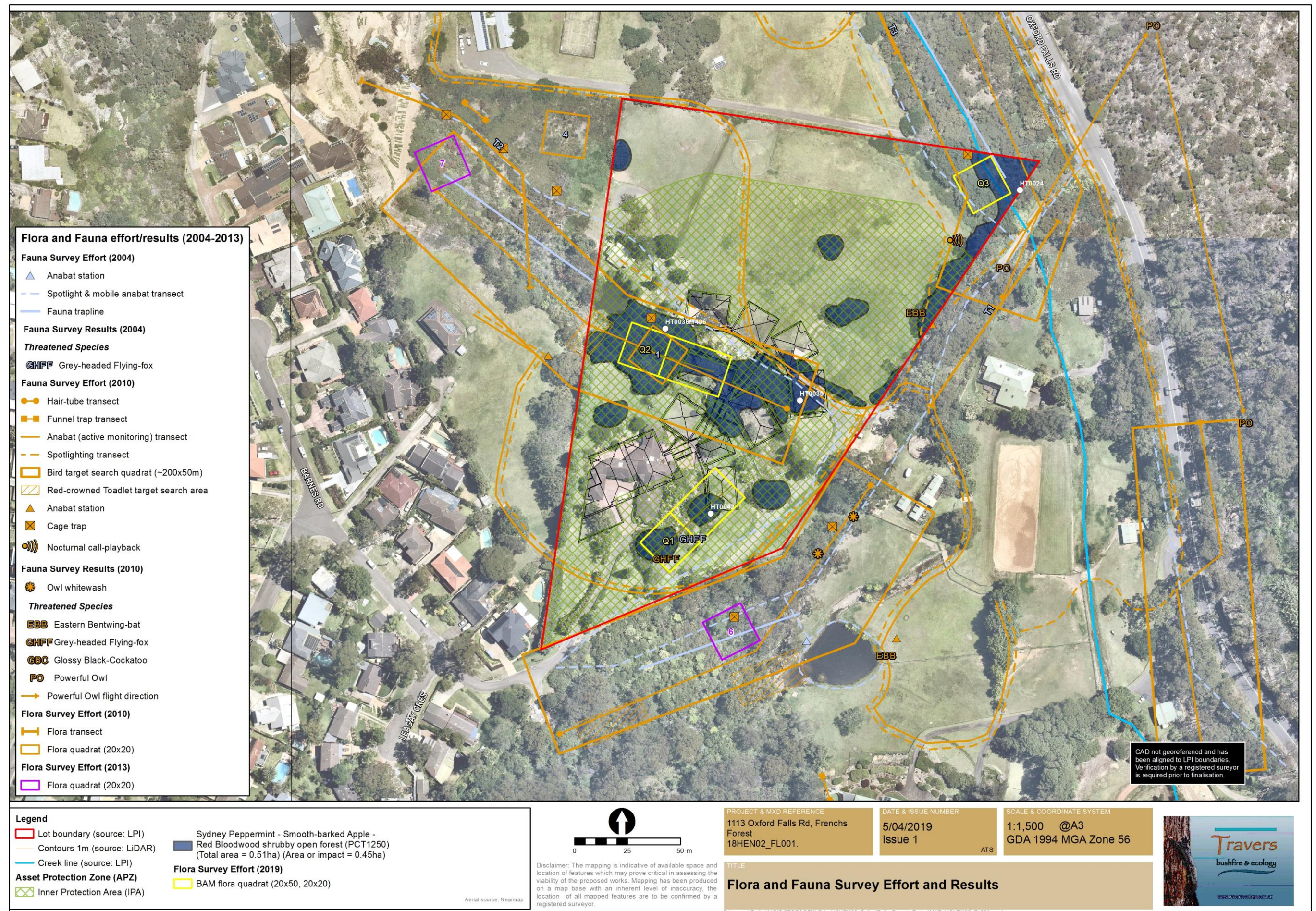


Figure 3 – Flora and fauna survey effort and results

## 2.0 Biodiversity Offsets Scheme (BOS)

The *BC Act* repeals the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*.

Together with the [Biodiversity Conservation Regulation 2017](#), the *BC Act* establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM).

### 2.1 Threshold assessment

The BOS includes two (2) elements to the threshold test – an area trigger and a Sensitive Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

#### 2.1.1 Sensitive Biodiversity Land Map

Sensitive Biodiversity Values Land has not been mapped within the study area – an offset is not required under this trigger. Figure 4 shows the site (blue) in relation to those areas (coloured purple) as having biodiversity values.



**Figure 4 – Biodiversity value land (purple) relative to the study site (blue)**  
(Source: OEH – Biodiversity Values Map – April 2019)

### 2.1.2 Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

**Table 2 – BOS entry threshold report**

|                                                                                                                                  |                     |                       |
|----------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|
| <b>Date of Calculation</b>                                                                                                       | 04/04/2019 11:38 AM | <b>BDAR Required*</b> |
| <b>Total Digitised Area</b>                                                                                                      | 0.84 ha             |                       |
| <b>Minimum Lot Size Method</b>                                                                                                   | Lot size            |                       |
| <b>Minimum Lot Size</b>                                                                                                          | 3.38 ha             |                       |
| <b>Area Clearing Threshold</b>                                                                                                   | 0.5 ha              |                       |
| <b>Area clearing trigger</b><br>Area of native vegetation cleared                                                                | Unknown #           | Unknown #             |
| <b>Biodiversity values map trigger</b><br>Impact on biodiversity values map(not including values added within the last 90 days)? | no                  | no                    |
| <b>Date of the 90 day Expiry</b>                                                                                                 | N/A                 |                       |

Table 2 identifies that BOS entry threshold report has determined the area threshold based on the actual lot size (provided as 3.38ha), and the area clearing threshold for which the BOS applies is 0.5ha. Clearing of 'native vegetation' that exceeds 0.5ha will require a biodiversity offset to be obtained. Note that 'native vegetation' includes planted native species. The development proposal will not impact more than 0.45ha of native vegetation, therefore offsetting will not be required under this trigger.

## 2.2 Serious and irreversible impacts on biodiversity values

The determination of SAI is to be made in accordance with principles prescribed section 6.7 of the BC Regulation (2017). The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales.

No candidate SAI entities/species were recorded within the study area and therefore further SAI assessment is not required.

## 3.0 Flora

### 3.1 Survey

#### 2019 Flora Survey

Additional survey Using BAM methodology was undertaken within the subject site on Tuesday 29 January 2019 between the hours of 10:30am and 3:20pm. Two 20 x 50m BAM Plots were undertaken and an additional 20 x 20 quadrat was also undertaken. Random meander searches were also undertaken in accordance with Cropper (1993) to create a broad species list and to search areas of potential habitat for threatened flora species.

Whilst a large number of exotic landscaping species were noted and identified during the random meander searches, no specific survey was undertaken for these species. Therefore, not all of the exotic species within the study area will appear on the species list in section 3.

A review of the Atlas of NSW Wildlife, Bionet (OEH January 2019) was undertaken prior to the botanical survey to identify threatened species previously recorded within 10km of the subject site and determine whether target searches were needed to be undertaken. Target searches for relevant threatened species were undertaken where applicable during the random meander and stratified surveys.

All observed plant species are listed in Appendix 1.

The following information was collected at each of the three (3) 20m x 20m full floristic plots:

- Native overstorey, mid-storey and ground cover recorded for all observed species and an estimate of stems.
- Stratum (and layer): stratum and layer in which each species occurs
- Growth form: growth form for each recorded species
- Species name: scientific name and common name
- Percent projected foliage cover of the understorey strata and exotic vegetation

The following information was collected at each of the two (2) 20m x 50m transect plot sites:

- Number of trees with hollows visible from the ground within the 20m x 50m plot
- The total length of fallen logs >10 cm in diameter within the 20m x 50m plot
- The proportion of regenerating overstorey species within the vegetation zone
- Number of large trees
- Estimates of leaf litter cover, bare ground, cryptograms and rocks in 1x1m subplots at five (5) locations along the 50m central transect

The vegetation types observed in the study area were converted to their relevant biometric vegetation type identification code (BVTID) and plant community type (PCT). They were then stratified based on vegetation type, condition and location were taken into consideration when locating the plots and transects.

### 2019 Survey

A flora survey was undertaken on 29 January 2019. This updated flora survey was restricted to Lot 1113 and included two (2) 20 x 50m plots in accordance with BAM methodology and an additional 20 x 20m plot within the north-eastern corner of the allotment as shown in Figure 3. Random meanders and general movement across the site were also used to search for threatened flora species.

### 2013/2014 Survey

Additional survey was undertaken on the 4<sup>th</sup> March 2013 in the vicinity of a then-proposed APZ off Barnes Road and within the remnant vegetation within a 100m radius of the existing dwelling which included two (2) additional flora quadrats. The flora survey targeted all vegetation communities present within the study area.

On the 29<sup>th</sup> May 2014, a brief target threatened species search was undertaken for relevant flora species within the riparian zone and in vegetation remnants along the north-eastern boundary near the access driveway.

### 2010 Survey

A full flora survey was undertaken on the 7th April 2010, in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft)* as set out by *Department of Environment & Conservation 2004*. This entailed some 4.5 hours of targeted threatened species searches within the study area in those areas

considered to contain any potential threatened species habitat, in near-to-linear-lines of 7-10m separation, subject to rock extrusions. Five (5) standardised quadrats and three (3) transects were also undertaken, as well as a wide ranging random meander (not part of the targeted survey). The locations of the 2010 survey plots are presented on Figure 3. Further targeted work was also undertaken on both 5 and 12 May 2010, around the perimeter of the proposed development area. Targeted *Tetratheca glandulosa* survey was conducted in the spring of 2010.

### 2004 Survey

The flora survey was undertaken on 8 January 2004 across the study area. Each of the identified vegetation communities were assessed using 20x20m quadrats and 10x40m quadrats for linear vegetation communities along the Middle Creek tributary. Within each quadrat vegetation structure, vegetation floristics and physical attributes were recorded for the upper, middle and lower strata. Random meanders were also conducted across the whole of the study area. Field assessment of vegetation within the forested escarpment and heath vegetation community was undertaken on 27 September 2004. Tree surveys were undertaken on 14 and 19 September 2004; and again on 1 September 2006.

All naturally occurring species were identified to species level where possible, and are listed in Appendix 1.

**Table 2 – Flora survey effort**

| Flora survey                  | Survey technique(s)                                                                                                                                                                                                                                                                                                                                                                                                                                 | Dates                                                                                          |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Vegetation communities</b> | <ul style="list-style-type: none"> <li>- Survey of vegetation community boundaries – check previous mapping</li> <li>- Survey of the boundaries of all communities – field verification, plotting vegetation boundaries on aerial photographs</li> </ul>                                                                                                                                                                                            | 29 January 2019<br>8 Jan 2004                                                                  |
| <b>Stratified sampling</b>    | <ul style="list-style-type: none"> <li>- One (1) 20m x 20m quadrat and two (2) 20 x 50m quadrats using BAM methodology</li> <li>- Two additional 20x20m flora quadrats</li> <li>- Five 20x20m quadrats, three transects</li> <li>- 20x20m Quadrats and 10x40m quadrats</li> </ul>                                                                                                                                                                   | 29 January 2019<br>4 March 2013<br>7 April 2010<br>8 Jan 2004                                  |
| <b>Targeted searches</b>      | <ul style="list-style-type: none"> <li>- Targeted threatened species searches within the allotment</li> <li>- Targeted threatened species searches in riparian zones</li> <li>- Targeted <i>Tetratheca glandulosa</i> searches</li> <li>- Random meander searches, targeted threatened species searches</li> <li>- Random meander searches, targeted threatened species searches</li> <li>- 4.5 hrs targeted threatened species searches</li> </ul> | 29 January 2019<br>29 May 2014<br>Spring 2010<br>29 January 2019<br>7 April 2010<br>8 Jan 2004 |

## **3.2 Vegetation communities**

The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) has mapped portions of the site as Coastal Sandstone Gully Forest and Weeds & Exotics. The equivalent PCT for Coastal Sandstone Gully Forest is Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion (PCT 1250).

Field verification of the study area found the following vegetation communities:

- Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion (PCT 1250)
- Managed Lands

### **Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion (PCT 1250)**

Woodland or Open Forest with a canopy cover of approximately 10-35% and height of approximately 15-23m. The understorey consists of a variable, but generally moderate, shrub layer to 10m high and sparse to moderate groundcover of herbs, ferns and grasses in drier areas. In the moister areas, where the soil depth is skeletal, the understorey consists mostly of dense fern and sedge species, whilst the overstorey cover is reduced and the mid storey replaced with those species favoring wetter conditions such as *Banksia ericifolia*. The height of the tree species in areas exposed to a high incidence of rock outcropping is reduced, as is the density of trees. This is evident in the central section of the western escarpment area. This vegetation community has been disturbed by the construction of access roads and moderate to severe incursions of weeds such as Pampas Grass, Senna and Lantana.

This community is equivalent to Sydney Sandstone Gully Forest as classified under the Native Vegetation of the Sydney Metropolitan Area mapping (OEH, 2016)

#### **Common Species**

Trees: *Eucalyptus piperita* (Sydney Peppermint), *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood).

Shrubs: *Acacia parramattensis* (Sydney Green Wattle), *Banksia ericifolia* (Heath-leaved Banksia), *Banksia spinulosa* (Hairpin Banksia), *Ceratopetalum gummiferum*, *Elaeocarpus reticulatus* (Blueberry Ash), *Leptospermum polygalifolium* (Tantoon), *Phyllanthus hirtellus* (Thyme Spurge), *Pittosporum undulatum* (Sweet Pittosporum) and *Platylobium formosum* (Handsome Flat-pea).

Groundcovers: *Cryptostylis erecta* (Bonnet Orchid), *Entolasia marginata* (Bordered Panic), *Gonocarpus teuroides* (Raspwort), *Imperata cylindrica* (Blady Grass), *Lepyrodia scariosa*, *Lomandra longifolia* (Spiky-headed Mat-rush), *Smilax glycyphylla* (Sarsparilla) and *Xanthosia pilosa*.

Weeds: *Ageratina adenophora* (Crofton Weed), *Centaurium erythraea* (Pink Stars), *Conyza albida* (Tall Fleabane), *Cortaderia selloana* (Pampas Grass), *Hedychium gardnerianum* (Ginger Lily), *Hypochaeris radicata* (Flatweed), *Ipomoea indica* (Blue Morning Glory), *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet), *Lonicera japonica* (Honeysuckle), *Nephrolepis cordifolia* (Fishbone Fern), *Plantago lanceolata* (Ribwort) and *Senna pendula* var. *glabrata*.



*Photo 1 – Sydney Peppermint - Smooth-barked Apple - Red Bloodwood (PCT 1250) in the central western portion of the subject site*



*Photo 2 – Sydney Peppermint - Smooth-barked Apple - Red Bloodwood (PCT 1250) in the central portion of the study area with dense exotic understorey*

## Managed Lands

This vegetation community describes the majority of the study area where native vegetation is absent. It is comprised primarily of exotic pasture, with planted trees and shrubs.



Photo 3 – Managed pasture in the northern portion of the site

### 3.3 Threatened flora species

*BC Act* – A search of the *Atlas of NSW Wildlife* (OEH, 2019) indicated a list of species that have been recorded within a 10 km radius of the subject site. These species are listed in Appendix 2 Table A2.1 and are considered for potential habitat within the subject site.

*EPBC Act* – A review of the schedules of the *EPBC Act* indicated the potential for a list of threatened flora species to occur within a 10km radius of the subject site. These species have also been listed in Appendix 2 Table A2.1 for consideration of potential to occur.

Based on the habitat assessment within Table A2.1 it is considered that the subject site provides potential habitat for the following threatened flora species. These species will be considered in the seven-part test within Appendix 3:

**Table 3** – Threatened flora species with suitable habitat present

| Scientific name             | BC Act | EPBC Act | Potential to occur |
|-----------------------------|--------|----------|--------------------|
| <i>Persoonia hirsuta</i>    | E      | E        | ✓                  |
| <i>Tetradlea glandulosa</i> | V      | -        | ✓                  |

| Scientific name                                      | BC Act | EPBC Act | Potential to occur |
|------------------------------------------------------|--------|----------|--------------------|
| <i>Acacia bynoeana</i>                               | E      | V        | low                |
| <i>Epacris purpurascens</i> var. <i>purpurascens</i> | V      | -        | unlikely           |
| <i>Pimelea curviflora</i> var. <i>curviflora</i> .   | V      | V        | low                |
| <i>Eucalyptus camfieldii</i>                         | V      | V        | low                |

Record of *Persoonia hirsuta* and *Tetratheca glandulosa* occur within 1km of the site. Targeted survey for threatened flora species in 2004, 2010, 2014 and 2019 failed to record these species, or any other threatened flora, within the study area. It is considered that these species are not likely to occur within the study area.

All other threatened species in both the Bionet (NSW) and EPBC coordinate search (National) were considered to have low potential suitable habitat within the study area because of previous clearing and landscaping works, past and ongoing land management practices, unsuitable soils / geology, unsuitable previous vegetation type or large distance to known specimens.

### 3.4 Endangered flora populations

There are no known endangered populations within the Northern Beaches (formerly Warringah) local government area (LGA).

### 3.5 Threatened ecological communities

No threatened ecological communities (TECs) occur within the study area.

### 3.6 State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

The *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* (Vegetation SEPP) was one of a suite of Land Management and Biodiversity Conservation (LMBC) reforms that commenced in New South Wales on 25 August 2017. The Vegetation SEPP (the SEPP) works together with the *Biodiversity Conservation Act 2016* and the *Local Land Services Amendment Act 2016* to create a framework for the regulation of clearing of native vegetation in NSW.

The SEPP will ensure the BOS (established under the Land Management and Biodiversity reforms) will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that does not require development consent.

Vegetation SEPP applies to the following local government areas:

*Bayside, City of Blacktown, Burwood, Camden, City of Campbelltown, Canterbury-Bankstown, Canada Bay, Cumberland, City of Fairfield, Georges River, City of Hawkesbury, Hornsby, Hunter's Hill, Georges River, Inner West, Ku-ring-gai, Lane Cove, City of Liverpool, Mosman, Newcastle, North Sydney, Northern Beaches, City of Parramatta, City of Penrith, City of Randwick, City of Ryde, Strathfield, Sutherland Shire, City of Sydney, The Hills Shire, Waverley, City of Willoughby, Woollahra.*

The Vegetation SEPP also applies to land within a variety of zones as set out in the legislation 'Land to which the policy applies'.

### **3.6.1 Is an Authority to clear vegetation required**

As 'development consent' is required for the proposed works the Vegetation SEPP does not apply.

## **4.0 Fauna**

### **4.1 Survey / Habitat assessment**

Previous fauna surveys within and adjacent to the study area were undertaken in 2010 and 2013 by *Travers bushfire & ecology*, and in 2004 by *Conacher Travers*. This assessment draws on data from those previous surveys.

Site survey effort accounting for techniques deployed, duration, and weather conditions are outlined in Table 4 and are depicted on Figure 3. The sections below illustrate the level of survey undertaken.

#### **Diurnal birds**

Visual observation and call identification of birds was carried out during visits to the site.

Opportunistic bird counts were also made, whilst undertaking other survey work and during spotlight surveys of the site.

Based on the comments made by Dr Stephen Ambrose in his peer review of 2004 surveys, bird quadrats were undertaken. Dr Ambrose suggested that it would be appropriate to have selected at least four (4) 2ha areas on site and to undertake area search surveys (30 minutes per area) and record bird species heard or seen.

Five (5) 1ha (approx. 50m x 200m) area search surveys were considered adequate due to the linear nature of the remnants. These were undertaken within the major vegetation areas of the site. These corresponded with hair tube transects (see Figure 3); as one person placed and collected tubes on 30 March and 6 April 2010, a second person undertook area search surveys for a minimum of 30 minutes.

Birds were observed and identified using handheld binoculars. Calls were generally identified in the field by the observer. If an unknown call was heard it was cross matched to bird call reference libraries taken into the field.

#### **Nocturnal birds**

The presence of nocturnal birds was first determined by quiet listening after dusk for calls by individuals emerging from diurnal roosts. Following this, and provided no calls were heard, call-playback techniques were employed. This involves broadcasting recorded calls through a 15 watt *Toa Faunatech* amplifier to evoke a response from species known to reply.

Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*) and Barking Owl (*Ninox connivens*) were targeted. Each call was played for 5 minute periods with 5 minute intervals of quiet listening for a response. This was followed with spotlighting and periods of quiet listening throughout the nocturnal survey.

Call playback stations are provided in Figure 3 and survey effort and weather conditions are outlined in Table 4. A third night's effort was undertaken for various nocturnal species during 2010 surveys, due to inclement weather on the second night's effort.

Searches for evidence of Owl roosts and potential Owl roosting / breeding hollows, were made during surveys of the subject site. Any whitewash, or regurgitated pellets found, were noted.

Given the recording of a Powerful Owl during 2010 surveys, habitat trees providing potential for nesting (HT9, HT11 & HT19) were targeted during the early nesting period on 3 June 2010. Active stag watching of HT11 was undertaken on this occasion, whilst passive remote surveillance cameras were placed at HT9 and HT19. Surveillance cameras used are *Reconyx HC500 Hyperfire* with infra-red and motion sensing capabilities with an illumination range up to 15m. The camera at HT19 was set up on a tripod and the camera set up at HT9 was strapped to a nearby tree with a bungee cord. Both cameras were placed within 7m of the hollows targeted.

Stag watching involves watching hollows in the dusk period approximately 15 minutes prior to dark until 30 minutes following dark. Placement of the observer on the ground allows for a silhouette of any emerging fauna to be seen against the lighter sky background such that a spotlight which is likely to disrupt emergence behaviour is not required. Where any movement is observed a spotlight is then used for identification purposes.

## **Arboreal and terrestrial mammals**

### 2004 Survey

*Elliott* Type A and B Traps were used for trapping arboreal and terrestrial mammals. Trapping consisted of a total of 200 trap nights, including 100 arboreal trap nights and 100 terrestrial trap nights.

Arboreal trap lines using 10-20m separations were placed in the most suitable trees along approximately 80m transects. *Elliott* Type A traps were placed onto platforms, that were attached to the trunks of trees 2-3m above the ground at an incline of 10 degrees, to facilitate drainage during inclement weather. A mixture of honey and water was then sprayed onto the trunk 3-5m above the trap and around the platform as a lure.

Terrestrial trap lines consisting of Type A and B *Elliott* traps, using 10-20m separations were placed along the same line as the arboreal traps in the most suitable terrestrial habitats. *Elliott* traps were baited with a mixture of rolled oats, honey and peanut butter.

Five (5) trap lines were set on the nights of 12, 13, 14 and 15 January 2004. The location of the trap lines is shown in Figure 3, located after the bibliography of this report. Each trap line consisted of five (5) Type-A arboreal traps, three (3) Type-B terrestrial traps and two (2) Type-A terrestrial traps.

Cage trapping was conducted within the subject site to target the threatened species, Southern Brown Bandicoot (*Isoodon obesulus*) and Spotted-tailed Quoll (*Dasyurus maculatus*). The cage traps used were 18cm x 18cm x 45cm long.

Ten (10) cage traps were set on the nights of 12, 13, 14 and 15 January 2004. Cage trapping consisted of a total of forty (40) trap nights. Cage traps were placed in suitable in areas of dense shrub and ground cover. Cage traps were baited with a mixture of rolled oats, honey and peanut butter for the Southern Brown Bandicoot and uncooked chicken meat for the Spotted-tail Quoll.

### 2010 survey

Hair tubes were used to survey for arboreal and terrestrial mammals from 30 March – 6 April 2010.

Five (5) hair tube transect lines (approx. 200m) were set for five (5) nights. Each line consisted of fifteen (15) tubes (five (5) arboreal and ten (10) terrestrial) for a significant total of 375 trap nights. All hair tubes were baited with a mixture of rolled oats, honey and peanut butter. Five (5) terrestrial tubes were also baited with white truffle oil to target Southern Brown Bandicoot (*Isoodon obesulus*) and were suitably spaced on the transect lines. Five (5) terrestrial tubes were also baited with sardines to target Spotted-tailed Quoll (*Dasyurus maculatus*) and alternatively spaced along the transect lines. Small arboreal tubes were used to target the Eastern Pygmy Possum (*Cercatetus nanus*) and placed in the most appropriate foraging area, such as within Banksias.

Arboreal hair tubes were attached to the trunks of trees using rubber bands. A mixture of honey and water was then sprayed onto the trunk up to 8m above the tube as a lure. Terrestrial hair tubes were placed in suitable areas of dense shrub and ground cover and often near signs of foraging e.g. burrows or shelters.

Double sided tape was attached around the entry of tubes so hair samples of animals entering the tube were collected. Hair samples collected were sent to noted hair and scat identification experts, Barbara Triggs or Robyn Carter for identification.

Hair tube transects were placed throughout the subject site as well as extending into connective habitats. Hair tube trapping effort amounted to a total of 175 small arboreal and 350 large terrestrial hair tube nights. See Figure 3 for hair tube transect locations.

Cage trapping was conducted within the subject site to target the threatened Southern Brown Bandicoot (*Isoodon obesulus*). The cage traps used were 18cm x 18cm x 45cm long.

Ten (10) cage traps were set for ten (10) nights between 20-30 April 2010. Cage trapping consisted of a total of 100 trap nights. Cage traps were placed in suitable areas of dense shrub and ground cover. Cage traps were baited with a mixture of rolled oats, honey and peanut butter for the Southern Brown Bandicoot and sprinkled with truffle oil drops.

#### *Stag watching within the subject site*

Habitat trees HT9, HT11 and HT19 (outside of current study area) providing large hollows were targeted for early nocturnal activity on 3 June 2010. This was undertaken to target Powerful Owl, however, this method also contributes to arboreal mammal surveys. Active stag watching of HT11 was undertaken on this occasion whilst passive remote surveillance cameras were placed at HT9 and HT19. A description of surveillance camera and stag watching methodologies is provided in Section 2.3.2 above.

#### *Spotlighting within the subject site*

Spotlighting for nocturnal mammalian fauna was carried out using a hand held lamp of (75W halogen globe). This technique involved walking on the fringes of the forested areas of the subject site so that a maximum number of trees could be observed.

#### *Call playback techniques for nocturnal mammals*

The presence of Koala (*Phascolactos cinereus*), Yellow-bellied Glider (*Petaurus australis*) and Squirrel Glider (*Petaurus norfolcensis*) were targeted by broadcasting taped calls through a 15-Watt *Toa Faunatech* amplifier. Calls were played for 5 minute periods during nocturnal surveys. This was followed by quiet listening and spotlighting. Call playback stations are shown on Figure 3.

### *Secondary indications within the subject site*

Assessment was made of found scats, markings, diggings, runways and scratches during visits to the site. Any scats or pellets not readily identifiable were collected and sent to noted hair and scat identification experts, Barbara Triggs or Robyn Carter for the identification of any contents, such as hair or bone fragments. Habitat was also assessed to determine the likelihood of threatened native species of fauna occurring within the subject site.

### *Koala assessment*

The subject area was assessed for activity by Koalas using the following methods:

- A search of the *Atlas of NSW Wildlife* (OEH 2014).
- Identification and assessment of the density of tree species listed as Koala feed trees in *State Environmental Protection Policy No. 44 – Koala Habitat Protection* (SEPP 44), was undertaken across the site. An estimate of the percentage density of each tree species within vegetation communities was determined by averaging the percentage of stems counted.
- The site was surveyed on foot, with known Koala food trees being inspected for signs of use. Trees were also inspected for characteristic scratch and claw marks on the trunk and scats around the base of each tree. The proportion of trees showing signs of Koala use was calculated. Additionally, the location and density of droppings, if found, were documented.
- Koalas were also targeted during spotlight surveys which included the use of call playback techniques described above.

### **Bats**

Micro-chiropteran bats were surveyed by echolocation, using *Anabat Mk 2* and SD-1 detectors in fixed passive monitoring positions, throughout the subject site. Fixed *Anabat* stations were determined in order to represent different available foraging structures for various micro-chiropteran bat species. Detectors were placed in the same locations on different nights, where indicated on Figure 3, for the 2010 surveys.

Roving recordings were undertaken along spotlighting transects during previous 2004 surveys. Mobile active monitoring, using a PDA connected to an SD-1 recorder to identify bats in real time, was also undertaken along spotlighting transects during updated survey on 7 April 2010.

All bat call recordings were interpreted through *Anabat V* and *Anabat CF* Storage and Interface Module ZCAIM devices and analysed using *Anabat 6* and *Analook 3.3q* computer software packages.

*Anabat* recording stations and mobile recording transects are shown on Figure 3.

Mega-chiropteran bat species, such as the Grey-headed Flying-fox (*Pteropus poliocephalus*), were surveyed by targeting flowering / fruiting trees during spotlighting activities.

### **Amphibians**

Amphibians were surveyed by opportunistic vocal call identification, spotlighting and by targeting call activity along and adjacent to drainages, both during and following rainfall. For

similar calling species, male calls were compared to recorded calls from a field reference library, for accuracy of identification. Amphibians were also surveyed by habitat searches.

Habitat searches targeting Red-crowned Toadlet (*Pseudophryne australis*) were undertaken along four (4) drainages of varying suitability for the species during surveys undertaken on 29 and 30 March and 6 April 2010.

Twenty (20) minute searches were undertaken at each drainage line on each day. This consisted of searching pools for tadpoles, turning rocks and litter, listening for calls and clapping for a call response. Searches were undertaken at each location either during or following rainfall within the previous 24 hour period.

Searches for Red-crowned Toadlet were also incorporated into 3 hours and 20 minutes of habitat searches undertaken during previous surveys in January 2004.

Any amphibians found are visually identified and when required to be examined are handled with latex gloves or placed in a plastic bag and kept moist until release. Any tadpoles requiring capture are collected with a scoop net and placed within a snaplock clear plastic bag for analysis of colour and morphological features.

## **Reptiles**

Searches for reptiles in likely localities such as under logs, rubbish debris and in deep leaf litter were undertaken during diurnal visits to the site. Spotlighting of terrestrial habitats suitable for reptiles occurred during nocturnal surveys.

Funnel traps were used to target Rosenberg's Goanna (*Varanus rosenbergii*). This method was indicated to be suitable for this species by Gerry Swan during recent works on a separate site within the Warringah LGA. Three (3) funnel trap lines each consisting of four (4) funnel traps were set for three (3) days between 7 and 9 April 2010 (see Figure 3 for locations). Funnels were placed in pairs on either side of a 10m long fence line. The fence, made of damp proof course, was 270mm wide and held tight and upright by wooden and steel pegs.

Weather conditions for funnel trapping effort are provided in Table 4.

**Table 4 – Fauna survey effort**

| Fauna group      | Date              | Weather conditions                                   | Survey technique(s)                                                           | Survey effort / time (24hr) |
|------------------|-------------------|------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------|
| Diurnal birds    | 12/01/04          | 8/8 cloud, no wind, temp 26°C, no rain               | Diurnal opportunistic                                                         | 3hr 45min 1245-1630         |
|                  | 13/01/04          | 2/8 cloud, no wind, temp 21°C                        | Diurnal opportunistic                                                         | 4hr 50 min 0730-1220        |
|                  | 14/01/04          | 5/8 cloud, no wind, temp 22°C                        | Diurnal opportunistic                                                         | 1hr 30min 0730-0900         |
|                  | 15/01/04          | 8/8 cloud, no wind, temp 20°C, no rain               | Diurnal opportunistic                                                         | 1hr 30min 0730-0900         |
|                  | 16/01/04          | 8/8 cloud, no wind, temp 18°C, light rain            | Diurnal opportunistic                                                         | 1hr 50min 0740-0930         |
|                  | 29/03/10          | 8/8 cloud, no wind, light shower, temp 26.5°C        | Diurnal opportunistic                                                         | 5hr 20min 1400-1920         |
|                  | 30/03/10          | 8/8 cloud, no wind, raining, temp 19-22°C            | Diurnal opportunistic                                                         | 6hr 15min 1215-1830         |
|                  |                   |                                                      | Area Search Surveys (5x1ha for min 30min)                                     | Min 2.5 hours               |
|                  | 06/04/10          | 7/8 cloud, no wind, no rain, temp 23.8°C             | Diurnal opportunistic                                                         | 6hr 1145-1745               |
|                  |                   |                                                      | Area Search Surveys (5x1ha for min 30min)                                     | Min 2.5 hours               |
| Nocturnal birds  | 07/04/10          | 6-8/8 cloud, no wind, previous rain, temp 22.5 -26°C | Diurnal opportunistic                                                         | 3hr 20min 1110-1430         |
|                  |                   | 8/8 cloud, no wind, no rain, temp 24°C               | Diurnal opportunistic                                                         | 1hr 1600-1700               |
|                  | 12/01/04          | 5/8 cloud, no wind, temp 22°C                        | Owl call playback                                                             | 50min 2045-2135             |
|                  | 15/01/04          | 1/8 cloud, no wind, temp 19°C                        | Owl call playback                                                             | 50min 2040-2130             |
|                  | 29/03/10          | 8/8 cloud, no wind, no rain, temp 24-23°C            | Listen, Owl call playback & spotlighting                                      | 3hr 5min 1835-2140          |
|                  | 06/04/10          | 8/8 cloud, no wind, light showers, temp 21-19°C      | Listen, Owl call playback & spotlighting                                      | 1hr 25min 1835-2000         |
| Arboreal mammals | 07/04/10          | 7-8/8 cloud, no wind, no rain, temp 22°C             | Listen, Owl call playback & spotlighting                                      | 1hr 50min 1835-2025         |
|                  | 03/06/10          | 8/8 cloud, no wind, light rain, temp 16°C            | Stag watching (1x active, 2x passive surveillance cameras)                    | 2hr 30min 1700-1755         |
|                  | 12/01/04          | 5/8 cloud, no wind, temp 22°C                        | Spotlighting                                                                  | 55min 2045-2140             |
|                  | 12/01/04          | 2/8 cloud, no wind, temp 21°C                        | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                  | 13/01/04          | 5/8 cloud, no wind, temp 22°C, scattered showers     | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                  | 14/01/04          | 8/8 cloud, no wind, temp 20°C, scattered showers     | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                  | 15/01/04          | 1/8 cloud, no wind, temp 19°C                        | Spotlighting                                                                  | 1hr 0840-0940               |
|                  | 15/01/04          | 8/8 cloud, no wind, temp 18°C                        | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                  | 29/03/10          | 8/8 cloud, no wind, no rain, temp 24-23°C            | Spotlighting + call playback (Koala, Yellow-bellied Glider & Squirrel Glider) | 2hr 55min 1845-2140         |
|                  | 30/03/10-06/04/10 | Various                                              | Hair tubes (small)                                                            | 175 trap nights             |

| Fauna group         | Date              | Weather conditions                                    | Survey technique(s)                                                           | Survey effort / time (24hr) |
|---------------------|-------------------|-------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------|
|                     | 06/04/10          | 8/8 cloud, no wind, light showers, temp 21-19°C       | Spotlighting                                                                  | 15min 1945 – 2000           |
|                     | 07/04/10          | 7-8/8 cloud, no wind, no rain, temp 22°C              | Spotlighting + call playback (Koala, Yellow-bellied Glider & Squirrel Glider) | 2hr 10min 1815 – 2025       |
|                     | 03/06/10          | 8/8 cloud, no wind, light rain, temp 16°C             | Stag watching (1x active, 2x passive surveillance cameras)                    | 2hr 30min 1700-1755         |
| Terrestrial mammals | 12/01/04          | 5/8 cloud, no wind, temp 22°C                         | Spotlighting                                                                  | 55min 2045-2140             |
|                     | 12/01/04          | 2/8 cloud, no wind, temp 21°C                         | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                     |                   |                                                       | Cage trapping                                                                 | 10 trap nights              |
|                     | 13/01/04          | 5/8 cloud, no wind, temp 22°C, scattered showers      | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                     |                   |                                                       | Cage trapping                                                                 | 10 trap nights              |
|                     | 14/01/04          | 8/8 cloud, no wind, temp 20°C, scattered showers      | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                     |                   |                                                       | Cage trapping                                                                 | 10 trap nights              |
|                     | 15/01/04          | 1/8 cloud, no wind, temp 19°C                         | Spotlighting                                                                  | 1hr 0840-0940               |
|                     | 15/01/04          | 8/8 cloud, no wind, temp 18°C,                        | <i>Elliott</i> trapping                                                       | 25 trap nights              |
|                     |                   |                                                       | Cage trapping                                                                 | 10 trap nights              |
|                     | 29/03/10          | 8/8 cloud, no wind, no rain, temp 24-23°C             | Spotlighting                                                                  | 2hr 55min 1845-2140         |
|                     | 30/03/10-06/04/10 | Various                                               | Hair tubes (large)                                                            | 350 trap nights             |
|                     | 06/04/10          | 8/8 cloud, no wind, light showers, temp 21-19°C       | Spotlighting                                                                  | 15min 1945 – 2000           |
|                     | 07/04/10          | 7/8 cloud, no wind, no rain, temp 22°C                | Spotlighting                                                                  | 2hr 10min 1815 – 2025       |
|                     | 20/04/10          | 0/8 cloud, no wind, no rain, 1/4 moon, temp 15°C      | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 21/04/10          | 0/8 cloud, no wind, no rain, 2/4 moon, temp 15°C      | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 22/04/10          | 0/8 cloud, no wind, no rain, 2/4 moon, temp 14.5°C    | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 23/04/10          | 0-8/8 cloud, no wind, no rain, 3/4 moon, temp 19°C    | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 24/04/10          | 5/8 cloud, light S wind, showers, 3/4 moon, temp 14°C | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 25/04/10          | 1/8 cloud, no wind, no rain, 4/4 moon, temp 11°C      | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 26/04/10          | 0/8 cloud, no wind, no rain, 4/4 moon, temp 10.5°C    | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 27/04/10          | 8-0/8 cloud, no wind, no rain, 4/4 moon, temp 10°C    | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 28/04/10          | 0/8 cloud, no wind, no rain, 4/4 moon, temp 12°C      | Cage trapping SBB                                                             | 10 trap nights              |
|                     | 29/04/10          | 0/8 cloud, no wind, no rain, 4/4 moon, temp 12.5°C    | Cage trapping SBB                                                             | 10 trap nights              |
| Bats                | 12/01/04          | 5/8 cloud, no wind, temp 22°C                         | <i>Anabat II</i>                                                              | 1hr 25min 2015-2140         |
|                     | 15/01/04          | 1/8 cloud, no wind, temp 19°C                         | <i>Anabat II</i>                                                              | 1hr 20min 20.20-2140        |
|                     | 29/03/10          | 8/8 cloud, no wind, no rain, temp 24-23°C             | <i>Anabat II</i> x2 / SD-1 passive monitoring                                 | 7hr 15min 1900 – 2140       |
|                     |                   |                                                       | Spotlighting                                                                  | 2hr 55min 1845-2140         |

| Fauna group | Date     | Weather conditions                               | Survey technique(s)                                         | Survey effort / time (24hr) |
|-------------|----------|--------------------------------------------------|-------------------------------------------------------------|-----------------------------|
|             | 06/04/10 | 8/8 cloud, no wind, light showers, temp 21-19°C  | <i>Anabat II</i> x2 / SD-1 passive monitoring               | 4hr 20min 1755 – 2000       |
|             |          |                                                  | Spotlighting                                                | 15min 1945 – 2000           |
|             | 07/04/10 | 7-8/8 cloud, no wind, no rain, temp 22°C         | <i>Anabat II</i> x2 passive / SD-1 active monitoring        | 6hr 45min 1750 – 2025       |
|             |          |                                                  | Spotlighting                                                | 2hr 10min 1815 – 2025       |
| Reptiles    | 12/01/04 | 5/8 cloud, no wind, temp 22°C                    | Spotlighting                                                | 55min 2045-2140             |
|             | 13/01/04 | 2/8 cloud, light SE wind, temp 26°C              | Habitat searches                                            | 3hr 20min 0900-1220         |
|             | 15/01/04 | 1/8 cloud, no wind, temp 19°C                    | Spotlighting                                                | 1hr 0840-0940               |
|             | 29/03/10 | 8/8 cloud, no wind, light shower, temp 26.5°C    | Habitat search, opportunistic                               | 5hr 20min 1400-1920         |
|             | 30/03/10 | 8/8 cloud, no wind, raining, temp 19-22°C        | Habitat search, opportunistic                               | 6hr 15min 1215-1830         |
|             | 06/04/10 | 7/8 cloud, no wind, no rain, temp 23.8°C         | Habitat search, opportunistic                               | 6hr 1145-1745               |
|             | 07/04/10 | 6-8/8 cloud, no wind, prev rain, temp 22.5 -26°C | Habitat search, opportunistic                               | 3hr 20min 1110-1430         |
|             |          | 8/8 cloud, no wind, no rain, temp 24°C           | Funnel traps                                                | 12 trap days                |
|             | 08/04/10 | 0-2/8 cloud, light W wind, no rain, temp 21-26°C | Funnel traps                                                | 12 trap days                |
|             | 09/04/10 | 0/8 cloud, light SE wind, no rain, temp 15-22°C  | Funnel traps                                                | 12 trap days                |
| Amphibians  | 12/01/04 | 5/8 cloud, no wind, temp 22°C                    | Spotlighting + call detection                               | 55min 2045-2140             |
|             | 13/01/04 | 2/8 cloud, light SE wind, temp 26°C              | Habitat searches (incorporating Red-crowned Toadlet survey) | 3hr 20min 0900-1220         |
|             | 15/01/04 | 1/8 cloud, no wind, temp 19°C                    | Spotlighting + call detection                               | 1hr 0840-0940               |
|             | 29/03/10 | 8/8 cloud, no wind, light shower, temp 26.5°C    | Target searched (Red-crowned Toadlet)                       | Min total 1hr 20min         |
|             | 30/03/10 | 8/8 cloud, no wind, raining, temp 19-22°C        | Target searched (Red-crowned Toadlet)                       | Min total 1hr 20min         |
|             | 06/04/10 | 7/8 cloud, no wind, no rain, temp 23.8°C         | Target searched (Red-crowned Toadlet)                       | Min total 1hr 20min         |

## 4.2 Hollow-bearing trees

Hollow-bearing trees were surveyed during the fauna survey with a total of four (4) trees containing hollows within or close to the study area. These trees were found to contain a total of five (5) small hollows (0-10cm in size). None of these hollows are considered suitable for threatened large forest owls or cockatoos. No such suitable hollows for nesting will also be indirectly impacted nearby. Hollow-bearing tree data for the study area is provided in Table 5.

**Table 5 – Hollow-bearing tree data**

| Tagno. | Common name       | DBH (cm) | Spread (m) | Height (m) | Vigour (%) | Hollows recorded |
|--------|-------------------|----------|------------|------------|------------|------------------|
| HT24   | Lemon-scented gum | 60       | 17         | 27         | 90         | 1x 5-10cm branch |
| HT30   | Silver-top Ash    | 40/20    | 9          | 7          | 30         | 1x 0-5cm branch  |
| HT36   | Silver-top Ash    | 75       | 8          | 18         | 55         | 1x 0-5cm branch  |
| HT40   | stag              | 45/45    | 5          | 7          | 0          | 2x 0-5cm branch  |

The recorded hollows may be suitable for hollow-dependent threatened species with considered potential to occur including East-coast Freetail Bat, Large-footed Myotis, Eastern Falsistrelle and Greater Broad-nosed Bat. None of these species have been detected within the study area.

The proposed development will likely impact on three (3) of these hollow-bearing trees. If any hollow-bearing tree is identified for removal, it will require supervision by a fauna ecologist at the time of removal to effectively recover any residing fauna, particularly threatened species, if present.

## 4.3 SEPP 44 Koala Habitat Protection

SEPP 44 Koala Habitat Protection applies to land within Local Government Areas (LGAs) listed under Schedule 1 of the Policy. In addition, Part 2 of the Policy outlines a three (3) step process to assess the likelihood of the land in question being potential or core koala habitat. Part 2 applies to land which has an area of greater than 1 hectare or has, together with any adjoining land in the same ownership, an area of more than 1 hectare.

The study area is required to be considered under SEPP 44 as it falls within the former Warringah (now Northern Beaches) LGA, which is listed on Schedule 1 of this Policy. In addition, the total area of the study area is greater than 1 hectare, hence Part 2 – Development Control of Koala Habitats, of this Policy applies.

Potential Koala Habitat (PKH) is defined as land where at least 15% of the total number of trees in the upper or lower strata constitutes any of the tree species listed in Schedule 2 of the policy.

Core Koala Habitat (CKH) is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females (i.e. females with young) and recent sightings of and historical records of a population.

A Koala Plan of Management is required to be prepared where council is satisfied that the land is CKH.

### **Step 1 – Is the land PKH?**

Four (4) Koala food tree species Grey Gum (*Eucalyptus punctata*), Scribbly Gum (*Eucalyptus haemastoma*), Tallowwood (*Eucalyptus microcorys*) and Swamp Mahogany (*Eucalyptus robusta*) listed on Schedule 2 of SEPP 44 were recorded within the study area. *Eucalyptus*

*microcorys* and *Eucalyptus robusta* were generally isolated and likely as planted specimens and not part of connective woodland forest habitats.

Grey Gum (*Eucalyptus punctata*), Scribbly Gum (*Eucalyptus haemastoma*) made up approximately 5% of trees within PCT1250. This is less than the 15% and, as such, the study area is not considered to comprise PKH as defined under SEPP 44 and no further assessment under this Policy is required.

#### 4.4 Threatened fauna species

**BC Act** – A search of the *Atlas of NSW Wildlife* (OEH, 2019) provided a list of threatened fauna species previously recorded within a 10km radius of the subject site. These species are listed in Appendix Table A2.2 and are considered for potential habitat within the subject site.

**Fisheries Management Act (FM Act)** – No habitats suitable for threatened aquatic species were observed within the subject site and as such the provisions of this act do not require any further consideration.

**EPBC Act** – A review of the schedules of the *EPBC Act* identified a list of threatened fauna species or species habitat likely to occur within a 10km radius of the subject site. These species have also been listed in Appendix Table A2.2.

In accordance with Table A2.2 the following state and nationally listed threatened fauna species are considered to have suitable habitat with varying potential to occur within the subject site. The state listed species will be considered in the seven-part test (Appendix 3):

**Table 6** – Threatened fauna species with suitable habitat present

| Common name                    | BC Act | EPBC Act | Potential to occur |
|--------------------------------|--------|----------|--------------------|
| Glossy Black-Cockatoo          | V      | -        | recorded           |
| Powerful Owl                   | V      | -        | recorded           |
| Grey-headed Flying-fox         | V      | V        | recorded           |
| Eastern Bentwing-bat           | V      | -        | recorded           |
| Rosenberg's Goanna             | V      | -        | possible           |
| Little Lorikeet                | V      | -        | possible           |
| Swift Parrot                   | E      | E        | possible           |
| Barking Owl                    | V      | -        | possible           |
| Varied Sittella                | V      | -        | possible           |
| Scarlet Robin                  | V      | -        | possible           |
| Spotted-tailed Quoll           | V      | E        | possible           |
| Southern Brown Bandicoot       | E      | E        | possible           |
| Eastern Pygmy Possum           | V      | -        | possible           |
| East-coast Freetail Bat        | V      | -        | possible           |
| Little Bentwing-bat            | V      | -        | possible           |
| Greater Broad-nosed Bat        | V      | -        | possible           |
| Red-crowned Toadlet            | V      | -        | possible           |
| Little Eagle                   | V      | -        | low                |
| Gang-gang Cockatoo             | V      | -        | low                |
| Turquoise Parrot               | V      | -        | low                |
| Masked Owl                     | V      | -        | low                |
| Yellow-bellied Sheath-tail-bat | V      | -        | low                |

| Common name          | BC Act | EPBC Act | Potential to occur |
|----------------------|--------|----------|--------------------|
| Large-footed Myotis  | V      | -        | low                |
| New Holland Mouse    | -      | V        | low                |
| Regent Honeyeater    | CE     | V        | unlikely           |
| Eastern Falsistrelle | V      | -        | unlikely           |
| Dusky Woodswallow    | V      | -        | unlikely           |

Note: Full habitat descriptions for these species are provided in Appendix 2

Four (4) state-listed threatened fauna species, Glossy Black-Cockatoo (*Calyptrorhynchus lathamii*), Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Eastern Bentwing-bat (*Miniopterus orianae oceansis*) were recorded within or in close proximity to the study area during surveys. A detailed significance of impact assessment has been applied to these species within Appendix 3 in accordance with Section 7.2 of the BC Act. The significance of impact test for threatened fauna species has concluded a not significant impact.

One (1) nationally-listed threatened fauna species, Grey-headed Flying-fox (*Pteropus poliocephalus*), was recorded foraging within the study area during surveys undertaken in 2004 and 2010.

The Significant Impact Criteria for a vulnerable species listed under the EPBC Act 1999 (Appendix 4) was reviewed to assess the impacts on this species as a result of the proposed development within the study area. As the study area does not contain any likely roosting or subsequent breeding habitat and foraging habitat will remain well represented in the locality, it is concluded that there will not be any significant impact on this species, or other nationally listed threatened fauna species with potential to occur, as a result of the proposed development.

It is concluded that there will be no likely serious or irreversible impact on any state or nationally listed threatened fauna species with considered potential to occur.

Additionally, protected migratory species listed under the EPBC Act are considered for habitat potential in Table A2.3. No nationally protected migratory bird species were recorded present during the preliminary survey or are considered likely to constrain development within the study area.

#### 4.6 Endangered fauna populations

There are no endangered fauna populations within the formerly Warringah (now Northern Beaches) LGA.

#### 4.7 Connectivity

The vegetation within the study area is mostly managed lands with extensive areas of lawn and garden beds containing a wide variety of exotic flora. There are however some remnant trees and a few native shrubs and groundcovers within the landscaped areas of the study area.

The study area is bounded to the north by the Australian Tennis Academy consisting of numerous tennis courts and to the west and east by adjoining rural residential land. Oxford Falls Road is to the east but is separated from the study area by a vegetated riparian corridor associated with the upper reaches of Middle Creek. A small portion of this riparian corridor

occupies the north-eastern corner of the subject site. The subject site is adjoined to the south-west by existing residential development.

Natural vegetation adjoining the study area to the north east includes recreation reserves which extend along Wakehurst Parkway and eventually into Garigal National Park.

Natural vegetation adjoining the north west boundary of the study area forms a vegetation corridor along Wakehurst Parkway to the west. This corridor extends along Wakehurst Parkway towards the south, across Frenchs Forest Road and Warringah Road into an extensive area of natural vegetation, including Manly Dam Reserve and Garigal National Park.

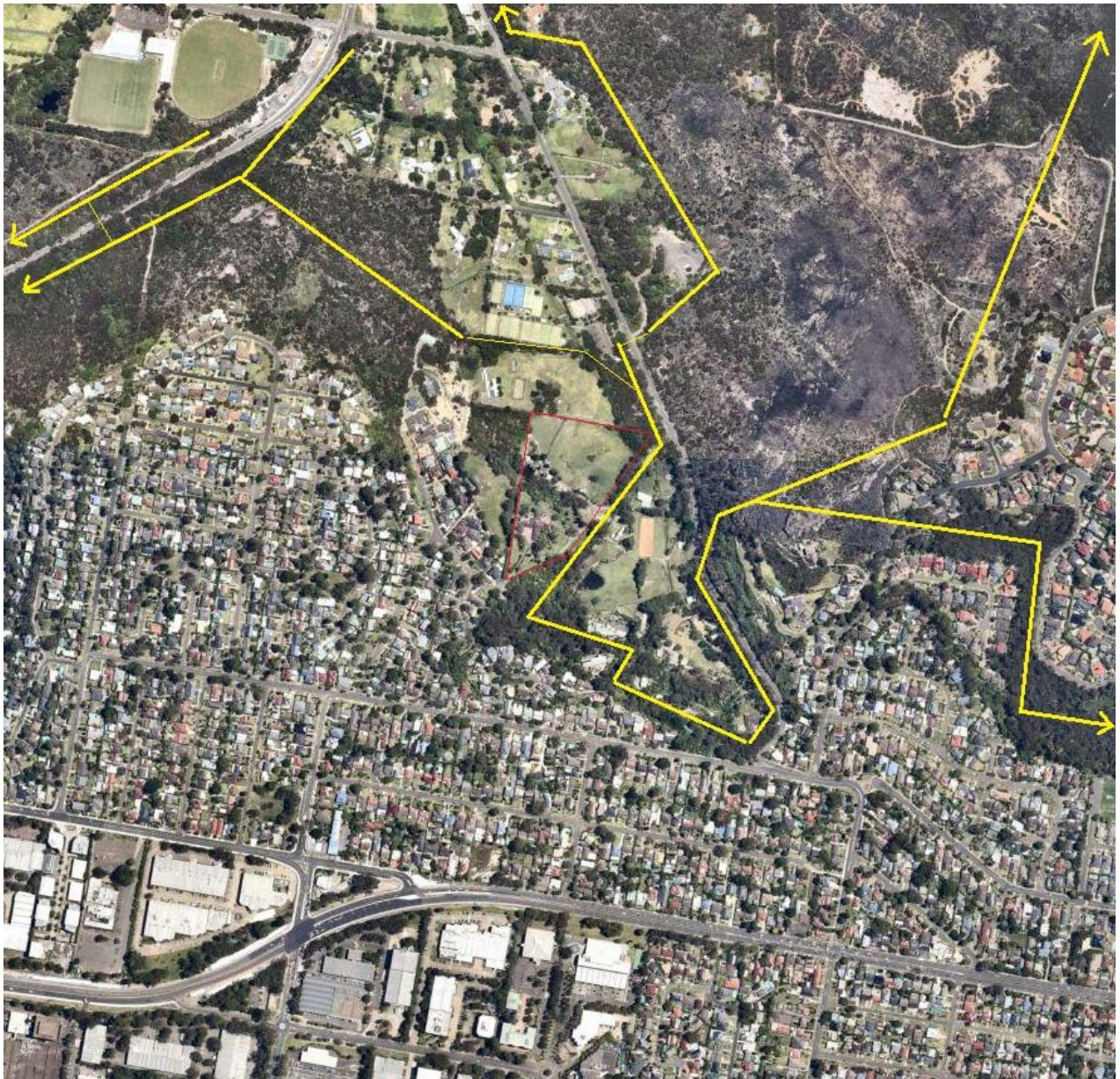
The study area contains two (2) existing vegetation corridors which pass through the subject site.

- The main riparian corridor – Middle Creek tributary runs north-south within the eastern confines of the study area and cuts the north eastern corner of the subject site. This Middle Creek tributary corridor is largely cleared on its western embankment which will be significantly enhanced by riparian revegetation works, inclusive of landscaped buffers. An existing natural forest area exists on the eastern side of the Middle Creek tributary. Oxford Falls Road along the edge of this remnant provides the only barrier between this corridor and extensive vegetation further north.
- Sandstone escarpment – This fragmented and weed infested corridor runs north-south along the western side of the study area and starts to head in an easterly direction within the subject site where it becomes severely dissected by a tennis court and road (approximately a 50-75m gap) from vegetation continuing on the south side of Barnes Road. This corridor currently previously contained a mixture of Kunzea Tall Heath, Peppermint and Angophora Woodland / Open Forest. It is noted the Kunzea is now not present.
- Miscellaneous corridor links - Minor canopy connectivity also occurs along existing road reserves and minor drainage lines through the site.

All corridors associated with the site have no direct linkages to extensive natural habitats and are all bound by roads, as well some small cleared patches and weedy areas along their nearby extent.

#### *Reason for Wildlife Corridors*

A corridor is used to ensure wildlife can move between vegetation parcels that contain suitable habitat characteristics for insitu wildlife. Corridors are also required for mating opportunities. For some wildlife, movement opportunity is quite small as they are territorial, whilst others are more opportunistic and migrate over larger areas. For some wildlife, the dispersal (home) range is quite small, whilst others migrate over larger areas. Where wildlife numbers, particularly some populations, and diversity are in large quantities and require movement to and from large areas (ecosystems), then a suitable large corridor linkage should be provided. Likewise, if a small quantity of wildlife is known to be present then a smaller corridor may accommodate these species / populations adequately.



**Figure 5 – Local connectivity**

## **5.0 Watercourses and wetlands**

### **5.1 Endangered wetland communities**

A number of wetland communities have been listed as an 'endangered ecological community' under the NSW *BC Act*.

No endangered wetland communities were present within the study area and therefore a referral to WaterNSW would not be required as part of a development application for the study area.

### **5.2 Groundwater dependent ecosystems (GDEs)**

Groundwater dependent ecosystems are ecosystems which have their species composition and their natural ecological processes determined by groundwater (NSW State Groundwater Dependent Ecosystems Policy April 2002).

Groundwater Dependent Ecosystems (GDEs) were not observed within the study area and therefore the policy does not require any further consideration. A referral to WaterNSW would not be required as part of a development application for the study area.

## 6.0 Conclusions

Ecological survey and biodiversity development assessment has been undertaken for a proposed development within Lot 1113, DP752038, No. 1113 Oxford Falls Road, Frenchs Forest. Assessment has been undertaken in consideration to the *BC Act* through the relevant process outlined by the *EP&A Act*. An assessment of 'Significance of Impact test' is provided in Appendix 3. The schedules and assessment criteria under the *EPBC Act* and the *FM Act* have also been considered for the proposal.

No threatened flora species have been observed or considered likely to occur in a natural state.

Four (4) threatened fauna species, Powerful Owl (*Ninox strenua*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Glossy Black-Cockatoo (*Calyptorhynchus lathamii*) and Eastern Bentwing-bat (*Miniopterus orianae oceansis*) were recorded within, or in close proximity to, the study area

No TECs listed within the NSW *BC Act* (2016) or within the Commonwealth *EPBC Act* (1999) were recorded within, or in close proximity to, the study area.

The proposed biodiversity corridor near the northern boundary will assist in mitigating some of the likely impacts of the proposal.

The direct impacts of the proposal within the subject site are considered as:

- Removal of three (3) hollow-bearing trees with potential habitat for threatened species.
- Removal / modification of 0.45ha of PCT1250 Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest.
- Clearing of 0.45ha poor-quality non-TEC vegetation.
- Subsequent removal of threatened fauna species foraging habitat.

The potential indirect impacts of the proposal are considered as:

- Edge effects such as weed incursions into the adjacent remaining non-certified natural habitat areas.
- Minor reduction of arboreal connectivity for arboreal mammals.
- Reduced cross-site movements by small bird species such as passerines.
- Edge effects such as weed incursions caused from soil disturbance, repeated clearing and landscaping species becoming a nuisance in the adjacent remnant bushland.
- Increased spill-over from noise, activity, scent and lighting effects into the adjacent natural habitat areas.
- Increased soil nutrients from changes to runoff that may provide further opportunities for weed plumes.
- Concentrated stormwater runoff from solid surfaces and subsequent increased flows.

The potential cumulative impacts (combined results of past, current and future activities) of the proposal are considered as:

- Increased risk of weed invasion and fungal mobilisation or infections.
- Cumulative loss of PCT1250 Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest within the locality.
- Cumulative loss of native vegetation within the locality.
- Further fragmentation of the connective remnant.
- Edge effects from inappropriate use of remaining native vegetation areas such as additional clearing, dumping of materials, dumping of waste and building refuse.

## 6.1 Biodiversity Conservation Act

There are two (2) elements to the Biodiversity Offsets Scheme (BOS) threshold test – an area trigger and a Sensitive Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

- The study area is not located on lands mapped as Sensitive Biodiversity Values Land.
- The threshold for clearing above which the BAM and offsets scheme apply is 0.5ha or more. The estimated clearing of native vegetation is 0.45ha which is less than the threshold therefore offsets do not apply.

In accordance with the Biodiversity Offsets Scheme of the *BC Act* the proposed development does not trigger biodiversity offsets.

In accordance with the Significance of Impact Test (refer to Appendix 3) of the *BC Act*, the proposal does not cause a significant impact or a serious or irreversible impact upon threatened species, endangered populations or threatened ecological communities.

The proposal is unlikely to have a significant impact on threatened or migratory fauna species listed as matters of national environmental significance under the *EPBC Act*. As such, a referral to the Commonwealth Department of Environment and Energy (DOEE) is not required.

## 6.2 Recommendations

To minimise adverse ecological impacts, the following mitigation measures are proposed:

1. Retention of hollow-bearing trees where possible.
2. The wildlife corridor and riparian restoration works are to be undertaken in accordance with an updated version of the Bushland Regeneration and Biodiversity Management Plan for 'The Falls Estate, Lot 1113 DP 752038 Barnes Road, French's Forest (April 2019), REF: 18HEN02BDAR".
3. Replacement landscaping should consider the use of locally occurring (endemic) native species commensurate with PCT 1250 including trees, shrubs and ground covers to encourage local fauna use, to consolidate remnant vegetation linkages and to provide 'island' refuges for native flora and fauna species within the locality.
4. Sediment and erosion control measures in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) to minimise impact of possible sedimentation to local drainage lines.

5. Control and eradication of noxious and other invasive ecological weeds should be undertaken to prevent further invasion by these species. Invasive species such as Lantana and Privet were observed within the study area.

# Appendix 1

## Flora & Fauna Species Lists

**Table A1.1 – Flora species recorded**

| Scientific name                    | Common name             | Family         |
|------------------------------------|-------------------------|----------------|
| <b>Trees</b>                       |                         |                |
| <i>Acacia implexa</i>              | Hickory                 | Mimosaceae     |
| <i>Allocasuarina littoralis</i>    | Black She-oak           | Casuarinaceae  |
| <i>Angophora costata</i>           | Smooth-barked Apple     | Myrtaceae      |
| <i>Archontophoenix alexandrae</i>  | Alexandra Palm          | Arecaceae      |
| <i>Brachychiton acerifolius</i>    | Illawarra Flame Tree    | Sterculiaceae  |
| <i>Casuarina cunninghamiana</i>    | River Oak               | Casuarinaceae  |
| <i>Casuarina glauca</i>            | Swamp Oak               | Casuarinaceae  |
| <i>Corymbia citriodora</i>         | Lemon-scented Gum       | Myrtaceae      |
| <i>Corymbia gummiifera</i>         | Red Bloodwood           | Myrtaceae      |
| <i>Corymbia maculata</i>           | Spotted Gum             | Myrtaceae      |
| <i>Eucalyptus botryoides</i>       | Southern Bangalay       | Myrtaceae      |
| <i>Eucalyptus haemastoma</i>       | Scribbly Gum            | Myrtaceae      |
| <i>Eucalyptus paniculata</i>       | Grey Ironbark           | Myrtaceae      |
| <i>Eucalyptus piperita</i>         | Sydney Peppermint       | Myrtaceae      |
| <i>Eucalyptus punctata</i>         | Grey Gum                | Myrtaceae      |
| <i>Eucalyptus robusta</i>          | Swamp Mahogany          | Myrtaceae      |
| <i>Eucalyptus sieberi</i>          | Silvertop Ash           | Myrtaceae      |
| <i>Glochidion ferdinandi</i>       | Cheese Tree             | Euphorbiaceae  |
| <i>Livistona australis</i>         | Cabbage Tree Palm       | Arecaceae      |
| <i>Melaleuca quinquenervia</i>     | Broad-leaved Tea Tree   | Myrtaceae      |
| <i>Syzygium</i> sp.                | Lillypilly              | Myrtaceae      |
| <b>Shrubs</b>                      |                         |                |
| <i>Acacia decurrens</i>            | Black Wattle            | Mimosaceae     |
| <i>Acacia floribunda</i>           | Sally Wattle            | Mimosaceae     |
| <i>Acacia linifolia</i>            | Flax Wattle             | Mimosaceae     |
| <i>Acacia longifolia</i>           | Sydney Golden Wattle    | Mimosaceae     |
| <i>Acacia parramattensis</i>       | Sydney Green Wattle     | Mimosaceae     |
| <i>Acacia suaveolens</i>           | Sweet Scented Wattle    | Mimosaceae     |
| <i>Banksia ericifolia</i>          | Heath-leaved Banksia    | Proteaceae     |
| <i>Banksia spinulosa</i>           | Hairpin Banksia         | Proteaceae     |
| <i>Boronia ledifolia</i>           | Sydney Boronia          | Rutaceae       |
| <i>Bossiaea heterophylla</i>       | -                       | Fabaceae       |
| <i>Callicoma serratifolia</i>      | Black Wattle            | Cunoniaceae    |
| <i>Callistemon citrinus</i>        | Crimson Bottlebrush     | Myrtaceae      |
| <i>Ceratopetalum gummiferum</i>    | Christmas Bush          | Cunoniaceae    |
| <i>Dodonaea triquetra</i>          | Hop Bush                | Sapindaceae    |
| <i>Elaeocarpus reticulatus</i>     | Blueberry Ash           | Elaeocarpaceae |
| <i>Epacris microphylla</i>         | Coral Heath             | Epacridaceae   |
| <i>Grevillea buxifolia</i>         | Grey Spider Flower      | Proteaceae     |
| <i>Grevillea speciosa</i>          | Red Spider Flower       | Proteaceae     |
| <i>Hibbertia bracteata</i>         | -                       | Dilleniaceae   |
| <i>Hibbertia empetrifolia</i>      | -                       | Dilleniaceae   |
| <i>Homalanthus populifolius</i>    | Bleeding Heart          | Euphorbiaceae  |
| <i>Kunzea ambigua</i>              | Tick Bush               | Myrtaceae      |
| <i>Leptospermum polygalifolium</i> | Tantoon                 | Myrtaceae      |
| <i>Lomatia silaifolia</i>          | Crinkle Bush            | Proteaceae     |
| <i>Melaleuca armillaris</i>        | Bracelet Honeymyrtle    | Myrtaceae      |
| <i>Melaleuca ericifolia</i>        | Swamp Paperbark         | Myrtaceae      |
| <i>Melaleuca styphelioides</i>     | Prickly-leaved Tea Tree | Myrtaceae      |
| <i>Persoonia lanceolata</i>        | Lance-leaved Geebung    | Proteaceae     |
| <i>Persoonia levis</i>             | Broad-leaved Geebung    | Proteaceae     |
| <i>Pimelea linifolia</i>           | Slender Rice Flower     | Thymeleaceae   |

| Scientific name                 | Common name             | Family           |
|---------------------------------|-------------------------|------------------|
| <i>Phyllanthus hirtellus</i>    | Thyme Spurge            | Euphorbiaceae    |
| <i>Pittosporum undulatum</i>    | Sweet Pittosporum       | Pittosporaceae   |
| <i>Platylobium formosum</i>     | Handsome Flat-pea       | Fabaceae         |
| <i>Platysace linearifolia</i>   | Narrow-leaved Platysace | Apiaceae         |
| <i>Pultenaea retusa</i>         | -                       | Fabaceae         |
| <b>Vines</b>                    |                         |                  |
| <i>Billardiera scandens</i>     | Apple Dumplings         | Pittosporaceae   |
| <i>Cassytha pubescens</i>       | Devil's Twine           | Lauraceae        |
| <i>Cayratia clematidea</i>      | Slender Grape           | Vitaceae         |
| <i>Cissus hypoglauca</i>        | Water Vine              | Vitaceae         |
| <i>Eustrephus latifolius</i>    | Wombat Berry            | Luzuriagaceae    |
| <i>Smilax glycyphylla</i>       | Sarsparilla             | Smilacaceae      |
| <b>Herbs</b>                    |                         |                  |
| <i>Actinotus helianthi</i>      | Flannel Flower          | Apiaceae         |
| <i>Austrodanthonia sp.</i>      | Wallaby Grass           | Poaceae          |
| <i>Austrostipa pubescens</i>    | Tall Spear Grass        | Poaceae          |
| <i>Centella asiatica</i>        | Swamp Pennywort         | Apiaceae         |
| <i>Commelina cyanea</i>         | Scurvy Weed             | Commelinaceae    |
| <i>Cyathochaeta diandra</i>     | -                       | Cyperaceae       |
| <i>Cynodon dactylon</i>         | Common Couch            | Poaceae          |
| <i>Dianella caerulea</i>        | Flax Lily               | Phormiaceae      |
| <i>Dianella prunina</i>         | -                       | Phormiaceae      |
| <i>Dichelachne crinita</i>      | Long-hair Plume Grass   | Poaceae          |
| <i>Echinopogon caespitosus</i>  | Tufted Hedgehog Grass   | Poaceae          |
| <i>Empodisma minus</i>          | -                       | Restionaceae     |
| <i>Entolasia marginata</i>      | Bordered Panic          | Poaceae          |
| <i>Entolasia stricta</i>        | Wiry Panic              | Poaceae          |
| <i>Eragrostis brownii</i>       | Brown's Lovegrass       | Poaceae          |
| <i>Gahnia clarkei</i>           | Saw Sedge               | Cyperaceae       |
| <i>Gonocarpus teuroides</i>     | Raspwort                | Haloragaceae     |
| <i>Hydrocotyle peduncularis</i> | Pennywort               | Apiaceae         |
| <i>Imperata cylindrica</i>      | Blady Grass             | Poaceae          |
| <i>Juncus usitatus</i>          | Common Rush             | Juncaceae        |
| <i>Lachnagrostis filiformis</i> | Blown Grass             | Poaceae          |
| <i>Lepidosperma laterale</i>    | Variable Sword-sedge    | Cyperaceae       |
| <i>Lepyrodia scariosa</i>       | -                       | Restionaceae     |
| <i>Lomandra filiformis</i>      | Wattle Matt-rush        | Lomandraceae     |
| <i>Lomandra glauca</i>          | Pale Matt-rush          | Lomandraceae     |
| <i>Lomandra longifolia</i>      | Spiky-headed Mat-rush   | Lomandraceae     |
| <i>Microlaena stipoides</i>     | Weeping Grass           | Poaceae          |
| <i>Mitrasacme polymorpha</i>    | Mitrewort               | Loganiaceae      |
| <i>Oplismenus aemulus</i>       | Basket Grass            | Poaceae          |
| <i>Panicum bisulcatum</i>       | Blackseed Panic         | Poaceae          |
| <i>Patersonia sericea</i>       | Wild Iris               | Iridaceae        |
| <i>Persicaria hydropiper</i>    | Water Pepper            | Polygonaceae     |
| <i>Persicaria decipiens</i>     | Slender Knotweed        | Polygonaceae     |
| <i>Schoenus imberbis</i>        | Beardless Bog-rush      | Cyperaceae       |
| <i>Stackhousia viminea</i>      | Slender Stackhousia     | Stackhousiaceae  |
| <i>Typha orientalis</i>         | Broad-leaved Cumbungi   | Typhaceae        |
| <i>Veronica plebeia</i>         | Creeping Speedwell      | Scrophulariaceae |
| <i>Xanthorrhoea media</i>       | -                       | Xanthorrhoeaceae |
| <i>Xanthosia pilosa</i>         | -                       | Apiaceae         |
| <b>Ferns</b>                    |                         |                  |
| <i>Adiantum aethiopicum</i>     | Common Maidenhair       | Adiantaceae      |
| <i>Blechnum cartilagineum</i>   | Gristle Fern            | Blechnaceae      |

| Scientific name                   | Common name             | Family           |
|-----------------------------------|-------------------------|------------------|
| <i>Calochlaena dubia</i>          | Common Ground Fern      | Dicksoniaceae    |
| <i>Cyathea australis</i>          | Rough Tree Fern         | Cyatheaceae      |
| <i>Gleichenia dicarpa</i>         | Pouched Coral Fern      | Gleicheniaceae   |
| <i>Histiopteris incisa</i>        | Bat's-wing Fern         | Dennstaedtiaceae |
| <i>Hypolepis muelleri</i>         | Harsh Ground Fern       | Dennstaedtiaceae |
| <i>Lindsaea linearis</i>          | Screw Fern              | Lindsaeaceae     |
| <i>Pteridium esculentum</i>       | Bracken Fern            | Dennstaedtiaceae |
| <b>Exotic species</b>             |                         |                  |
| <i>Acer negundo</i>               | -                       | Aceraceae        |
| <i>Acer</i> sp. (cultivar)        | Maple                   | Aceraceae        |
| <i>Acetosa sagittata</i>          | Turkey Rhubarb          | Polygonaceae     |
| <i>Agapanthus praecox</i>         | Agapanthus              | Amaryllidaceae   |
| <i>Ageratina adenophora</i>       | Crofton Weed            | Asteraceae       |
| <i>Ageratum houstonianum</i>      | Mist Flower             | Asteraceae       |
| <i>Anagalis arvensis</i>          | Scarlet Pimpernel       | Primulaceae      |
| <i>Andropogon virginicus</i>      | Whisky Grass            | Poaceae          |
| <i>Anredera cordifolia</i>        | Madiera Vine            | Basellaceae      |
| <i>Araucaria heterophylla</i>     | Norfolk Island Pine     | Araucariaceae    |
| <i>Arundo donax</i>               | Giant Reed              | Poaceae          |
| <i>Asparagus aetheopicus</i>      | Asparagus Fern          | Asparagaceae     |
| <i>Axonopus fissifolius</i>       | Narrowleaf Carpet Grass | Poaceae          |
| <i>Bidens pilosa</i>              | Cobblers Pegs           | Asteraceae       |
| <i>Briza maxima</i>               | Quaking Grass           | Poaceae          |
| <i>Callistemon</i> sp. (cultivar) | Crimson Bottlebrush     | Myrtaceae        |
| <i>Callitris</i> sp.              | -                       | Cupressaceae     |
| <i>Centaurium erythraea</i>       | Pink Stars              | Gentianaceae     |
| <i>Cestrum parqui</i>             | Chilean Cestrum         | Solanaceae       |
| <i>Chlorophytum comosum</i>       | Spider Plant            | Liliaceae        |
| <i>Cinnamomum camphora</i>        | Camphor Laurel          | Lauraceae        |
| <i>Cirsium vulgare</i>            | Spear Thistle           | Asteraceae       |
| <i>Colocasia esculenta</i>        | Taro                    | Araceae          |
| <i>Conyza sumatrensis</i>         | Tall Fleabane           | Asteraceae       |
| <i>Coreopsis lanceolata</i>       | Coreopsis               | Asteraceae       |
| <i>Cortaderia selloana</i>        | Pampas Grass            | Poaceae          |
| <i>Crocasmia X crocosmiiflora</i> | Montbretia              | Iridaceae        |
| <i>Cyperus congestus</i>          | -                       | Cyperaceae       |
| <i>Cyperus eragrostis</i>         | Umbrella Sedge          | Cyperaceae       |
| <i>Delairea odorata</i>           | Cape Ivy                | Asteraceae       |
| <i>Ehrharta erecta</i>            | Panic Veldtgrass        | Poaceae          |
| <i>Erythrina crista-galli</i>     | Coskspur Coral Tree     | Fabaceae         |
| <i>Eucalyptus microcorys</i> #    | Tallowwood              | Myrtaceae        |
| <i>Euphorbia peplus</i>           | -                       | Euphorbiaceae    |
| <i>Fumaria muralis</i>            | Wall Fumitory           | Fumariaceae      |
| <i>Gamochaeta</i> sp.             | Cudweed                 | Asteraceae       |
| <i>Gamochaeta spicata</i>         | Cudweed                 | Asteraceae       |
| <i>Hedychium gardnerianum</i>     | Ginger Lily             | Anthericaceae    |
| <i>Hydrocotyle bonariensis</i>    | Pennywort               | Apiaceae         |
| <i>Hypochaeris radicata</i>       | Flatweed                | Asteraceae       |
| <i>Impatiens walleriana</i>       | Busy Lizzie             | Balsaminaceae    |
| <i>Ipomoea indica</i>             | Blue Morning Glory      | Convolvulaceae   |
| <i>Jacaranda mimosifolia</i>      | Jacaranda               | Bignoniaceae     |
| <i>Juncus articulatus</i>         | -                       | Juncaceae        |
| <i>Lantana camara</i>             | Lantana                 | Verbenaceae      |
| <i>Leptospermum</i> sp.           | -                       | Myrtaceae        |
| <i>Ligustrum lucidum</i>          | Broad-leaved Privet     | Oleaceae         |

| Scientific name                                                       | Common name              | Family           |
|-----------------------------------------------------------------------|--------------------------|------------------|
| <i>Ligustrum sinense</i>                                              | Small-leaved Privet      | Oleaceae         |
| <i>Lilium formosanum</i>                                              | -                        | Liliaceae        |
| <i>Lonicera japonica</i>                                              | Honeysuckle              | Caprifoliaceae   |
| <i>Lotus suaveolens</i>                                               | Hairy Birds-foot Trefoil | Fabaceae         |
| <i>Modiola caroliniana</i>                                            | Red-flowered Mallow      | Malvaceae        |
| <i>Monstera deliciosa</i>                                             | -                        | Araceae          |
| <i>Musa acuminata</i>                                                 | Banana                   | Musaceae         |
| <i>Nephrolepis cordifolia</i>                                         | Fish-bone Fern           | Davalliaceae     |
| <i>Paspalum dilatatum</i>                                             | Paspalum                 | Poaceae          |
| <i>Paspalum urvillei</i>                                              | Vasey Grass              | Poaceae          |
| <i>Pennisetum clandestinum</i>                                        | Kikuyu                   | Poaceae          |
| <i>Phyllostachys sp.</i>                                              | Bamboo                   | Poaceae          |
| <i>Phytolacca octandra</i>                                            | Inkweed                  | Phytolaccaceae   |
| <i>Pinus sp.</i>                                                      | Exotic Pine              | Pinaceae         |
| <i>Plantago lanceolata</i>                                            | Ribwort                  | Plantaginaceae   |
| <i>Plantago major</i>                                                 | Large Plantain           | Plantaginaceae   |
| <i>Plantanus x acerifolia</i>                                         | Plane Tree               | Plantanaceae     |
| <i>Populus alba</i>                                                   | White Poplar             | Salicaceae       |
| <i>Populus nigra</i>                                                  | Lombardy Poplar          | Salicaceae       |
| <i>Ranunculus repens</i>                                              | Creeping Buttercup       | Ranunculaceae    |
| <i>Robinia pseudoacacia</i>                                           | Black Locust             | Fabaceae         |
| <i>Rubus fruticosus</i> ssp. agg.                                     | Blackberries             | Rosaceae         |
| <i>Rumex crispus</i>                                                  | Curled Dock              | Polygonaceae     |
| <i>Salix babylonica</i>                                               | Weeping Willow           | Salicaceae       |
| <i>Salix sp.</i>                                                      | Willow                   | Salicaceae       |
| <i>Schefflera actinophylla</i>                                        | Umbrella Tree            | Araliaceae       |
| <i>Senecio madagascariensis</i>                                       | Fireweed                 | Asteraceae       |
| <i>Senna pendula</i> var. <i>glabrata</i>                             | -                        | Fabaceae         |
| <i>Setaria parvifolia</i>                                             | Slender Pigeon Grass     | Poaceae          |
| <i>Sida rhombifolia</i>                                               | Paddy's Lucerne          | Malvaceae        |
| <i>Solanum mauritianum</i>                                            | Tobacco Bush             | Solanaceae       |
| <i>Stenotaphrum secundatum</i>                                        | Buffalo Grass            | Poaceae          |
| <i>Taraxacum officinale</i>                                           | Dandelion                | Asteraceae       |
| <i>Tibouchina sp.</i>                                                 | -                        | Melastomataceae  |
| <i>Tradescantia albiflora</i>                                         | Wandering Jew            | Commelinaceae    |
| <i>Trifolium dubium</i>                                               | Yellow Suckling Clover   | Fabaceae         |
| <i>Trifolium repens</i>                                               | White Clover             | Fabaceae         |
| <i>Verbascum virgatum</i>                                             | Twiggy Mullein           | Scrophulariaceae |
| <i>Verbena bonariensis</i>                                            | Purple Top               | Verbenaceae      |
| <i>Zantedeschia aethiopica</i>                                        | Arum Lily                | Araceae          |
| <i>Syagrus romanzoffiana</i>                                          | Cocos Palm               | Arecaceae        |
| # denotes species native to Australia but exotic within the locality. |                          |                  |
| * denotes exotic species                                              |                          |                  |
| <sup>TS</sup> denotes threatened species                              |                          |                  |

It should be noted that not all garden, cultivar or landscape species have been identified as part of this assessment.

**Table A1.2 – Fauna species recorded**

| Common name                         | Scientific name                      | Method observed |                   |
|-------------------------------------|--------------------------------------|-----------------|-------------------|
| Birds                               |                                      | Jan 2004        | Mar-Apr 2010      |
| Australasian Grebe                  | <i>Tachybaptus novaehollandiae</i>   | O               |                   |
| Australian King Parrot              | <i>Alisterus scapularis</i>          |                 | O C               |
| Australian Magpie                   | <i>Gymnorhina tibicen</i>            | O C             | O C               |
| Australian Raven                    | <i>Corvus coronoides</i>             | O C             | C                 |
| Australian White Ibis               | <i>Threskiornis molucca</i>          |                 | O                 |
| Australian Wood Duck                | <i>Chenonetta jubata</i>             | O C             | O C               |
| Black-faced Cuckoo-shrike           | <i>Coracina novaehollandiae</i>      | O C             | O C               |
| Common Koel                         | <i>Eudynamys scolopacea</i>          | O C             |                   |
| Common Myna *                       | <i>Acridotheres tristis</i>          | O               | O C               |
| Common Starling *                   | <i>Sturnus vulgaris</i>              | O C             |                   |
| Crested Pigeon                      | <i>Ocyphaps lophotes</i>             | O C             | O C               |
| Dollarbird                          | <i>Eurystomus orientalis</i>         | O               |                   |
| Dusky Moorhen                       | <i>Gallinula tenebrosa</i>           | O               | O                 |
| Eastern Rosella                     | <i>Platycercus eximius</i>           | O C             | C                 |
| Eastern Spinebill                   | <i>Acanthorhynchus tenuirostris</i>  | O               | C                 |
| Eastern Whipbird                    | <i>Psophodes olivaceus</i>           | C               | O C               |
| Eastern Yellow Robin                | <i>Eopsaltria australis</i>          |                 | C                 |
| Fan-tailed Cuckoo                   | <i>Cacomantis flabelliformis</i>     | C               | C                 |
| Galah                               | <i>Cacatua roseicapilla</i>          | O C             |                   |
| Glossy Black-Cockatoo <sup>TS</sup> | <i>Calyptorhynchus lathami</i>       |                 | O C               |
| Golden Whistler                     | <i>Pachycephala pectoralis</i>       |                 | C                 |
| Goose (domestic)                    | <i>Anser anser</i>                   |                 | O                 |
| Grey Butcherbird                    | <i>Cracticus torquatus</i>           | O C             | O C               |
| Grey Fantail                        | <i>Rhipidura fuliginosa</i>          |                 | O C               |
| Laughing Kookaburra                 | <i>Dacelo novaeguineae</i>           | O C             | O C               |
| Lewin's Honeyeater                  | <i>Meliphaga lewinii</i>             |                 | O C               |
| Little Pied Cormorant               | <i>Phalacrocorax melanoleucos</i>    | O               |                   |
| Little Wattlebird                   | <i>Anthochaera chrysoptera</i>       |                 | O C               |
| Magpie-lark                         | <i>Grallina cyanoleuca</i>           | O C             | O C               |
| Masked Lapwing                      | <i>Vanellus miles</i>                | O C             | O C               |
| New Holland Honeyeater              | <i>Phylidonyris novaehollandiae</i>  | O               | C <sup>PR</sup>   |
| Noisy Miner                         | <i>Manorina melanocephala</i>        | O C             | O C               |
| Pacific Black Duck                  | <i>Anas superciliosa</i>             | O               | O C               |
| Pied Currawong                      | <i>Strepera graculina</i>            | O C             | O C               |
| Powerful Owl <sup>TS</sup>          | <i>Ninox strenua</i>                 |                 | P Sp C            |
| Rainbow Lorikeet                    | <i>Trichoglossus haematodus</i>      | O C             | O C               |
| Red-browed Finch                    | <i>Neochmia temporalis</i>           |                 | O C               |
| Red Wattlebird                      | <i>Anthochaera carunculata</i>       | O C             | O C               |
| Red-whiskered Bulbul *              | <i>Pycnonotus jocosus</i>            | O C             | C                 |
| Restless Flycatcher                 | <i>Myiagra inquieta</i>              |                 | O C               |
| Rock Dove *                         | <i>Columba livia</i>                 |                 | O                 |
| Sacred Kingfisher                   | <i>Todiramphus sanctus</i>           | O C             |                   |
| Scaly-breasted Lorikeet             | <i>Trichoglossus chlorolepidotus</i> |                 | O C <sup>PO</sup> |
| Scarlet Honeyeater                  | <i>Myzomela sanguinolenta</i>        |                 | C                 |

| Common name                                                                                                                                                                                                                                                                                                                                                                                                             | Scientific name                     | Method observed |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------|-----------------|
| Silvereye                                                                                                                                                                                                                                                                                                                                                                                                               | <i>Zosterops lateralis</i>          | O C             | O C             |
| Spangled Drongo                                                                                                                                                                                                                                                                                                                                                                                                         | <i>Dicrurus bracteatus</i>          |                 | O               |
| Spotted Turtle-Dove *                                                                                                                                                                                                                                                                                                                                                                                                   | <i>Streptopelia chinensis</i>       | O               | C               |
| Striated Pardalote                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Pardalotus striatus</i>          |                 | C               |
| Sulphur Crested Cockatoo                                                                                                                                                                                                                                                                                                                                                                                                | <i>Cacatua galerita</i>             | O C             | O C             |
| Superb Fairy-wren                                                                                                                                                                                                                                                                                                                                                                                                       | <i>Malurus cyaneus</i>              | O C             | O C             |
| Tree Martin                                                                                                                                                                                                                                                                                                                                                                                                             | <i>Hirundo nigricans</i>            |                 | O <sup>PR</sup> |
| Welcome Swallow                                                                                                                                                                                                                                                                                                                                                                                                         | <i>Hirundo neoxena</i>              | O               | O C             |
| White-browed Scrubwren                                                                                                                                                                                                                                                                                                                                                                                                  | <i>Sericornis frontalis</i>         |                 | O C             |
| Willie Wagtail                                                                                                                                                                                                                                                                                                                                                                                                          | <i>Rhipidura leucophrys</i>         | O C             | O C             |
| Yellow-tailed Black-Cockatoo                                                                                                                                                                                                                                                                                                                                                                                            | <i>Calyptorhynchus funereus</i>     | C               |                 |
| <b>Mammals</b>                                                                                                                                                                                                                                                                                                                                                                                                          |                                     |                 |                 |
| Black Rat *                                                                                                                                                                                                                                                                                                                                                                                                             | <i>Rattus rattus</i>                | E               | HT E            |
| Brown Antechinus                                                                                                                                                                                                                                                                                                                                                                                                        | <i>Antechinus stuartii</i>          | E               | HT              |
| Bush Rat                                                                                                                                                                                                                                                                                                                                                                                                                | <i>Rattus fuscipes</i>              |                 | E               |
| Common Brushtail Possum                                                                                                                                                                                                                                                                                                                                                                                                 | <i>Trichosurus vulpecula</i>        | Sp E            | Sp E            |
| Common Ringtail Possum                                                                                                                                                                                                                                                                                                                                                                                                  | <i>Pseudocheirus peregrinus</i>     | Sp              | Sp HT           |
| Domesticated Cat *                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Felis cattus</i>                 |                 | O HT            |
| Domesticated Dog *                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Canis familiaris</i>             | O               | O C             |
| Eastern Bentwing-bat <sup>TS</sup>                                                                                                                                                                                                                                                                                                                                                                                      | <i>Miniopterus orianae oceansis</i> |                 | A               |
| Eastern Freetail-bat                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Mormopterus ridei</i>            |                 | A <sup>PO</sup> |
| Gould's Wattled Bat                                                                                                                                                                                                                                                                                                                                                                                                     | <i>Chalinolobus gouldii</i>         | A               | A               |
| Grey-headed Flying-fox <sup>TS</sup>                                                                                                                                                                                                                                                                                                                                                                                    | <i>Pteropus poliocephalus</i>       | Sp              | Sp              |
| Horse *                                                                                                                                                                                                                                                                                                                                                                                                                 | <i>Equus caballus</i>               | O Sc            | O               |
| House Mouse *                                                                                                                                                                                                                                                                                                                                                                                                           | <i>Mus musculus</i>                 | E               |                 |
| Little Forest Bat                                                                                                                                                                                                                                                                                                                                                                                                       | <i>Vespertilio vulturus</i>         | A               | A               |
| Long-nosed Bandicoot                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Paramelomys nasuta</i>           | E               | HT E            |
| Rabbit *                                                                                                                                                                                                                                                                                                                                                                                                                | <i>Oryctolagus cuniculus</i>        | Sc O            | O Sp Sc         |
| Swamp Wallaby                                                                                                                                                                                                                                                                                                                                                                                                           | <i>Wallabia bicolor</i>             |                 | HT              |
| <b>Reptiles</b>                                                                                                                                                                                                                                                                                                                                                                                                         |                                     |                 |                 |
| Cream-striped Shining Skink                                                                                                                                                                                                                                                                                                                                                                                             | <i>Cryptoblepharus virgatus</i>     |                 | O               |
| Delicate Skink                                                                                                                                                                                                                                                                                                                                                                                                          | <i>Lampropholis delicata</i>        |                 | O E             |
| Eastern Blue Tongue Lizard                                                                                                                                                                                                                                                                                                                                                                                              | <i>Tiliqua scincoides</i>           | E O             | O               |
| Eastern Water Dragon                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Physignathus lesueurii</i>       | E O             | O               |
| Eastern Water Skink                                                                                                                                                                                                                                                                                                                                                                                                     | <i>Eulamprus quoyii</i>             | E O             | O               |
| Grass Skink                                                                                                                                                                                                                                                                                                                                                                                                             | <i>Lampropholis guichenoti</i>      | E O             |                 |
| Red-Bellied Black Snake                                                                                                                                                                                                                                                                                                                                                                                                 | <i>Pseudechis porphyriacus</i>      |                 | E               |
| Southern Leaf-tailed Gecko                                                                                                                                                                                                                                                                                                                                                                                              | <i>Phyllurus platurus</i>           |                 | E               |
| <b>Amphibians</b>                                                                                                                                                                                                                                                                                                                                                                                                       |                                     |                 |                 |
| Common Eastern Froglet                                                                                                                                                                                                                                                                                                                                                                                                  | <i>Crinia signifera</i>             |                 | C E             |
| Dusky Toadlet                                                                                                                                                                                                                                                                                                                                                                                                           | <i>Uperoleia fusca</i>              |                 | C               |
| Peron's Tree Frog                                                                                                                                                                                                                                                                                                                                                                                                       | <i>Litoria peronii</i>              | C               |                 |
| Striped Marsh Frog                                                                                                                                                                                                                                                                                                                                                                                                      | <i>Limnodynastes peronii</i>        | C               | C E             |
| <p>Note: * indicates introduced species<br/> <sup>TS</sup> indicates threatened species</p> <p>All species listed are identified to a high level of certainty unless otherwise noted as:</p> <p><sup>PR</sup> indicates species identified to a 'probable' level of certainty – more likely than not<br/> <sup>PO</sup> indicates species identified to a 'possible' level of certainty – recorded to a moderate to</p> |                                     |                 |                 |

| Common name                                                                |                      | Scientific name |                      | Method observed |                        |
|----------------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------|------------------------|
| high level of uncertainty usually applied to a threatened species of note. |                      |                 |                      |                 |                        |
| E                                                                          | - Nest/roost         | H               | - Hair/feathers/skin | P               | - Scat                 |
| F                                                                          | - Tracks/scratchings | K               | - Dead               | Q               | - Camera               |
| FB                                                                         | - Burrow             | O               | - Observed           | T               | - Trapped/netted       |
| G                                                                          | - Crushed cones      | OW              | - Obs & heard call   | U               | - Anabat/ultrasound    |
|                                                                            |                      |                 |                      | W               | - Heard call           |
|                                                                            |                      |                 |                      | X               | - In scat              |
|                                                                            |                      |                 |                      | Y               | - Bone/teeth/shell     |
|                                                                            |                      |                 |                      | Z               | - In raptor/owl pellet |

# Appendix 2

## Threatened Flora and Fauna Species Habitat Assessment

**Table A2.1 – Threatened flora species habitat assessment**

| Scientific name<br>DATABASE SOURCE                            | BC Act | EPBC Act | Growth form and habitat requirements<br>Distribution limit                                                                                                                                                                                                                                        | Recorded on site<br>(✓) | If not recorded on site         |                                                                  |                                                     |                    | Considered in assessment of significance test<br>(✓)<br>Refer to Appendix 3 |
|---------------------------------------------------------------|--------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|------------------------------------------------------------------|-----------------------------------------------------|--------------------|-----------------------------------------------------------------------------|
|                                                               |        |          |                                                                                                                                                                                                                                                                                                   |                         | Suitable habitat present<br>(✓) | Nearby and / or high number of record(s)<br>(✓)<br>Notes 1,2 & 3 | Record(s) from recent years<br>(✓)<br>Notes 1,2 & 3 | Potential to occur |                                                                             |
| <i>Acacia bynoeana</i><br>OEH EPBC                            | E1     | V        | Erect or spreading shrub to 0.3m high growing in heath and dry sclerophyll open forest on sandy soils. Often associated with disturbed areas such as roadsides. <i>Distribution limits N-Newcastle S-Berrima.</i>                                                                                 | x                       | ✓                               | 2km W (17 records within 10km)                                   | 2008                                                | low                | ✓                                                                           |
| <i>Acacia pubescens</i><br>EPBC                               | V      | V        | Spreading shrub 1-4m high open sclerophyll growing in open forest and woodlands on clay soils. <i>Distribution limits N-Bilpin S-Georges River.</i>                                                                                                                                               | x                       | x                               | -                                                                | -                                                   | x                  | x                                                                           |
| <i>Acacia terminalis</i> subsp. <i>terminalis</i><br>OEH EPBC | E1     | E        | Erect shrub to 2m tall, flowers from March to July. Occurs in eucalypt woodland or forest, usually in sandy soil on creek banks, hillslopes or in shallow soil in rock crevices and sandstone platforms on cliffs. <i>Typically restricted to the Port Jackson and eastern suburbs of Sydney.</i> | x                       | x                               | -                                                                | -                                                   | x                  | x                                                                           |
| <i>Allocasuarina glareicola</i><br>EPBC                       | E1     | E        | Small shrub 1-2m high growing in open sclerophyll forest on lateritic soils derived from tertiary alluviums. <i>Distribution limits Castlereagh NR region.</i>                                                                                                                                    | x                       | x                               | -                                                                | -                                                   | x                  | x                                                                           |
| <i>Allocasuarina portuensis</i><br>OEH                        | E1     | E        | A shrub of 3-5m tall, similar to other <i>Casuarinaceae</i> species. Grows in tall shrubland on sandstone headland at Nielsen Park, Vaucluse.                                                                                                                                                     | x                       | x                               | -                                                                | -                                                   | x                  | x                                                                           |
| <i>Asterolasia elegans</i><br>OEH EPBC                        | E1     | E        | Erect shrub 1-3m high growing in moist sclerophyll forests on Hawkesbury sandstone slopes hillsides. <i>Distribution limits Maroota region.</i>                                                                                                                                                   | x                       | x                               | -                                                                | -                                                   | x                  | x                                                                           |
| <i>Caladenia tessellata</i><br>OEH EPBC                       | E1     | V        | Terrestrial orchid. Clay-loam or sandy soils. LHCCREMS guidelines suggest the species grows in Map Unit 34 – Coastal Sand Wallum Woodland - Heath. Flowers in September – November. <i>Distribution limits N-Swansea S-south of Eden.</i>                                                         | x                       | x                               | -                                                                | -                                                   | x                  | x                                                                           |

|                                                             |    |      |                                                                                                                                                                                                       |   |          |                                 |      |            |   |
|-------------------------------------------------------------|----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------|---------------------------------|------|------------|---|
| <i>Callistemon linearifolius</i><br>OEH                     | V  | -    | Shrub to 4m high. Dry sclerophyll forest on coast and adjacent ranges. <i>Distribution limits N-Nelson Bay S-Georges River.</i>                                                                       | x | x        | -                               | -    | x          | x |
| <i>Camarophyllopsis kearneyi</i><br>OEH                     | E1 | -    | Small gilled fungus. <i>Known only from Lane Cove Bushland Park in Sydney.</i>                                                                                                                        | x | x        | -                               | -    | x          | x |
| <i>Chamaesyce psammogeton</i><br>OEH                        | E1 | -    | Prostrate herb. Coastal dunes. <i>Distribution limits N-Tweed Heads S-Jervis Bay.</i>                                                                                                                 | x | x        | -                               | -    | x          | x |
| <i>Cryptostylis hunteriana</i><br>OEH EPBC                  | V  | V    | Saprophytic orchid. Grows in swamp heath on sandy soils. <i>Distribution limits N-Gibraltar Range S-south of Eden.</i>                                                                                | x | x        | -                               | -    | x          | x |
| <i>Cynanchum elegans</i><br>EPBC                            | E1 | E    | Climber or twiner to 1m. Grows in rainforest gullies, scrub & scree slopes. <i>Distribution limits N-Gloucester S-Wollongong.</i>                                                                     | x | x        | -                               | -    | x          | x |
| <i>Darwinia biflora</i><br>OEH EPBC                         | V  | V    | Erect or spreading shrub to 0.8m high. Grows in heath or understorey of woodland on or near shale-capped ridges underlain by Hawkesbury sandstone. <i>Distribution limits N-Gosford S-Cheltenham.</i> | x | Marginal | x                               | x    | Not likely | x |
| <i>Darwinia peduncularis</i><br>OEH                         | V  | -    | Divaricate shrub to 1.5m high. Grows in dry sclerophyll forest on sandstone hillsides and ridges. <i>Distribution limits N-Glen Davis S-Hornsby.</i>                                                  | x | x        | -                               | -    | x          | x |
| <i>Deyeuxia appressa</i><br>OEH EPBC                        | E1 | E    | Erect grass to 0.9m high. Grows on wet ground. <i>Distribution limits N-Hornsby S-Bankstown.</i>                                                                                                      | x | x        | -                               | -    | x          | x |
| <i>Diuris bracteata</i><br>OEH                              | E1 | Ext. | An orchid that grows in dry sclerophyll woodland. Was thought to be extinct until approximately 10yrs ago. <i>Found in the Sydney Basin Bioregion.</i> Flowers in September.                          | x | x        | -                               | -    | x          | x |
| <i>Epacris purpurascens</i> var. <i>purpurascens</i><br>OEH | V  | -    | Erect shrub to 1.5m high growing in sclerophyll forest and scrub and near creeks and swamps on sandstone. <i>Distribution limits N-Gosford S-Blue Mountains.</i>                                      | x | ✓        | 4km NE (65 records within 10km) | 2018 | unlikely   | ✓ |

|                                                             |    |   |                                                                                                                                                                                                                                             |   |   |        |      |     |   |
|-------------------------------------------------------------|----|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--------|------|-----|---|
| <i>Eucalyptus camfieldii</i><br>OEH EPBC                    | V  | V | Stringybark to 10m high. Grows on coastal shrub heath and woodlands on sandy soils derived from alluviums and Hawkesbury sandstone. <i>Distribution limits N-Norah Head S-Royal NP.</i>                                                     | x | ✓ | 2km NE | 2017 | low | ✓ |
| <i>Eucalyptus nicholii</i><br>OEH                           | V  | - | This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property. | x | x | -      | -    | x   | x |
| <i>Eucalyptus scoparia</i><br>OEH                           | E1 | V | Smooth-barked tree only known from vicinity of Bald Rock.                                                                                                                                                                                   | x | x | -      | -    | x   | x |
| <i>Genoplesium baueri</i><br>OEH EPBC                       | E1 | E | A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Feb–Mar. <i>Distribution limits N – Hunter Valley S – Nowra.</i>                                                                      | x | x | -      | -    | x   | x |
| <i>Grammitis stenophylla</i><br>OEH                         | E1 | - | A small lithophytic fern with fronds generally <5cm. <i>Occurs in rainforest and wet sclerophyll forest in the coastal divisions of NSW. Usually grown on rocks.</i>                                                                        | x | x | -      | -    | x   | x |
| <i>Grevillea caleyi</i><br>OEH EPBC                         | E1 | E | Shrub mostly 1-3m high. Grows in laterite. <i>Distribution limits Terrey Hills-Belrose area.</i>                                                                                                                                            | x | x | -      | -    | x   | x |
| <i>Grevillea juniperina</i> subsp. <i>juniperina</i><br>OEH | V  | - | Erect to spreading shrub 0.5-1.5m tall. Grows on laterite and Tertiary alluvium. <i>Distribution limits St Marys-Londonderry-Prospect.</i>                                                                                                  | x | x | -      | -    | x   | x |
| <i>Grevillea shiressii</i><br>EPBC                          | V  | V | Shrub 2-5m high. Flowers mainly spring. Grows along creek banks in wet sclerophyll forest. Sandy soil on Hawkesbury Sandstone. <i>Restricted to the Gosford area. CC.</i>                                                                   | x | x | -      | -    | x   | x |
| <i>Haloragodendron lucasii</i><br>OEH EPBC                  | E1 | E | Straggling shrub to 1.5m high. Grows in open forest on sheltered slopes near creeks. <i>Distribution limits Ku-ring-gai Plateau and Mt Wilson.</i>                                                                                          | x | x | -      | -    | x   | x |
| <i>Hibbertia puberula</i><br>OEH                            | E1 | - | Shrublets with branches up to 30cm long. <i>Not been seen for 40 years however early records are from Hawkesbury River area in Sydney and the Blue Mountains.</i>                                                                           | x | x | -      | -    | x   | x |

|                                                                   |    |   |                                                                                                                                                       |   |   |   |   |   |   |
|-------------------------------------------------------------------|----|---|-------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|
| <i>Hibbertia superans</i><br>OEH                                  | E1 | - | Small spreading shrub to 0.3m high. Grows on sandstone, usually in or near SSTF. <i>Distribution limits N-Glenorie S-Kellyville disjunct Mt Boss.</i> | X | X | - | - | X | X |
| <i>Hygrocybe austropratensis</i><br>OEH                           | E1 | - | Small gilled fungus known only from Lane Cove Bushland Park.                                                                                          | X | X | - | - | X | X |
| <i>Hygrocybe anomala</i> var.<br><i>inanthinomarginata</i><br>OEH | V  | - | Small gilled fungus known only from Lane Cove Bushland Park, Blue Mountains National Park and Royal National Park.                                    | X | X | - | - | X | X |
| <i>Hygrocybe aurantipes</i><br>OEH                                | V  | - | Small gilled fungus known only from Lane Cove Bushland Park and Blue Mountains National Park.                                                         | X | X | - | - | X | X |
| <i>Hygrocybe collucera</i><br>OEH                                 | E1 | - | Small gilled fungus known only from Lane Cove Bushland Park.                                                                                          | X | X | - | - | X | X |
| <i>Hygrocybe griseoramosa</i><br>OEH                              | E1 | - | Small gilled fungus known only from Lane Cove Bushland Park.                                                                                          | X | X | - | - | X | X |
| <i>Hygrocybe lanecovensensis</i><br>OEH                           | E1 | - | Small gilled fungus known only from Lane Cove Bushland Park.                                                                                          | X | X | - | - | X | X |
| <i>Hygrocybe reesiaae</i><br>OEH                                  | V  | - | Small gilled fungus known only from Lane Cove Bushland Park and Blue Mountains National Park on moss covered banks under closed canopy.               | X | X | - | - | X | X |

|                                        |    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |          |   |      |            |   |
|----------------------------------------|----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------|---|------|------------|---|
| <i>Hygrocybe rubronivea</i><br>OEH     | V  | -    | Known in a few locations including in Lane Cove Bushland Park and the Blue Mountains in NSW and in areas of south-east Queensland. Little information exists for populations outside Lane Cove Bushland Park. Occurs in gallery warm temperate forests dominated by <i>Acmena smithii</i> , <i>Backhousia myrtifolia</i> , <i>Glochidion ferdinandi</i> and <i>Pittosporum undulatum</i> .<br><i>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes.</i><br>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.<br>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid-May to mid-July sometimes to August. | x | x        | - | -    | x          | x |
| <i>Hypsela sessiliflora</i><br>OEH     | E1 | Ext. | Was named <i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i> . Is a prostrate herb, rooting at nodes, growing in damp places on the Cumberland Plain.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | x | x        | - | -    | x          | x |
| <i>Kunzea rupestris</i><br>OEH EPBC    | V  | V    | Shrub to 1.5m high. Grows in cracks and fissures on Hawkesbury Sandstone rock platforms. <i>Distribution limits N-Maroota S-Glenorie.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | x | x        | - | -    | x          | x |
| <i>Lasiopetalum joyceae</i><br>OEH     | V  | V    | Erect shrub to 2m high. Grows in heath and open forest on Hawkesbury sandstone. <i>Distribution limits Hornsby Plateau.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | x | marginal | x | 2013 | not likely | x |
| <i>Leptospermum deanei</i><br>OEH EPBC | V  | V    | Shrub to 5m high. Grows on forested slopes. <i>Distribution limits near watershed of Lane Cove River.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | x | x        | - | -    | x          | x |
| <i>Melaleuca biconvexa</i><br>OEH EPBC | V  | V    | Tall shrub. Grows in wetlands adjoining perennial streams and on the banks of those streams, generally within the geological series known as the Terrigal Formation. <i>Distribution limits N-Port Macquarie S-Jervis Bay.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | x | x        | - | -    | x          | x |
| <i>Melaleuca deanei</i><br>OEH EPBC    | V  | V    | Shrub to 3m high. Grows in heath on sandstone. <i>Distribution limits N-Gosford S-Nowra.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | x | marginal | x | 2017 | not likely | x |

|                                                              |    |    |                                                                                                                                                                                                                        |   |             |                                 |      |     |   |
|--------------------------------------------------------------|----|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------|---------------------------------|------|-----|---|
| <i>Microtis angusii</i><br>OEH EPBC                          | E1 | E  | Terrestrial orchid which is known from one population at Ingleside. Associated with the Duffy's Forest vegetation community. Flowers May-Oct.                                                                          | x | x           | -                               | -    | x   | x |
| <i>Pelargonium</i> sp.<br><i>Striatellum</i><br>EPBC         | E1 | E  | Herb to 90cm tall which grows in damp places especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. <i>Varied distribution from SE NSW to QLD.</i>                          | x | x           | -                               | -    | x   | x |
| <i>Persoonia hirsuta</i><br>OEH EPBC                         | E1 | E  | Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. <i>Distribution limits N-Glen Davis S-Hill Top.</i>                                     | x | ✓           | 1km NE (32 records within 10km) | 2007 | ✓   | ✓ |
| <i>Persoonia mollis</i> subsp. <i>maxima</i><br>OEH EPBC     | E1 | E  | Erect to prostrate shrub. Grows in moist to wet sclerophyll forests on Hawkesbury sandstone. <i>Distribution limits N-Cowan S-Hornsby.</i>                                                                             | x | x           | -                               | -    | x   | x |
| <i>Pimelea curviflora</i> var. <i>curviflora</i><br>OEH EPBC | V  | V  | Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury Sandstone near shale outcrops. <i>Distribution Sydney.</i>                                                                                               | x | sub-optimal | 1km NE (63 records within 10km) | 2002 | low | ✓ |
| <i>Pimelea spicata</i><br>EPBC                               | E1 | E  | Decumbent or erect shrub to 0.5m high. Occurs principally in woodland on soils derived from Wianamatta Shales. <i>Distribution limits N-Lansdowne S-Shellharbour.</i>                                                  | x | x           | -                               | -    | x   | x |
| <i>Prostanthera densa</i><br>OEH                             | V  | V  | Erect shrub 0.5-2m. Grows in sclerophyll forest and shrubland. <i>Distribution limits N-Nelson Bay S-Beecroft Peninsula.</i>                                                                                           | x | x           | -                               | -    | x   | x |
| <i>Prostanthera junonis</i><br>OEH                           | E1 | E  | Small shrub. Grows in sclerophyll forest and heath in shallow soil on sandstone. <i>Distribution limits Somersby region.</i>                                                                                           | x | x           | -                               | -    | x   | x |
| <i>Prostanthera marifolia</i><br>OEH EPBC                    | CE | CE | Erect shrub to 0.3m high. Woodland dominated by Eucalyptus sieberi and Corymbia gummifera. In deeply weathered clay soil with ironstone nodules. <i>Has been recorded previously in the Sydney Harbour region.</i>     | x | x           | -                               | -    | x   | x |
| <i>Sarcochilus hartmannii</i><br>OEH                         | V  | V  | An orchid which grows on volcanic rocks, often in shallow soil in sclerophyll forest or exposed sites usually at an elevation above 500m. <i>Distribution – north from the Richmond River in the far north of NSW.</i> | x | x           | -                               | -    | x   | x |

|                                         |                                                                                                                                                                                                                                                                                                                    |   |                                                                                                                                                                                           |   |   |   |   |   |   |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|
| <i>Senecio spathulatus</i><br>OEH       | E1                                                                                                                                                                                                                                                                                                                 | - | A low growing daisy that prefers primary dunes. Known to occur at Cape Howe and between Kurnell north to Myall Lakes National Park. Also occurs in coastal locations in eastern Victoria. | X | X | - | - | X | X |
| <i>Syzygium paniculatum</i><br>OEH EPBC | V                                                                                                                                                                                                                                                                                                                  | V | Small tree. Subtropical and littoral rainforest on sandy soil. Distribution limits N-Forster S-Jervis Bay.                                                                                | X | X | - | - | X | X |
| <i>Tetratheca glandulosa</i><br>OEH     | V                                                                                                                                                                                                                                                                                                                  | - | Spreading shrub to 0.2m high. Sandy or rocky heath or scrub. Distribution limits N-Mangrove Mountain S-Port Jackson.                                                                      | X | ✓ | ✓ | ✓ | ✓ | ✓ |
| <i>Thesium australe</i><br>EPBC         | V                                                                                                                                                                                                                                                                                                                  | V | Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. Distribution limits N-Tweed Heads S-south of Eden.                                                      | X | X | - | - | X | X |
| <i>Triplarina imbricata</i><br>EPBC     | E1                                                                                                                                                                                                                                                                                                                 | E | A shrub to 2.8m tall, flowers from Nov-Dec. Occurs in heath, often in damp places along creek lines; coast and adjacent ranges. Known from the Tabulum and Nymboida districts in NE NSW.  | X | X | - | - | X | X |
| OEH                                     | - Denotes species listed within 10km of the subject site on the <i>Atlas of NSW Wildlife</i>                                                                                                                                                                                                                       |   |                                                                                                                                                                                           |   |   |   |   |   |   |
| EPBC                                    | - Denotes species listed within 10km of the subject site in the <i>EPBC Act</i> habitat search                                                                                                                                                                                                                     |   |                                                                                                                                                                                           |   |   |   |   |   |   |
| V                                       | - Denotes vulnerable listed species under the relevant Act                                                                                                                                                                                                                                                         |   |                                                                                                                                                                                           |   |   |   |   |   |   |
| E or E1                                 | - Denotes endangered listed species under the relevant Act                                                                                                                                                                                                                                                         |   |                                                                                                                                                                                           |   |   |   |   |   |   |
| E4a or CE                               | - Denotes critically endangered listed species under the relevant Act                                                                                                                                                                                                                                              |   |                                                                                                                                                                                           |   |   |   |   |   |   |
| NOTE:                                   | 1. This field is not considered if no suitable habitat is present within the subject site<br>2. 'records' refer to those provided by the <i>Atlas of NSW Wildlife</i> / <i>Bionet Database</i><br>3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle |   |                                                                                                                                                                                           |   |   |   |   |   |   |

**Table A2.2 – Threatened fauna species habitat assessment**

| Common name<br>Scientific name<br><small>Database source</small>                   | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                           | Recorded on site<br>(✓) | If not recorded on site      |                                                                                |                                                                     |                    | Considered in assessment of significance test (✓)<br>(Refer to Appendix 3) |
|------------------------------------------------------------------------------------|--------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------|
|                                                                                    |        |          |                                                                                                                                                                                                                                   |                         | Suitable habitat present (✓) | Nearby and/or high number of record(s) (✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years (✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                            |
| Giant Burrowing Frog<br><i>Heleioporus australiacus</i><br><small>OEH EPBC</small> | V      | V        | Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. <i>Distribution limit: N-Near Singleton S-South of Eden.</i>                                                      | x                       | marginal                     | x                                                                              | x                                                                   | Not likely         | x                                                                          |
| Stuttering Frog<br><i>Mixophyes balbus</i><br><small>OEH EPBC</small>              | E      | V        | Terrestrial inhabitant of rainforest and wet sclerophyll forests. <i>Distribution limit: N-near Tenterfield S-South of Bombala.</i>                                                                                               | x                       | x                            | -                                                                              | -                                                                   | x                  | x                                                                          |
| Giant Barred Frog<br><i>Mixophyes iteratus</i><br><small>OEH EPBC</small>          | E      | E        | Terrestrial inhabitant of rainforest and open forests. <i>Distribution Limit: N-Border Ranges National Park. S-Narooma.</i>                                                                                                       | x                       | x                            | -                                                                              | -                                                                   | x                  | x                                                                          |
| Red-crowned Toadlet<br><i>Pseudophryne australis</i><br><small>OEH</small>         | V      | -        | Prefers sandstone areas, breeds in grass and debris beside non-perennial creeks or gutters. Individuals can also be found under logs and rocks in non-breeding periods. <i>Distribution limit: N-Pokolbin. S-near Wollongong.</i> | x                       | ✓                            | x                                                                              | ✓                                                                   | ✓                  | ✓                                                                          |
| Green and Golden Bell Frog<br><i>Litoria aurea</i><br><small>OEH EPBC</small>      | E      | V        | Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. <i>Distribution limit: N-Byron Bay S-South of Eden.</i>                                         | x                       | marginal                     | x                                                                              | x                                                                   | Not likely         | x                                                                          |

| Common name<br>Scientific name<br><small>Database source</small>   | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                  | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|--------------------------------------------------------------------|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                    |        |          |                                                                                                                                                                                                                                                                          |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Littlejohn's Tree Frog<br><i>Litoria littlejohnii</i><br>OEH EPBC  | V      | V        | Found in wet and dry sclerophyll forest associated with sandstone outcrops at altitudes 280-1,000m on eastern slopes of Great Dividing Range. Prefers flowing rocky streams. <i>Distribution limit: N-Hunter River S-Eden.</i>                                           | x                       | marginal                        | x                                                                                 | x                                                                      | Not likely         | x                                                                             |
| Rosenberg's Goanna<br><i>Varanus rosenbergi</i><br>OEH             | V      | -        | Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops. <i>Distribution limit: N-Nr Broke. S-Nowra Located in scattered patches near Sydney, Nowra and Goulburn.</i> | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Broad-headed Snake<br><i>Hoplocephalus bungaroides</i><br>OEH EPBC | E      | V        | Sandstone outcrops, exfoliated rock slabs and tree hollows in coastal and near coastal areas. <i>Distribution limit: N-Mudgee Park. S-Nowra.</i>                                                                                                                         | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Cotton Pygmy-goose<br><i>Nettapus coromandelianus</i><br>OEH       | E      | -        | An aquatic species found in tropical to subtropical coastal lagoons, swamps and large bodies of calm fresh water with abundant vegetation. <i>Distribution limit: N-Tweed Heads. S-Pambula.</i>                                                                          | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Wompoo Fruit-dove<br><i>Ptilinopus magnificus</i><br>OEH           | V      | -        | Inhabits large undisturbed patches of lowland and adjacent highland rainforest and moist eucalypt forests where it feeds on fruit. <i>Distribution limit: N-Tweed Heads. S-Sydney.</i>                                                                                   | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |

| Common name<br>Scientific name<br><small>Database source</small>  | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                               | Recorded on site (✓) | If not recorded on site      |                                                                                |                                                                     |                    | Considered in assessment of significance test (✓)<br>(Refer to Appendix 3) |
|-------------------------------------------------------------------|--------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------|
|                                                                   |        |          |                                                                                                                                                                                                                                                                                       |                      | Suitable habitat present (✓) | Nearby and/or high number of record(s) (✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years (✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                            |
| Superb Fruit-dove<br><i>Ptilinopus superbus</i><br>OEH            | V      | -        | Rainforests, adjacent mangroves, eucalypt forests, scrubland with native fruits. <i>Distribution limit: N-Border Ranges National Park. S-Batemans Bay.</i>                                                                                                                            | X                    | X                            | -                                                                              | -                                                                   | X                  | X                                                                          |
| Australasian Bittern<br><i>Botaurus poiciloptilus</i><br>OEH EPBC | E      | E        | Found in or over water of shallow freshwater or brackish wetlands with tall reedbeds, sedges, rushes, cumbungi, lignum and also in ricefields, drains in tussocky paddocks, occasionally saltmarsh, brackish wetlands. <i>Distribution limit: N-North of Lismore. S- Eden.</i>        | X                    | X                            | -                                                                              | -                                                                   | X                  | X                                                                          |
| Black Bittern<br><i>Ixobrychus flavicollis</i><br>OEH             | V      | -        | Found in shadowy, leafy waterside trees such as callistemons, casuarinas, paperbarks, eucalypts, mangroves and willows along tidal creeks, freshwater and brackish streams and ponds, sheltered mudflats and oyster slats. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i> | X                    | X                            | -                                                                              | -                                                                   | X                  | X                                                                          |
| White-bellied Sea Eagle<br><i>(Haliaeetus leucogaster)</i><br>OEH | V      | -        | Occupies coasts, islands, estuaries, inlets, large rivers, inland lakes and reservoirs. <i>Sedentary; dispersive. N-Tweed Heads. S-South of Eden.</i>                                                                                                                                 | X                    | X                            | -                                                                              | -                                                                   | X                  | X                                                                          |
| Little Eagle<br><i>Hieraaetus morphnoides</i><br>OEH              | V      | -        | Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. <i>Distribution limit - N-Tweed Heads. S-South of Eden.</i>                                                                                                             | X                    | ✓                            | X                                                                              | X                                                                   | low                | ✓                                                                          |

| Common name<br>Scientific name<br><small>Database source</small>    | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                   | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|---------------------------------------------------------------------|--------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                     |        |          |                                                                                                                                                                                                                                           |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Square-tailed Kite<br><i>Lophoictinia isura</i><br>OEH              | V      | -        | Utilises mostly coastal and sub-coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and mallee that are rich in passerine birds. <i>Distribution limit: N-Goondiwindi. S-South of Eden.</i> | x                       | marginal                        | x                                                                                 | x                                                                      | x                  | x                                                                             |
| Eastern Osprey<br><i>Pandion cristatus</i><br>OEH                   | V      | -        | Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                        | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Red Goshawk<br><i>Erythrotriorchis radiatus</i><br>EPBC             | E      | V        | Inhabits tall open forests and woodlands. Breeds in tall trees adjacent to watercourses of wetlands. <i>Distribution Limit: N-Border Ranges National Park. S-Foster.</i>                                                                  | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Bush Stone-curlew<br><i>Burhinus grallarius</i><br>OEH              | E      | -        | Utilises open forests and savannah woodlands, sometimes dune scrub, savannah and mangrove fringes. <i>Distribution limit: N-Border Ranges National Park. S-Near Nowra.</i>                                                                | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Beach Stone-curlew<br><i>Esacus neglectus</i><br>OEH                | E      | -        | Inhabits remote and secluded beaches, coral reefs and cays, mangrove fringes and estuarine mudflats. <i>Distribution limit: N-Tweed Heads. S-Shoalhaven River.</i>                                                                        | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Australian Painted Snipe<br><i>Rostratula australis</i><br>OEH EPBC | E      | E        | Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                              | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |

| Common name<br>Scientific name<br><small>Database source</small> | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                    | Recorded on site (✓) | If not recorded on site      |                                                                                |                                                                     |                    | Considered in assessment of significance test (✓) (Refer to Appendix 3) |
|------------------------------------------------------------------|--------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------|
|                                                                  |        |          |                                                                                                                                                                                                                                                                            |                      | Suitable habitat present (✓) | Nearby and/or high number of record(s) (✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years (✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                         |
| Gang-gang Cockatoo<br><i>Callocephalon fimbriatum</i><br>OEH     | V      | -        | Prefers wetter forests and woodlands from sea level to > 2,000m on the Great Dividing Range, timbered foothills and valleys, timbered watercourses, coastal scrubs, farmlands and suburban gardens. <i>Distribution limit: mid north coast of NSW to western Victoria.</i> | x                    | ✓                            | x                                                                              | x                                                                   | low                | ✓                                                                       |
| Glossy Black-Cockatoo<br><i>Calyptorhynchus lathamii</i><br>OEH  | V      | -        | Open forests with <i>Allocasuarina</i> species and hollows for nesting. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                                                                                                                         | ✓                    | ✓                            | -                                                                              | -                                                                   | ✓                  | ✓                                                                       |
| Little Lorikeet<br><i>Glossopsitta pusilla</i><br>OEH            | V      | -        | Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                                                                                 | x                    | ✓                            | ✓                                                                              | ✓                                                                   | ✓                  | ✓                                                                       |
| Swift Parrot<br><i>Lathamus discolor</i><br>OEH EPBC             | E      | E        | Inhabits eucalypt forests and woodlands with winter flowering eucalypts. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>                                                                                                                        | x                    | ✓                            | ✓                                                                              | ✓                                                                   | ✓                  | ✓                                                                       |
| Turquoise Parrot<br><i>Neophema pulchella</i><br>OEH             | V      | -        | Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. <i>Distribution limit: N-Near Tenterfield. S-South of Eden.</i>                                                                           | x                    | ✓                            | -                                                                              | -                                                                   | low                | ✓                                                                       |
| Barking Owl<br><i>Ninox connivens</i><br>OEH                     | V      | -        | Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. <i>Distribution limit: N-Border Ranges National Park. S-Eden.</i>                                                                                        | x                    | ✓                            | ✓                                                                              | ✓                                                                   | ✓                  | ✓                                                                       |

| Common name<br>Scientific name<br><small>Database source</small>  | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                          | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|-------------------------------------------------------------------|--------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                   |        |          |                                                                                                                                                                                                                                                                  |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Powerful Owl<br><i>Ninox strenua</i><br>OEH                       | V      | -        | Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. <i>Distribution limits: N-Border Ranges National Park. S-Eden.</i>                                                                                           | x                       | ✓                               | ✓<br>400m E                                                                       | 2014                                                                   | ✓                  | ✓                                                                             |
| Masked Owl<br><i>Tyto novaehollandiae</i><br>OEH                  | V      | -        | Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. <i>Distribution limit: N-Border Ranges National Park. S-Eden.</i>                                                                                    | x                       | ✓                               | x                                                                                 | x                                                                      | low                | ✓                                                                             |
| Sooty Owl<br><i>Tyto tenebricosa</i><br>OEH                       | V      | -        | Tall, dense, wet forests containing trees with very large hollows. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>                                                                                                                    | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Brown Treecreeper<br><i>Climacteris picumnus victoriae</i><br>OEH | V      | -        | Occupies eucalypt woodlands, open woodland lacking a dense understorey with fallen dead timber. <i>Distribution limit: (Sub species victoriae) Central NSW west of Great Div. Cumberland Plains, Hunter Valley, Richmond, Clarence, and Snowy River Valleys.</i> | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Eastern Bristlebird<br><i>Dasyornis brachypterus</i><br>OEH EPBC  | E      | E        | Coastal woodlands, dense scrubs and heathlands, especially where low heathland borders taller woodland or dense tall tea-tree. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                                                        | x                       | ✓                               | x                                                                                 | x                                                                      | Not likely         | x                                                                             |
| Regent Honeyeater<br><i>Xanthomyza phrygia</i><br>OEH EPBC        | E4A    | CE       | Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. <i>Distribution limit: N-Urbanville. S-Eden.</i>                                                                             | x                       | ✓                               | x                                                                                 | x                                                                      | unlikely           | ✓                                                                             |

| Common name<br>Scientific name<br><small>Database source</small>       | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                                                                                                                                                                                                                  | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|------------------------------------------------------------------------|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                        |        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Painted Honeyeater<br><i>Grantiella picta</i><br>OEH EPBC              | V      | V        | A nomadic bird occurring in low densities within open forest, woodland and scrubland feeding on mistletoe fruits. Inhabits primarily Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. <i>Distribution limit: N-Boggabilla. S-Albury with greatest occurrences on the inland slopes of the Great Dividing Range.</i>                                                                                                                                       | X                       | X                               | -                                                                                 | -                                                                      | X                  | X                                                                             |
| Black-chinned Honeyeater<br><i>Melithreptus gularis gularis</i><br>OEH | V      | -        | Found in woodlands containing box-ironbark associations and River Red Gums, also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence. <i>Distribution limit: N-Cape York Pen. Qld. S-Victor H. Mt Lofty Ra &amp; Flinders Ra. SA.</i>                                                                                                                                                                                                       | X                       | X                               | -                                                                                 | -                                                                      | X                  | X                                                                             |
| Varied Sittella<br><i>Daphoenositta chrysoptera</i><br>OEH             | V      | -        | Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>                                                                                                                                                                                                                 | X                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Dusky Woodswallow<br><i>Artamus cyanopterus cyanopterus</i><br>OEH     | V      | -        | Found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Prefers habitat with an open understorey. Often observed in farmland tree patches or roadside remnants. <i>Widespread in eastern, southern and south-western Australia.</i> | X                       | ✓                               | -                                                                                 | -                                                                      | unlikely           | ✓                                                                             |

| Common name<br>Scientific name<br><small>Database source</small> | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                               | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|------------------------------------------------------------------|--------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                  |        |          |                                                                                                                                                                                                                                                                                       |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Scarlet Robin<br><i>Petroica boodang</i><br>OEH                  | V      | -        | Found in foothill forests, woodlands, watercourses; in autumn-winter, more open habitats: river red gum woodlands, golf courses, parks, orchards, gardens. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                                                 | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Diamond Firetail<br><i>Stagonopleura guttata</i><br>OEH          | V      | -        | Found in eucalypt woodlands, forests and mallee where there is grassy understorey west of the Great Div. also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence River Valleys. <i>Distribution limit: N-Rockhampton Q. S-Eyre Pen Kangaroo Is. SA.</i> | x                       | ✓                               | x                                                                                 | x                                                                      | Not likely         | x                                                                             |
| Spotted-tailed Quoll<br><i>Dasyurus maculatus</i><br>OEH EPBC    | V      | E        | Dry and moist open forests containing rock caves, hollow logs or trees. <i>Distribution limit: N-Mt Warning National Park. S-South of Eden.</i>                                                                                                                                       | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Southern Brown Bandicoot<br><i>Isodon obesulus</i><br>OEH EPBC   | E      | E        | Utilises a range of habitats containing thick ground cover - open forest, woodland, heath, cleared land, urbanised areas and regenerating bushland. <i>Distribution limit: N-Kempsey. S-South of Eden.</i>                                                                            | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Koala<br><i>Phascolarctos cinereus</i><br>OEH EPBC               | V      | V        | Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>                                                                                                                          | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |

| Common name<br>Scientific name<br><small>Database source</small>                 | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                                                                                                                                                                                                | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|----------------------------------------------------------------------------------|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                                  |        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Eastern Pygmy Possum<br><i>Cercatus nanus</i><br><small>OEH</small>              | V      | -        | Found in a variety of habitats from rainforest through open forest to heath. Feeds on insects but also gathers pollen from banksias, eucalypts and bottlebrushes. Nests in banksias and myrtaceous shrubs. <i>Distribution limit: N-Tweed Heads. S-Eden.</i>                                                                                                                                                                                           | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Yellow-bellied Glider<br><i>Petaurus australis</i><br><small>OEH</small>         | V      | -        | Tall mature eucalypt forests with high nectar producing species and hollow bearing trees. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>                                                                                                                                                                                                                                                                                   | x                       | ✓                               | x                                                                                 | x                                                                      | Not likely         | x                                                                             |
| Squirrel Glider<br><i>Petaurus norfolcensis</i><br><small>OEH</small>            | V      | -        | Mixed aged stands of eucalypt forest & woodlands including gum barked & high nectar producing species & hollow bearing trees. <i>Distribution limit: N-Tweed Heads. S-Albury.</i>                                                                                                                                                                                                                                                                      | x                       | marginal                        | x                                                                                 | x                                                                      | x                  | x                                                                             |
| Greater Glider<br><i>Petauroides volans</i><br><small>EPBC</small>               | -      | V        | Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Population density is optimal at elevation levels at 845 m above sea level. Prefer overstorey basal areas in old-growth tree stands. Highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows <i>Distribution limit: N-Border Ranges National Park. S- South of Eden.</i> | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |
| Brush-tailed Rock-wallaby<br><i>Petrogale penicillata</i><br><small>EPBC</small> | E      | V        | Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country. <i>Distribution limit: N-North of Tenterfield. S-Bombala.</i>                                                                                                                                                                                                                                                          | x                       | x                               | -                                                                                 | -                                                                      | x                  | x                                                                             |

| Common name<br>Scientific name<br><small>Database source</small>                       | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                       | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|----------------------------------------------------------------------------------------|--------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                                        |        |          |                                                                                                                                                                                                                                                               |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Grey-headed Flying-fox<br><i>Pteropus poliocephalus</i><br><small>OEH EPBC</small>     | V      | V        | Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy. <i>Distribution limit: N-Tweed Heads. S-Eden.</i> | ✓<br>2014               | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Yellow-bellied Sheathtail-bat<br><i>Saccolaimus flaviventris</i><br><small>OEH</small> | V      | -        | Rainforests, sclerophyll forests and woodlands. <i>Distribution limit: N-North of Walgett. S-Sydney.</i>                                                                                                                                                      | x                       | ✓                               | x                                                                                 | x                                                                      | low                | ✓                                                                             |
| East-coast Freetail Bat<br><i>Micronomus norfolkensis</i><br><small>OEH</small>        | V      | -        | Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. <i>Distribution limit: N-Woodenbong. S-Pambula.</i>                                                            | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Large-eared Pied Bat<br><i>Chalinolobus dwyeri</i><br><small>OEH EPBC</small>          | V      | V        | Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. <i>Distribution limit: N-Border Ranges National Park. S-Wollongong.</i>                                         | x                       | ✓                               | x                                                                                 | x                                                                      | Not likely         | x                                                                             |
| Eastern Falsistrelle<br><i>Falsistrellus tasmaniensis</i><br><small>OEH</small>        | V      | -        | Recorded roosting in caves, old buildings and tree hollows. <i>Distribution limit: N-Border Ranges National Park. S-Pambula.</i>                                                                                                                              | x                       | ✓                               | x                                                                                 | x                                                                      | unlikely           | ✓                                                                             |

| Common name<br>Scientific name<br><small>Database source</small>     | BC Act | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                                                                                                                           | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|----------------------------------------------------------------------|--------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                      |        |          |                                                                                                                                                                                                                                                                                                                                                                                   |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Little Bentwing-bat<br><i>Miniopterus australis</i><br>OEH           | V      | -        | Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. <i>Distribution limit: N-Border Ranges National Park. S-Sydney.</i>                                                                                                                                                                                              | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| Eastern Bentwing-bat<br><i>Miniopterus orianae oceanensis</i><br>OEH | V      | -        | Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>                                                                                                                                                                                              | ✓<br>2014               | ✓                               | -                                                                                 | -                                                                      | ✓                  | ✓                                                                             |
| Large-footed Myotis<br><i>Myotis macropus</i><br>OEH                 | V      | -        | Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>                                                                                                                                                                                                   | x                       | ✓                               | ✓                                                                                 | x                                                                      | low                | ✓                                                                             |
| Greater Broad-nosed Bat<br><i>Scoteanax rueppellii</i><br>OEH        | V      | -        | Inhabits areas containing moist river and creek systems, especially tree lined creeks. <i>Distribution limit: N-Border Ranges National Park. S-Pambula.</i>                                                                                                                                                                                                                       | x                       | ✓                               | ✓                                                                                 | ✓                                                                      | ✓                  | ✓                                                                             |
| New Holland Mouse<br><i>Pseudomys novaehollandiae</i><br>EPBC        | -      | V        | Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations have a marked preference for sandy substrates, a heathy understorey of leguminous shrubs less than 1m high and sparse ground litter. Recolonise of regenerating burnt areas. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i> | x                       | ✓                               | x                                                                                 | x                                                                      | low                | ✓                                                                             |

| Common name<br>Scientific name<br><small>Database source</small> | BC Act                                                                                                                                                                                                                                                                                    | EPBC Act | Preferred habitat<br>Distribution limit                                                                                                                                                                                                                                                                                                                   | Recorded on site<br>(✓) | If not recorded on site         |                                                                                   |                                                                        |                    | Considered in assessment of significance test<br>(✓)<br>(Refer to Appendix 3) |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------|
|                                                                  |                                                                                                                                                                                                                                                                                           |          |                                                                                                                                                                                                                                                                                                                                                           |                         | Suitable habitat present<br>(✓) | Nearby and/or high number of record(s)<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Record(s) from recent years<br>(✓)<br><small>Notes 1,2 &amp; 3</small> | Potential to occur |                                                                               |
| Dural Land Snail<br><i>Pommerhelix duralensis</i><br>EPBC        | E                                                                                                                                                                                                                                                                                         | E        | Occurs on shale-sandstone transitional forest landscapes within the Blue Mountains, Penrith, The Hills, Wollondilly, Hornsby and Parramatta LGA's. Occurs in low abundance and shelters under rocks or inside curled-up bark, beneath leaves and light woody debris. <i>Distribution limit: St Albans to Mulgoa with most records from The Hills LGA.</i> | X                       | X                               | -                                                                                 | -                                                                      | X                  | X                                                                             |
| OEH                                                              | Denotes species listed within 10km of the subject site on the <i>Atlas of NSW Wildlife</i>                                                                                                                                                                                                |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| EPBC                                                             | Denotes species listed within 10km of the subject site in the <i>EPBC Act</i> habitat search                                                                                                                                                                                              |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| TBE                                                              | Denotes additional species considered by <i>Travers bushfire &amp; ecology</i> to have potential habitat based on regional knowledge and other records                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| V                                                                | Denotes vulnerable listed species under the relevant Act                                                                                                                                                                                                                                  |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| E or E1                                                          | Denotes endangered listed species under the relevant Act                                                                                                                                                                                                                                  |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| E4a or CE                                                        | Denotes critically endangered listed species under the relevant Act                                                                                                                                                                                                                       |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| NOTE:                                                            | 1. This field is not considered if no suitable habitat is present within the subject site<br>2. 'records' refer to those provided by the <i>Atlas of NSW Wildlife</i><br>3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| Unlikely                                                         | Represents such a low margin but not enough to 100% rule it one. A significance of impact test is required.                                                                                                                                                                               |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |
| Not likely                                                       | Means 0% change of occurring, despite there being potential habitat. A significance of impact test is not applied to these species.                                                                                                                                                       |          |                                                                                                                                                                                                                                                                                                                                                           |                         |                                 |                                                                                   |                                                                        |                    |                                                                               |

A detailed assessment in accordance with Section 1.7 of the *EP&A Act* will be completed for these species in Appendix 3 of this report.

Table A2.3 provides an assessment of potential habitat within the subject site for nationally *protected* migratory fauna species recorded within 10km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are considered in Table A2.3.

**Table A2.3 – Migratory fauna habitat assessment**

| Common name<br>Scientific name                                | Preferred habitat<br>Migratory breeding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Suitable habitat present<br>(✓) | Recorded on site<br>(✓) | Comments                                 |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------|------------------------------------------|
| Oriental Cuckoo<br>( <i>Cuculus optatus</i> )                 | Mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ✓                               | x                       | No local records                         |
| Osprey<br>( <i>Pandion haliaetus</i> )                        | Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays. They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging sites. Eastern Ospreys occur sympatrically and sometimes interact with White-bellied Sea-Eagles. | x                               | x                       | No significant impact expected           |
| White-throated Needletail<br>( <i>Hirundapus caudacutus</i> ) | Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies often forage along favoured hilltops and timbered ranges. <i>Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ✓                               | x                       | Aerial habitat only – no impact expected |
| Fork-tailed Swift<br>( <i>Apus pacificus</i> )                | Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. <i>Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ✓                               | x                       | Aerial habitat only – no impact expected |
| Black-faced Monarch<br>( <i>Monarcha melanopsis</i> )         | Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. <i>Summer breeding migrant to coastal south east Australia, otherwise uncommon.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sub-optimal                     | x                       | No significant impact expected           |
| Spectacled Monarch<br>( <i>Monarcha trivirgatus</i> )         | Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. <i>Summer breeding migrant to south-east Qld and north-east NSW down to Port Stephens from Sept / Oct to May. Uncommon in southern part of range.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | migratory                       | x                       | No significant impact expected           |
| Satin Flycatcher<br>( <i>Myiagra cyanoleuca</i> )             | Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. <i>Breeds mostly south-east Australia and Tasmania over warmer months, winters in north east Qld.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Sub-optimal                     | x                       | No significant impact expected           |

| Common name<br>Scientific name                   | Preferred habitat<br>Migratory breeding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Suitable habitat present<br>(✓) | Recorded on site<br>(✓) | Comments                       |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------|--------------------------------|
| Rufous Fantail<br>( <i>Rhipidura rufifrons</i> ) | Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. <i>Breeding migrant to south-east Australia over warmer months. Altitudinal migrant in north-east NSW in mountain forests during warmer months.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                               | x                       | No significant impact expected |
| Great Egret<br>( <i>Ardea alba</i> )             | Shallows of rivers, estuaries; tidal mudflats, freshwater wetlands; sewerage ponds, irrigation areas, larger dams, etc.<br><i>Dispersive; cosmopolitan.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ✓                               | x                       | No significant impact expected |
| Cattle Egret<br>( <i>Ardea ibis</i> )            | Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains. <i>Breeds in summer in warmer parts of range including NSW.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ✓                               | x                       | No significant impact expected |
| Yellow Wagtail<br>( <i>Motacilla flava</i> )     | The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ✓                               | x                       | No significant impact expected |
| Painted Snipe<br>( <i>Rostratula australis</i> ) | Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum or canegrass or sometimes tea-tree. The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber. Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands, provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover. Has also been recorded nesting in and near swamps, canegrass swamps, flooded areas including samphire, grazing land, among cumbungi, sedges, grasses, salt water couch ( <i>Paspalum</i> ), saltbush ( <i>Halosarcia</i> ) and grass, also in ground cover of water-buttons and grasses, at the base of tussocks and under low saltbush. | x                               | x                       | No significant impact expected |

# Appendix 3

## Significance of Impact Test

Section 7.2 of the *BC Act* requires a determination as to whether a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Henceforth this is referred to as the ‘Significance of Impact Test’.

For the purposes of this part, development or an activity is likely to significantly affect threatened species if:

- (a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in Section 7.3, or
- (b) the development exceeds the threshold if the BOS applies to the impacts of the development on biodiversity values, or
- (c) it is carried out in a declared area of outstanding biodiversity value.

Section 7.3 of the *BC Act* provides the terms of the test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats.

The following significance of impact test relies on the biodiversity assessment provided in this report and should be read making reference to the relevant discussion on each threatened species or their habitats, endangered population and ecological community.

Flora investigations and fauna habitat assessments of the study area have resulted in the identification of suitable habitat for the following threatened species and populations with varying potential to occur. Species recorded or with a considered potential to occur have been noted. The potential for any direct or indirect impacts on these species has also been considered and noted.

### ***Threatened flora***

| Scientific name                                      | BC Act | Potential to occur | Potential impact                           |
|------------------------------------------------------|--------|--------------------|--------------------------------------------|
| <i>Persoonia hirsuta</i>                             | E      | ✓                  | Removal of 0.45ha of potential habitat     |
| <i>Tetradlea glandulosa</i>                          | V      | ✓                  | Removal of 0.45ha of potential habitat     |
| <i>Acacia bynoeana</i>                               | E      | low                | Removal of 0.45ha of low potential habitat |
| <i>Epacris purpurascens</i> var. <i>purpurascens</i> | V      | unlikely           | Removal of 0.45ha of potential habitat     |
| <i>Pimelea curviflora</i> var. <i>curviflora</i> .   | V      | low                | Removal of 0.45ha of potential habitat     |
| <i>Eucalyptus camfieldii</i>                         | V      | low                | Removal of 0.45ha of potential habitat     |

### ***Threatened ecological communities***

Nil

### ***Threatened fauna***

| Common name           | BC Act | Potential to occur | Potential impact                                    |
|-----------------------|--------|--------------------|-----------------------------------------------------|
| Glossy Black-Cockatoo | V      | recorded           | Direct – on a potential foraging and roosting trees |

| Common name                    | BC Act | Potential to occur | Potential impact                                             |
|--------------------------------|--------|--------------------|--------------------------------------------------------------|
| Powerful Owl                   | V      | recorded           | Direct – on potential roosting and prey species habitat only |
| Grey-headed Flying-fox         | V      | recorded           | Direct – on suitable foraging habitat only                   |
| Eastern Bentwing-bat           | V      | recorded           | Direct – potential foraging habitat                          |
| Rosenberg's Goanna             | V      | possible           | Direct – low potential foraging and burrowing habitat        |
| Little Lorikeet                | V      | possible           | Direct – potential foraging habitat                          |
| Swift Parrot                   | E      | possible           | Direct – potential foraging habitat                          |
| Barking Owl                    | V      | possible           | Direct – potential foraging habitat                          |
| Varied Sittella                | V      | possible           | Direct – potential foraging habitat                          |
| Scarlet Robin                  | V      | possible           | Direct – potential foraging habitat                          |
| Spotted-tailed Quoll           | V      | possible           | Direct – potential foraging habitat                          |
| Southern Brown Bandicoot       | E      | possible           | Direct – potential foraging habitat                          |
| Eastern Pygmy Possum           | V      | possible           | Direct – potential foraging habitat                          |
| East-coast Freetail Bat        | V      | possible           | Direct – low potential foraging and roosting habitat         |
| Little Bentwing-bat            | V      | possible           | Direct – potential foraging habitat                          |
| Greater Broad-nosed Bat        | V      | possible           | Direct – low potential foraging and roosting habitat         |
| Red-crowned Toadlet            | V      | possible           | None anticipated                                             |
| Little Eagle                   | V      | low                | Direct – low potential foraging habitat                      |
| Gang-gang Cockatoo             | V      | low                | Direct – low potential foraging habitat                      |
| Turquoise Parrot               | V      | low                | Direct – low potential foraging habitat                      |
| Masked Owl                     | V      | low                | Direct – low potential foraging habitat                      |
| Yellow-bellied Sheath-tail-bat | V      | low                | Direct – low potential foraging habitat                      |
| Large-footed Myotis            | V      | low                | Direct – low potential foraging and roosting habitat         |
| New Holland Mouse              | -      | low                | Direct – low potential foraging                              |
| Regent Honeyeater              | CE     | unlikely           | Direct – unlikely potential foraging habitat                 |
| Eastern Falsistrelle           | V      | unlikely           | Direct – unlikely potential foraging and roosting            |
| Dusky Woodswallow              | V      | unlikely           | Direct – unlikely potential foraging habitat                 |

### ***Endangered populations***

- None for flora
- None for fauna

### **BC ACT 2016 - SECTION 7.3 – SIGNIFICANCE OF IMPACT TEST**

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

- a) *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,***

The direct and indirect impacts of the proposal are considered within Section 6.

Despite the presence of potential habitat or the recording of presence during surveys, it is considered that the proposal is unlikely to disrupt the life cycle for any of these listed species such that a viable local population would be placed at risk of extinction. The proposal will have limited impacts upon the remnant vegetation within the study area. The remnant vegetation has existed insitu with rural residential, horses and recreational pursuits for many decades, and there is currently no management of vegetation or drainage.

### **Summary of threatened species recorded within or immediately adjacent to the subject site**

No threatened flora species of state significance were recorded within the study area during all surveys undertaken.

#### **Powerful Owl (*Ninox strenua*)**

*Behavioral background* - The Powerful Owl inhabits mature rainforest and wet and dry eucalypt forest. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal mammals. Roosting is generally within dense foliage of mid-canopy trees in sheltered gullies. Large trees with hollows at least 45cm in diameter and 100cm deep are required for nesting. Mated pairs of Powerful Owl roost together or separately, maintaining several roost sites throughout their territory, which are used in rotation (*Lindsey 1992*), shifting with the availability of prey. A pair is generally faithful to a traditional nesting hollow. Powerful Owls form pairs for life, and are strongly territorial. Estimates of the home range of this species vary greatly, but territories are thought to range from 800 to 1500ha (*Kavanagh 1997*).

*Recordings* - A Powerful Owl was recorded responding to call-playback on 7 April 2010. An individual was spotlighted approximately half an hour after the Powerful Owl call was broadcast on this occasion. The individual was perched in a tree less than 15m from the call-playback station located in the north-eastern corner of the allotment. When observed by spotlight, this individual flew east and perched within the neighbouring lands on the other side of Oxford Falls Road. It then flew in approximately the same distance south where it perched and called for an extended period (see Figure 3). It was heard at times from around this same location whilst undertaking spotlighting activities within the study area.

Owl whitewash was also observed during survey at three locations within the Peppermint-Angophora Woodland / Open Forest. One location was observed within the eastern portions next to Oxford Falls Road. Two other locations were observed in the narrow vegetated strip adjacent to the large dam in the southern portions of the subject site (see Figure 1 for approximate locations).

The whitewash observed was considered consistent with *Ninox* owl species as two were located below dense foliage perches. Owl whitewash, as described by owl expert John Young, is typically scattered droppings of thicker and whiter lime content located below suitable roosting perches depending on the species. The whitewash is considered most likely to belong to Powerful Owl.

*Site Specific Habitat* - It is considered that the subject site provides suitable roosting and foraging and habitat for the Powerful Owl. There are no suitable nesting hollows within the subject site. Suitable nesting hollows located within the study area were targeted during the 2010 breeding season with no use of these hollows recorded.

Roosting habitat is best represented within PCT1250, particularly the larger eastern portions located along Oxford Falls Road. Suitable roosting habitat is typified by dense areas of mid-storey foliage where individuals may perch out of open view during diurnal periods.

Foraging habitat is evident within the subject site by an obvious large presence of prey species and their habitat, particularly the favored Common Ringtail Possum (*Pseudocheirus peregrinus*) and Grey-headed Flying-fox (*Pteropus poliocephalus*).

The removal of habitat for APZ will impact on suitable roosting and prey species habitat. This is particularly given that two roosting locations were recorded within the greater study area. Both roosting and prey species habitat will be reduced or eliminated within the APZ area. The provision to revegetate a cross site corridor will not provide any short or medium term replacement habitat.

Due to the species tendency to have numerous roosting sites within seasonal foraging home ranges, the removal of such roosts within the narrow southern strip is not considered to be significant. As no nesting locations will be impacted or are nearby and prey species habitat is otherwise well represented in the locality it is unlikely that the proposal will result in a significant impact on a local population of this species. Furthermore, higher quality roosting habitat is represented elsewhere in the local surrounds; the recorded roosting locations may also have been the result of response to call-playback.

The *Recovery Plan for the Large Forest Owls* (DEC 2006) states that forest clearing and fragmentation is recognised as the greatest ongoing threat to the three (3) large forest owls in NSW. The recovery plan also states that the Powerful Owl, in particular, displays considerable resilience to low level habitat disturbance through its continuing and successful occupancy of bushland among the outer suburbs of major Australian cities.

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

*Behavioral background* - The Grey-headed Flying-fox roosts in camps, which may contain tens of thousands of individuals. Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy (Tidemann et. al., 2008). Camps can be found in riparian rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas.

Grey-headed Flying-foxes are canopy-feeding frugivores and nectarivores, inhabiting a wide range of habitats including rainforests, open forests, woodlands, Melaleuca swamps, Banksia woodlands and cultivated areas during night foraging forays. Foraging is generally within 20km of camps.

*Site Specific* - The subject site provides only suitable foraging habitat for the Grey-headed Flying-fox. There are no known camps located within or in proximity to the subject site.

On the night of 12 January 2004 at 20:35, four (4) Grey-headed Flying-foxes were spotlighted foraging within trees located next to the existing house within the subject site. One (1) individual of this species was again recorded foraging within this community during surveys undertaken on 29 March 2010. This individual was foraging on a bottlebrush tree located within the landscaped gardens surrounding the house near to the previous observations (see Figure 3 for locations). On this same night two (2) other individuals were observed in flight over the subject site generally heading in a north easterly direction.

It is considered that flowering trees throughout PCT 1250 provide suitable foraging habitat for this species. Given the extent of suitable foraging habitat within the proposed conservation areas and throughout the local area, it is considered that the removal of

suitable foraging trees within the development area will not significantly impact on this species. Future landscaping and restoration of habitat within the subject site will sufficiently supplement the short-term loss of habitat.

It is recommended that bottlebrush trees surrounding the existing house within the subject site are retained where possible or otherwise replaced as part of future landscaping.

### **Eastern Bentwing-bat (*Miniopterus orianae oceanensis*)**

*Behavioural background* - The Eastern Bentwing-bat forages above and below the canopy within open forests and woodlands, feeding on small flying insects, predominantly moths (Dwyer 1995). The Eastern Bentwing-bat is known to roost in a range of habitats including stormwater channels, under bridges, occasionally in buildings, old mines and, in particular, caves (Dwyer 1995). Caves are an important resource for this species, particularly for breeding, where maternity caves must have suitable temperature, humidity and physical dimensions to permit breeding (Dwyer 1995). Roost sites in tree hollows have not been reported for this species within the literature reviewed.

*Site Specific* - The study area provides suitable foraging habitat for the Eastern Bentwing-bat. Roosting habitat is not likely but should not be ruled out based on the presence of old buildings. No suitable caves, bridges or culverts were observed during survey. The study area does not offer any breeding habitat.

The Eastern Bentwing-bat was recorded during each of the three 2010 nocturnal surveys undertaken on 23 March and 6 and 7 April. Recordings were made from all four (4) *Anabat* station locations (see Figure 3 for locations). This suggests that the study area is utilised for foraging throughout, however it should be noted that all *Anabat* stations were placed on the fringes of forest, tall landscaped vegetation or next to waterbodies where foraging is more likely concentrated by this particular species.

As no breeding or roosting habitats will be impacted by the proposal, and foraging habitat will remain consistent in the locality, there will be no likely significant impact on the local population of this species.

### **Glossy Black-Cockatoo (*Calyptorhynchus lathami*)**

*Behavioral background* - The Glossy Black-Cockatoo inhabits mountain forests, coastal woodland, open forest and trees bordering watercourses where there are substantial stands of *Allocasuarina*. They choose trees with larger cone crops but show no sign of selecting trees on the basis of cone size, concentrating foraging in trees with a high ratio of total seed weight to cone weight (Clout 1989). They breed in hollow trees or stumps, usually in eucalypts.

*Site specific* - It is considered that the subject site provides suitable foraging and roosting habitat for the Glossy Black-Cockatoo. There is no suitable nesting habitat present within the subject site or outer APZ areas.

A trio of Glossy Black-Cockatoos was heard and then observed late in the day on 30 March 2010, landing to perch in trees located up the slope of neighbouring native vegetation, approximately 60m to the east of the subject site (see Figure 3 for location). It appeared that this trio had flown from the south and had likely flown over the subject site.

Target searches were undertaken below mature and seeding *Allocasuarina* trees found within the study area during 2010 surveys with no evidence of foraging found. In general *Allocasuarina* trees occur in low densities within the study area with high densities of mature

seeding specimens occurring almost immediately on the other side of Oxford Falls Road and extending into natural bushlands to the east.

Given that the subject site has not recorded any foraging activity and nesting habitat is not present it is considered that the proposed development will not result in any significant impacts on this species.

***Summary of other threatened species requiring target survey by the DGR's (DoP 2006) and / or DECC (2009)***

**Giant Burrowing Frog (*Heleioporus australiacus*)**

*Behavioral background* - This species is most common on the Hawkesbury Sandstone in the Sydney region. It occurs south to Victoria (Barker .et. al. 1995). Males call from beside smaller semi-permanent to permanent streams or dams or from burrows within the bank of streams or dams. (Anstis M., 2002). They call mainly in spring and late autumn, but also after rain in late summer. Foamy egg mass is laid in a burrow such as an old crayfish hole in a stream bank, or concealed under dense vegetation. (Anstis M., 2002).

*Site specific* - It is considered that the subject site does not provide suitable habitat for this species.

**Barking Owl (*Ninox connivens*)**

*Behavioral background* - The Barking Owl utilises dry sclerophyll forests and woodlands of tropical, temperate and semi-arid zones, often dominated by eucalyptus, and containing many large trees suitable for roosting or breeding. This species is both carnivorous and insectivorous, taking mainly insects outside breeding season and more birds and mammals when breeding (Higgins, P.J. 1999). The Barking Owl utilises eucalypt forests and woodlands and adjacent cleared areas for foraging and large hollows for nesting and breeding (Schodde & Tiedemann 1986).

*Site specific* - Targeted surveys for this species were undertaken during surveys. Call playback stations and hollow bearing tree locations are shown on Figure 3.

Given the hollow characteristic utilised as described by the Barking Owl Recovery Plan (NPWS 2003), it is considered that hollow bearing trees provide suitable nesting habitat outside the study area.

Due to this species tendency to have numerous roosting sites within seasonal foraging home ranges, the removal of potential roosting habitat within the subject site is not considered to be significant. As no nesting locations will be impacted and prey species habitat is otherwise well represented in the locality it is unlikely that the proposal will result in a significant impact on a local population of this species.

**Koala (*Phascolarctos cinereus*)**

*Behavioral background* - Koalas are recognised to occupy both forest and woodland communities, provided that the suitable eucalypt tree species are present. Koalas inhabit both wet and dry eucalypt forest that contains a canopy cover of between 10% and 70% as well as suitable feed trees (Reed et. al. 1990). The home range of Koalas varies according to the quality of habitat and number of available food trees, more so than food tree density. Studies in Port Stephens have recorded home range sizes between 0.2-500ha, with an average of 80-90ha, considering also that males tend to occupy larger areas.

*Site specific* - Targeted surveys for this species were undertaken during surveys. Call playback stations are shown on Figure 3. A habitat assessment for this species according to the definitions of *SEPP 44 - Koala Habitat Protection* is provided within this section of the document. Under *SEPP 44* the subject site is not considered to provide PKH.

Further to this one (1) primary food tree species (*Eucalyptus robusta*) and one (1) secondary food tree species (*Eucalyptus punctata*), as listed in Appendix 1 of the Recovery Plan for the Koala (*Phascolarctos cinereus*), were recorded within the study area. Koalas show a higher level of use for primary tree species. If these are absent, secondary tree species may support Koala habitat at a lower carrying capacity. *E. robusta* occurs as a single recorded specimen and *E. punctata* occurs in low densities.

Therefore the subject site does not likely offer suitable habitat that may be utilised as part of existing home ranges. The study area also has low potential to offer transient habitat to individuals in dispersal based on nearby records and surrounding habitats and roads. Therefore the proposal is not likely to significantly impact on a local population of Koalas. .

### **Spotted-tailed Quoll (*Dasyurus maculatus*)**

*Behavioral background* - The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry open forests and rainforests containing rock caves, hollow logs or trees for shelter / breeding. It appears to prefer moist forest types and riparian habitat. It has been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in inland riparian areas, it also ranges over dry ridges (NPWS 1999).

Female home ranges are generally non-overlapping and 88-1,515ha in size. Male home ranges are much larger, from 359-5,512ha in size, and overlap and encompass multiple female home ranges. The species is capable of covering large distances in a short period of time, with animals recorded at moving at least 8km in a day and 19km in a week (Long & Nelson 2010). Habitat that is critical to the survival of the Spotted-tailed Quoll includes large patches of forest with adequate denning resources and relatively high densities of medium sized mammalian prey.

*Site specific* - This species was not recorded during surveys incorporation targeted hair tubes.

The areas of forest removed or modified as part of the proposal are not considered highly suitable for the species due to the narrow or disturbed nature of these portions. This is considered also due to an absence of shelter in the form of hollows or caves within this portion. Use of the western corridor is considered unlikely in respect of this species being known to require large areas of relatively intact vegetation in which to forage (NPWS, 1999). The site is also surrounded by local roads. Whilst there is some potential for the species to utilise the habitat present, this habitat is not likely central to local activity, particularly given the social organisation between individuals. Therefore, the proposal is not likely to significantly impact on a local population of this species.

### **Rosenberg's Goanna (*Varanus rosenbergi*)**

*Behavioral background* - On the east coast of NSW the Rosenberg's Goanna (also known as Heath Monitor) is a Hawkesbury / Narrabeen sandstone outcrop specialist (State Forests of NSW, 1995). The Rosenberg's Goanna is largely restricted to heath (NPWS 1997); inhabiting humid woodlands, dry hardwood forests and heathland where it shelters in self-dug burrows, hollow logs, rock crevices and sandstone outcrops (Cogger 1992), usually with a sandy substrate (State Forests of NSW, 1997). The Rosenberg's Goanna shelters in self-

dug burrows, hollow logs, rock crevices and sandstone outcrops (Cogger 1992). Eggs are laid within a terrestrial termite mound.

*Site specific* - Targeted surveys for this species were undertaken during 2010 surveys. Locations of funnel trap transects are shown on Figure 3. This species was not conclusively recorded during survey; however a large dark lizard was very briefly observed scurrying away when disturbed at the location of the far southern cage trap. A clear observation was not possible, however it was considered more likely of monitor lizard rather than dragon lizard size.

It is considered that the subject site provides suitable foraging and burrowing habitat for the Rosenberg's Goanna, particularly along the rocky outcroppings contained along the western remnants. Suitability is not ideal due to the narrow linear remnants and fragmented connectivity to those that do exist, however the species has potential to occur based on the incidence of local records and anecdotal evidence of local activity.

The *Atlas of NSW Wildlife* also provides records of this species within the nearby locality, predominantly on the other side of Oxford Falls Road in habitats extending north. An aerial assessment of the locality also shows that high quality areas of heath and neighbouring forest habitats occur to the east within and surrounding Red Hill Park reserve and extensive areas extending north into and beyond Cromer Heights. Approximately 18ha of heath and heath associated habitat exists to the immediate north of the subject site. This area extends for a smaller distance as connective forest as well as extended habitat on the other side of Wakehurst Parkway.

A local population of Rosenberg's Goanna, although more likely centered on nearby higher quality habitat, may actively utilise the eastern or western vegetated fringes of the subject site on occasion or in dispersal.

No terrestrial termite mounds, which are considered the most suitable for nesting habitat, were observed within the study area. Terrestrial termite mounds were observed beyond the study area boundary towards the end of the hair tube transect which extended into neighbouring lands to the north-west.

Funnel trapping survey targeted the presence of this species within what was considered the most suitable areas of habitat for the species within the subject site. No Rosenberg's Goannas were captured or observed opportunistically during survey meanders within all vegetated areas present.

Given the suitability of habitat present, the higher quality habitat in the local area surrounds where records are known, it is considered that the proposal will not likely significantly impact on the local population of this species.

### **Southern Brown Bandicoot (*Isoodon obesulus*)**

*Behavioral background* - The Southern Brown Bandicoot has been detected in a range of habitats, including open forest, woodland, heaths, agricultural land and urban areas, preferring areas with thick ground cover which provide protection from predators (Braithwaite, 1988). *Environment Australia* (2000) recorded this species from a range of habitat types, though it was more typically found in heathland environments on sandy friable soils. When located in forests and woodlands, there is generally a heathy or shrubby understorey characterised by *Acacia*, *Banksia*, *Daviesia*, *Epacris*, *Hakea*, *Leptospermum*, *Melaleuca* and *Platylobium* species.

Distribution is patchy along the NSW coast and foothills with current information suggesting only two population strongholds, one in the far south-eastern corner and the other within the Northern Sydney Metropolitan Area. Research undertaken by *Macquarie University* indicates that the sub-populations within Ku-ring-gai and Garigal National Parks may have been genetically different (DEC 2006). Additionally, this species is found to display a preference for newly regenerating natural heathland habitat following fire or clearing (*Menkhorst & Seebeck 1990; Braithwaite and Gullan 1978; Stoddart and Braithwaite 1979; Opie 1980*).

*Site specific* - Cage trapping for this species was undertaken for four (4) nights in January 2004, ten (10) nights in April 2010, as well as supplementary hair tube survey for seven (7) nights between March and April 2010. The 2010 surveys also used truffle oil as an additional attractant known for its increased success rate at recording this species. Despite the presence of suitable habitat this species has not been detected following these extensive targeted surveys within the subject site and nearby. Targeted surveys for this species are described in Section 4.1 and Table 2. Locations of target method funnel trap transects are shown on Figure 3.

It is considered that suitable habitat for this species is present in select locations within the western vegetated portions of the study area. Suitability is not considered ideal due to a lack of extensive heath and dense native scrub type habitats and the fragmented connectivity between those areas that do exist. Bandicoot activity was observed during survey, however the more common Long-nosed Bandicoot (*Perameles nasuta*), more noted for its presence near disturbed areas and the urban interface, was recorded in these locations.

Based on the species absence during targeted survey it is considered that the proposal is not likely to significantly impact on a local population of this species. The proposed east-west corridor along the northern site boundary will restore potential for this and other terrestrial species to disperse in the locality as east-west connectivity is currently highly fragmented within the study area.

### **Red-crowned Toadlet (*Pseudophryne australis*)**

*Behavioral background* - Red-crowned Toadlets use small ephemeral drainage lines, which feed water from the top of ridges to perennial creeks below. This species is totally confined to the Hawkesbury sandstone formation and is not usually found in the vicinity of permanent water (*Ehmann, 1997*). Breeding habitat is small puddles or depressions where rock or leaf litter holds back water temporarily (*Ehmann, 1997; State Forests Threatened Species Protocol, 1997*). Breeding congregations can occur deep in grass and debris beside such non-perennial creeks, gutters etc. They have also been noted to be very partial to damp shelves and cracks in sandstone where they have been observed emerging at dusk (NPWS 1997). At other times, individuals disperse and are found under rocks, logs etc. on sandstone ridges (*Cogger, H.G. 2000*).

*Site specific* - Target searches were undertaken for this species within the study area as part of the 2004 as well as 2010 surveys. Search areas of 2010 surveys are provided in Figure 3, with methods described in Section 4.1 and effort summarised in Table 2. Searches were undertaken during good conditions following or during rainfall.

The 2010 searches were undertaken along portions of all drainages within the broader study area considered to provide habitat. This included one drainage within the study area as well as other drainages to the north and south.

It is considered that the proposal is not likely to significantly impact on a local population of this species based on the species absence during targeted surveys.

**b) *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:***

***i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***

No state listed threatened ecological communities (TECs) have been identified within the subject site or the wider study area.

It is therefore considered that the proposed development is unlikely to have an adverse effect on the extent of any threatened ecological community such that its local occurrence is likely to be placed at risk of extinction.

***ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,***

No State listed threatened ecological communities (TECs) have been identified within the subject site or the wider study area. There has been no previous mapping to suggest the vegetation on site is commensurate with Duffys Forest or any of the riparian / floodplain TECs. Species such as Casuarinas, Melaleucas and the lone Swamp Mahogany tree would often form a riparian / floodplain TEC, however, most of these trees have been planted outside of their natural habitat.

It is unlikely that the proposed development will adversely modify the composition of any threatened ecological community such that its local occurrence is likely to be placed at risk of extinction.

**c) *In relation to the habitat of threatened species or ecological community:***

It is considered that the habitat attributes of the subject site provide known or potential habitat for *Acacia bynoeana*, *Epacris purpurascens* var. *purpurascens*, *Eucalyptus camfieldii*, *Persoonia hirsuta*, *Pimelea curviflora* var. *curviflora*, *Tetratheca glandulosa*, red-crowned Toadlet, Rosenberg's Goanna, Little Eagle, Glossy Black-cockatoo, Gang-gang Cockatoo, Little Lorikeet, Swift Parrot, Turquoise Parrot, Barking Owl, Powerful Owl, Masked Owl, Regent Honeyeater, Varied Sittella, Dusky Woodswallow, Scarlet Robin, Spotted-tailed Quoll, Southern Brown Bandicoot, Eastern Pygmy Possum, Grey-headed Flying-fox, Yellow-bellied Sheath-tail-bat, East-coast Freetail Bat, Eastern Falsistrelle, Little Bentwing-bat, Eastern Bentwing-bat, Large-footed Myotis and Greater Broad-nosed Bat.

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

The subject site inclusive of surrounding proposed APZs comprises approximately 3.36ha of natural open forest / woodland vegetation which is moderately to highly disturbed. The proposed development is likely to remove or modify approximately 0.45ha of such habitat for the aforementioned species.

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

The subject site is covered by a mixture of natural and disturbed bushland and cleared areas. The areas of natural vegetation are narrow or patch remnants surrounded by urban or

rural residential landscapes and bound by the busy Wakehurst Parkway to the west and Oxford Falls Road to the east. These remnant patches are subsequently already fragmented within the local natural landscape with no high quality direct connectivity to expansive areas of similar forest/woodland habitat in the locality. The proposal will not further fragment the patches from contiguous surrounding habitat but will further fragment the patches from each other internally.

Therefore, it is considered that known habitat for a threatened species, population or ecological community within the local area and region is unlikely to become isolated or fragmented as a result of the proposal.

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

The proposal will not impact on any recorded TECs or threatened flora. The existing habitat is in relatively poor condition and is not of significant importance to recorded threatened fauna species and not likely central to the habitat requirements of species with potential to occur.

Therefore, the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population and ecological communities in the locality is considered to be minimal.

**d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),**

The subject site is not within any declared area of outstanding biodiversity value or areas identified as critical habitat. Therefore the proposal will not have any adverse effects on any declared area of outstanding biodiversity value (either directly or indirectly).

**e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**

A key threatening process is defined as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

The current list of key threatening processes, and whether the proposed activity is recognised as a threatening process, is shown below.

| Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process) | Is the development or activity proposed of a class of development or activity that is recognised as a threatening process? |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------|----------|
|                                                                                                                                      | Likely                                                                                                                     | Possible | Unlikely |
| Aggressive exclusion of birds by Noisy Miners ( <i>Manorina melanoccephala</i> )                                                     |                                                                                                                            | ✓        |          |
| Alteration of habitat following subsidence due to longwall mining                                                                    |                                                                                                                            |          | ✓        |
| Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands                                      |                                                                                                                            |          | ✓        |
| Anthropogenic Climate Change                                                                                                         |                                                                                                                            | ✓        |          |

| Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process)           | Is the development or activity proposed of a class of development or activity that is recognised as a threatening process? |          |          |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------|----------|
|                                                                                                                                                | Likely                                                                                                                     | Possible | Unlikely |
| Bushrock removal                                                                                                                               |                                                                                                                            | ✓        |          |
| Clearing of native vegetation                                                                                                                  | ✓                                                                                                                          |          |          |
| Competition and habitat degradation by feral goats                                                                                             |                                                                                                                            |          | ✓        |
| Competition and grazing by the feral European Rabbit ( <i>Oryctolagus cuniculus</i> )                                                          |                                                                                                                            |          | ✓        |
| Competition from feral honeybees                                                                                                               |                                                                                                                            |          | ✓        |
| Death or injury to marine species following capture in shark control programs on ocean beaches                                                 |                                                                                                                            |          | ✓        |
| Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments                                                     |                                                                                                                            |          | ✓        |
| Forest Eucalypt dieback associated with over-abundant psyllids and bell miners                                                                 |                                                                                                                            |          | ✓        |
| High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition |                                                                                                                            |          | ✓        |
| Herbivory and environmental degradation caused by feral deer                                                                                   |                                                                                                                            |          | ✓        |
| Importation of red imported fire ants into NSW                                                                                                 |                                                                                                                            |          | ✓        |
| Infection by <i>Psittacine circoviral</i> (beak and feather) disease affecting endangered psittacine species and populations                   |                                                                                                                            |          | ✓        |
| Infection of frogs by amphibian chytrid causing the disease chytridiomycosis                                                                   |                                                                                                                            |          | ✓        |
| Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae                      |                                                                                                                            | ✓        |          |
| Infection of native plants by <i>Phytophthora cinnamomi</i>                                                                                    |                                                                                                                            | ✓        |          |
| Introduction of the large earth bumblebee ( <i>Bombus terrestris</i> )                                                                         |                                                                                                                            |          | ✓        |
| Invasion and establishment of exotic vines and scramblers                                                                                      |                                                                                                                            | ✓        |          |
| Invasion and establishment of Scotch Broom ( <i>Cytisus scoparius</i> )                                                                        |                                                                                                                            |          | ✓        |
| Invasion and establishment of the Cane Toad ( <i>Bufo marinus</i> )                                                                            |                                                                                                                            |          | ✓        |
| Invasion, establishment and spread of <i>Lantana camara</i>                                                                                    |                                                                                                                            | ✓        |          |
| Invasion of native plant communities by bitou bush & boneseed <i>Chrysanthemoides monilifera</i>                                               |                                                                                                                            |          | ✓        |
| Invasion of native plant communities by exotic perennial grasses                                                                               |                                                                                                                            |          | ✓        |
| Invasion of native plant communities by African Olive ( <i>Olea europaea</i> subsp. <i>cuspidata</i> )                                         |                                                                                                                            |          | ✓        |
| Invasion of the Yellow Crazy Ant ( <i>Anoplolepis gracilipes</i> )                                                                             |                                                                                                                            |          | ✓        |
| Loss of Hollow-bearing trees                                                                                                                   |                                                                                                                            |          | ✓        |
| Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants                         |                                                                                                                            | ✓        |          |

| Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process) | Is the development or activity proposed of a class of development or activity that is recognised as a threatening process? |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------|----------|
|                                                                                                                                      | Likely                                                                                                                     | Possible | Unlikely |
| Loss and/or degradation of sites used for hill-topping by butterflies                                                                |                                                                                                                            |          | ✓        |
| Predation and hybridisation by feral dogs ( <i>Canis lupus familiaris</i> )                                                          |                                                                                                                            |          | ✓        |
| Predation by the European Red Fox ( <i>Vulpes vulpes</i> )                                                                           |                                                                                                                            |          | ✓        |
| Predation by the Feral Cat ( <i>Felis catus</i> )                                                                                    |                                                                                                                            |          | ✓        |
| Predation by <i>Gambusia holbrooki</i> Girard, 1859 (plague minnow or mosquito fish)                                                 |                                                                                                                            |          | ✓        |
| Predation by the Ship Rat ( <i>Rattus rattus</i> ) on Lord Howe Island                                                               |                                                                                                                            |          | ✓        |
| Predation, habitat degradation, competition & disease transmission from Feral pigs ( <i>Sus scrofa</i> )                             |                                                                                                                            |          | ✓        |
| Removal of dead wood and dead trees                                                                                                  |                                                                                                                            | ✓        |          |

The above key threatening processes have been considered in reference to the proposal. It was considered that the proposal may contribute to a small degree to a number these processes as described below. It was not considered that the proposal will have a large or significant impact on any of the following key threatening processes. Some mitigation measures have been listed under each process to minimise or reduce such impacts upon those processes.

### Summary of “likely” or “possible” Key Threatening Processes

This section identifies what mitigation measures can be implemented to address threatening processes.

#### *Aggressive exclusion of birds by Noisy Miners (*Manorina melanoccephala*)*

Noisy Miners have been recorded present within the study area. It is likely that Noisy Miners from within the study area may be slightly displaced as a result of habitat removal for the development, resulting in increased impacts from this species on other native birds in the nearby surrounds. Given the high degree of disturbance in the local surrounds it is expected that the Noisy Miner is already at impacting numbers in these areas.

#### *Human-caused Climate Change*

The proposal will require the removal of a small amount of vegetation which will result in a negative or positive contribution to climate change. Vegetation is considered to act as a sink for a range of greenhouse gases but in particular Carbon Dioxide. The maintenance of native vegetation cover is a key strategy to combat the contributing impacts of the proposed action on Climate Change. Increased risk of bushfire, flooding and storms are to be considered as part of the proposed action. This issue requires total systems management including consideration of energy use throughout the lifecycle of the proposed action including all aspects of the actions processes, materials supply and production. Whilst almost insignificant in size, the proposal is part of the accumulative effect and thus should be considered as contributing to this threatening process.

### *Bushrock removal*

The proposal may remove naturally occurring sandstone bushrock but it is more likely that this rock will be retained as part of on-site landscaping. There will be reduced potential for threatened species to use this bushrock given the management of surrounding vegetation required for APZs and landscaping. For threatened species considered, the Rosenberg's Goanna and to a lesser extent the Red-crowned Toadlet may utilise this rock type habitat and therefore it is recommended to provide some degree of native vegetation landscaping along the rocky habitats to the north of the house. This may permit ongoing north-south passage of goannas.

It is also recommended that any bush rocks requiring removal should be relocated into the proposed corridor. This corridor should contain large sandstone rocks placed together.

### *Clearing of native vegetation*

The proposal is of a class of development recognised as a threatening process. It is generally recommended that all sites should aim to achieve a 'maintain or improve' outcome on the quality and quantity of native vegetation cover through protection and restoration measures. As such, a 24m wide corridor is proposed along the northern boundary which shall link the narrow sandstone and heath area to the riparian vegetation adjacent to Oxford Falls Road. The vegetation management process is to be undertaken in accordance with the conditions of consent and any required vegetation and tree management plans for the proposed development. Offsetting the loss of native vegetation including trees is to be considered as part of the proposed works.

The proposal may require the removal or maintenance of some native vegetation for asset protection purposes. Weed control of existing remnant native vegetation will also improve the longevity of those remnants. The removal of native vegetation on the subject site is not likely to significantly affect the biodiversity of the local area due to the extent of better quality natural vegetation within the local area and the small area of vegetation to be removed.

### *Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae*

Myrtle Rust may be spread via machinery, animals and humans as well as by environmental factors such as wind. The presence of machinery and construction works is likely to slightly increase the potential for spread of this key threatening process. Similar protocols as to *Phytophthora cinnamomi* should be applied.

### *Infection of native plants by *Phytophthora cinnamomi**

The proposal may temporarily increase the risk of fungal infection on site as it may be spread via vehicular movement and relocation of soil and vegetation. Consequently standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres or tracks. Any equipment found to contain soil or vegetation material from offsite is to be cleaned in a quarantined work area or wash station and treated with anti-fungal pesticides prior to commencing work.

### *Invasion and establishment of exotic vines and scramblers*

The subject site currently contains exotic vine and scrambler species such as *Ipomoea indica* (Morning Glory), *Anredera cordifolia* (Madiera Vine) and *Tradescantia fluminensis*

(Wandering Jew). The proposed development will provide an opportunity to remove, control and possibly eradicate these species within the subject site. This will result in a beneficial outcome by reducing the likelihood of this Key Threatening Process (KTP) from impacting on the site.

### *Invasion, establishment and spread of Lantana camara*

The site currently contains this species, however it is expected that the proposed development will provide an opportunity to remove, control and manage this species throughout the whole of the site by the application of a bushland management plan or weed control program.

### *Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants*

Flora survey within the site observed a weed plume along the drainage line associated with the Middle Creek riparian zone located in the north-eastern corner of the allotment. This plume extends along both up and downstream areas of the creek. It is recommended that a Bushland Management Plan (BMP) be produced that specifies the locations, strategies and methods required to control these escaped garden plants and to restore the bushland to a healthy condition.

### *Removal of dead wood and dead trees*

The proposal will require the removal of deadwood and / or dead trees and as such is of a class of development recognised as part of this threatening process. Threatened fauna species with potential habitat within the subject site and likely dependent on dead wood or dead trees include the Scarlet Robin and Varied Sittella. These species have not been recorded to date within the subject site. Given the low amount of deadwood to be removed within the APZ areas, the removal of dead wood is not considered likely to impact on threatened species or the biodiversity of the local area.