



Flora and Fauna Assessment of No 55-65 Bronzewing Street, Tahmoor NSW

(Reference Number: 2018-12-07)



Enviro

Ecology

Po Box 345
Ourimbah, NSW

www.enviroecology.com.au

enviroecology@live.com.au

Mobile: 0402592399

Revision	Details	Date	Amended By
A	Draft Flora & Fauna Assessment	6/08/2018	John Whyte
B	Final Draft	20/08/2018	John Whyte

© Enviro Ecology [2018].

This document may only be used for the purpose for which it was commissioned.

Enviro Ecology accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.

Copyright in the drawings, information and data recorded in this document (the information) is the property of Enviro Ecology. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Enviro Ecology. Enviro Ecology makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

Author:John Whyte

Signed: 

Date: 20th of August 2018

Contents

	Page Number
1. Introduction	3
1.1 Terminology	3
1.2 Legislative context	4
1.3 Site Description	4
1.4 Study objectives	5
2. Methodology.....	3
2.1 Licensing	3
2.2 Nomenclature	3
2.3 Database searches and literature review	3
2.4 Field Survey	4
2.5 Flora Surveys	4
2.5.1 <i>Quadrat surveys</i>	4
2.5.2 <i>Random meander surveys</i>	5
2.5.3 <i>Vegetation condition</i>	5
2.6 Terrestrial fauna	6
2.6.1 <i>Fauna habitats</i>	6
2.6.2 <i>SEPP 44 Koala habitat assessment</i>	6
2.6.3 <i>Fauna survey</i>	7
2.6.4 <i>Diurnal Birds</i>	7
2.6.5 <i>Amphibians</i>	7
2.6.6 <i>Reptiles</i>	7
2.7 Significant Assessments	8
2.8 Limitations	8
3. Results	10
3.1 Vegetation mapping	10
3.2 Vegetation communities	10
3.2.1 <i>Cleared Land with Scattered Trees</i>	10
3.2.1 <i>DSF P146: Sydney Hinterland Transition Woodland (Under-scrubbed/remnant canopy)</i>	11
3.3 Species of plant	14
3.4 Species of animal	14
3.4.1 <i>Amphibians</i>	14
3.4.2 <i>Reptiles</i>	14
3.4.3 <i>Birds</i>	14
3.4.4 <i>Mammals</i>	14
3.4.5 <i>Fauna habitat types</i>	15
3.4.6 <i>Fauna microhabitat features</i>	15
3.4.7 <i>SEPP44 Koala Habitat Assessment</i>	15
3.5 Threatened biodiversity	16
3.5.1 <i>Threatened ecological communities</i>	16
3.5.2 <i>Endangered populations</i>	16
3.5.3 <i>Threatened Flora</i>	17
3.5.4 <i>Threatened fauna</i>	17
3.5.5 <i>Migratory species</i>	17
3.6 Critical habitat	18
4. Impacts	19
4.1 Impacts on threatened species, endangered populations and endangered ecological communities	19
4.2 Key threatening processes	19
4.3 Mitigation measures	20
4.3.1 <i>Fencing of the construction zone</i>	20
4.3.2 <i>Truck and machine wash down areas</i>	20
4.3.3 <i>Animal welfare</i>	20
4.3.4 <i>Nest boxes</i>	20
5. Significance Assessments	21
5.1 Background to the Seven Part Test	21
6. Conclusions	22
7. References.....	23

List of tables

Table 1-1 Site details	4
Table 2-1 Database searches	3
Table 2-2 Suggested survey technique and effort for plant quadrats	4
Table 2-3 Modified Braun-Blanquet scale	5
Table 2-4 Vegetation community condition classes	5
Table 2-5 Fauna Habitat Condition Classes	6
Table 3-1 Endangered Ecological Communities known from the Locality	16
Table 3-2 Migratory Species considered to have suitable habitat within the study area	17
Table 5-1 Summary of significance assessments	21
Table 7-1 Flora species recorded within the study area	27
Table 7-2 Fauna species recorded during flora and fauna survey	32
Table 7-3 Threatened flora species recorded in the locality	35
Table 7-4 Threatened fauna species recorded in the locality	43

List of figures

Figure 1-1 Subject property-study area and subject site	1
Figure 1-2 Proposed Development	2
Figure 2-1 Flora survey locations within the study area	9
Figure 3-1 Field verified vegetation communities from the study area	13

List of photographs

Photograph 3-1 Cleared Land with Scattered Trees recorded from the study area	11
Photograph 3-3 Sydney Hinterland Transition Woodland (Under-scrubbed variant) within the study area	12
Photograph 3-4 Sydney Hinterland Transition Woodland (Remnant Canopy variant) within the study area	12

List of appendices

Appendix A
Species of flora recorded
Appendix B
Species of animal recorded
Appendix C
Threatened flora species recorded in the locality
Appendix D
Threatened fauna species recorded in the locality
Appendix E
TSC Assessments of Significance

1. Introduction

Enviro Ecology has been engaged by Mr Phil of Parkesholdings to carry out a Flora and Fauna Assessment of No 55-65 (Lots 8 & 9 in DP 249821) Bronzewing Street, Tahmoor NSW within the Wollondilly LGA, hereafter referred to as the study area (Figure 1-1).

The proposed development is to subdivide the subject property (Figure 1-1) into 41 residential allotments (Figure 1-2).

This report examines the terrestrial flora assemblages and faunal species and their habitats within the location of proposed development (Figure 1-2). The report then determines the impacts of future dwellings and associated infrastructure upon local biodiversity. It summarises proposed mitigation measures as well as the assessment under the *Environmental Planning and Assessment Act 1979* and under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*.

1.1 Terminology

This report uses the following terminology:

- Study area: 55-65 Bronzewing Street, Tahmoor NSW, the study area is defined as the yellow boundary on the aerial photograph see (Figure 1-1).
- TSC Act abbreviates the *Threatened Species Conservation Act 1995*;
- EPBC Act abbreviates the *Environment Protection and Biodiversity Conservation Act 1999*;
- EP&A Act abbreviates the *Environmental Planning and Assessment Act 1979*;
- OEH abbreviates Office of Environment & Heritage (OEH) formerly the Department of Environment Climate Change and Water (NSW);
- LGA abbreviates Local Government Area;
- Threatened species refers to those flora and fauna species listed as vulnerable, endangered or critically endangered under the TSC Act or EPBC Act
- EEC abbreviates Endangered Ecological Community; and
- WSUD abbreviates Water Sensitive Urban Design.

1.2 Legislative context

From 25 February 2018, in most local government areas, any new application for development consent or modification to an approved development under Part 4 of the Environmental Planning & Assessment (EP&A) Act 1979 (not including State Significant Development) will be subject to the biodiversity assessment requirements under the new *Biodiversity Conservation Act 2016*.

The Minister for the Environment has declared five additional Councils in the Lower Hunter (Cessnock, Newcastle, Port Stephens, Lake Macquarie and Maitland), Central Coast, Coffs Harbour and Wollongong (West Dapto) as Interim Designated Areas. These are in addition to seven Western Sydney local government areas (Camden, City of Campbelltown, City of Fairfield, City of Hawkesbury, City of Liverpool, City of Penrith and **Wollondilly**) previously identified as Interim Designated Areas. In these areas, applications for development consent, or modifications to an approved development, under Part 4 of the EP&A Act, will continue to be assessed under former planning provisions until the 24 November 2018.

All proposals assessed under the *Environmental Planning and Assessment Act 1979* must include an examination of the threatened biodiversity, or their habitats, that are likely to occur within the development area or that may be indirectly affected by the construction and operation of a proposal. In the event that threatened biodiversity is within the vicinity of a proposal, the application must also include an assessment of the potential impact.

Other Commonwealth and State legislation relevant to the protection of flora, fauna and biodiversity within the study area include:

- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
- *Threatened Species Conservation Act 1995*
- State Environmental Planning Policy No 44—Koala Habitat Protection

1.3 Site Description

The planning and cadastral details of the study area are provided in (Table 1-1). The study area is bordered by Manarina Place/residential to the north, west by rural residential, east by residential and to the south by Bronzewing Street (Figure 1-1).

Table 1-1 Site details

Location	No 55-65 (Lots 8 & 9 in DP 249821) Bronzewing Street, Tahmoor NSW
Lot size	4.046ha
LGA	Wollondilly City
Aspect	North-south
Vegetation	Cleared land with Scattered Trees & DSF P146: Sydney Hinterland Transition Woodland

1.4 Study objectives

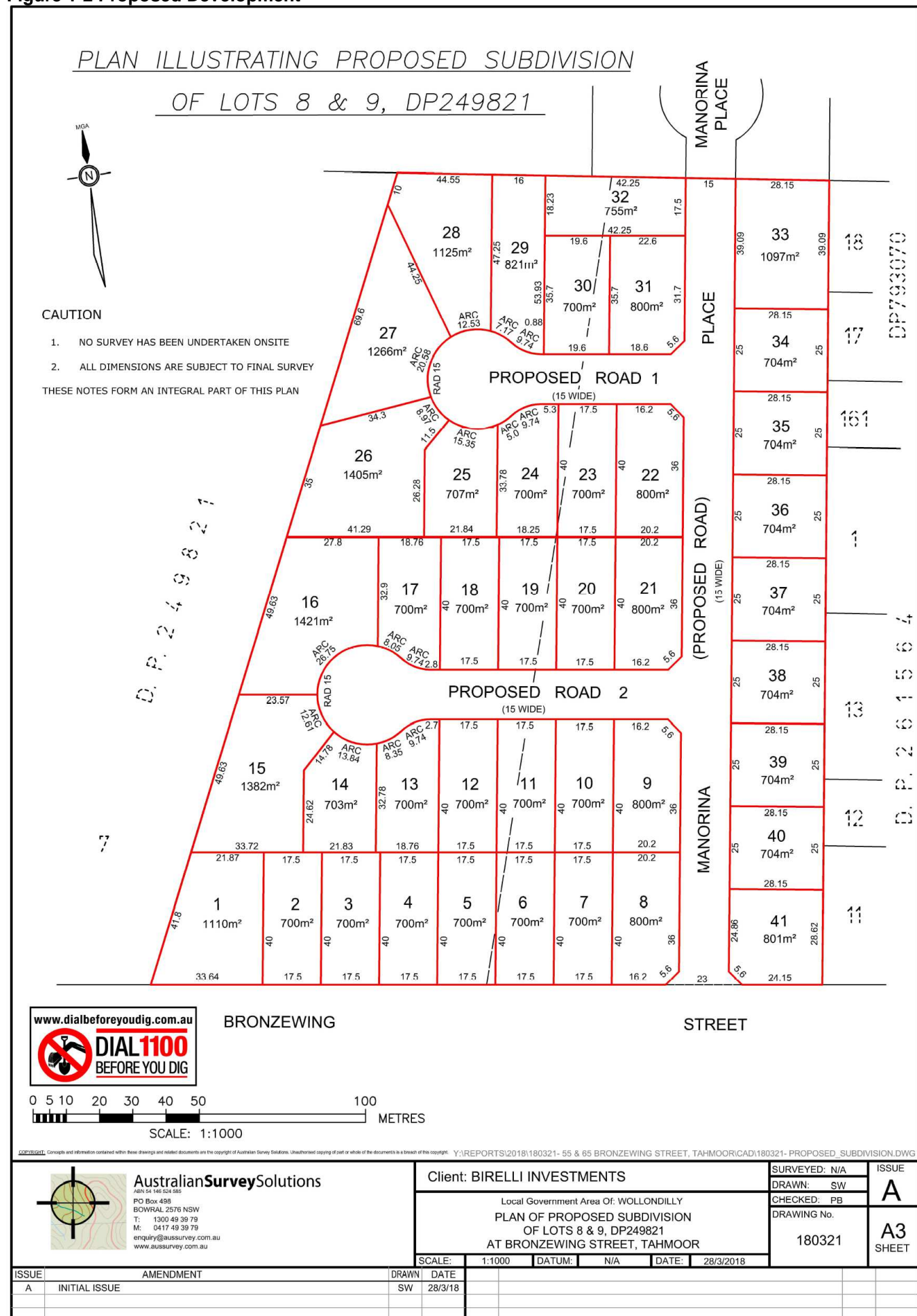
The objectives of this report are to:

- Conduct a fauna survey and habitat assessments to determine the likelihood of occurrence of threatened or Migratory species of animal occurring within the study area.
- Conduct a floral survey to identify any threatened species of plant present or considered likely to occur within the proposal area & determine and describe the characteristics and condition of the vegetation communities and flora.
- Determine the presence, or likelihood of occurrence, of threatened biodiversity listed under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* occurring within the study area.
- Describe and assess likely impacts of the project on biodiversity.
- Undertake significance assessments for threatened biodiversity that occur or have potential habitat within the study area.
- Propose amelioration measures to mitigate or minimise impacts on the ecological values of the study area.

Figure 1-1 Subject property-study area and subject site



Figure 1-2 Proposed Development



2. Methodology

This ecological assessment was based on the results of a desktop review and site inspections on the 24th of June & 12th of July 2018 by Mr John Whyte B.Bio.Sc (Majors Botany & Zoology) & Dr Gilbert Whyte PHD, B.Bio.Sc (Majors Botany & Zoology). This assessment has been prepared to identify potential impacts as a result of the proposed activity upon biodiversity.

2.1 Licensing

All work was carried out under the appropriate licences, including a scientific licence as required under Clause 22 of the National Parks and Wildlife Regulations 2002 and Section 132C of the *National Parks and Wildlife Act 1974*, and an Animal Research Authority issued by the Department of Industries and Investment formerly the Department of Industries & Investment (Agriculture).

2.2 Nomenclature

Names of plants used in this document follow Harden (Harden 1992; Harden 1993; Harden 2000; Harden 2002) with updates from PlantNet (Royal Botanic Gardens 2018). Scientific names are used in this report for species of plant. Scientific and common names of plants are listed in Appendices A and C.

Names of vertebrates follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of Sustainability Environment Water Population and Communities (Department of Sustainability Environment Water Population and Communities 2018). Common names are used in the report for species of animal. Scientific names are included in species lists found in Appendices B and D.

2.3 Database searches and literature review

This assessment included a review of:

- Topographic maps & Aerial photographs
- Vegetation mapping of the area
- A review of *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands. Version 12*, Department of Environment and Climate Change, Hurstville (Tozer, Turner et al. 2016) & Native Vegetation Maps of the Cumberland Plain - Western Sydney (NSW National Parks and Wildlife Service 2008).
- Database searches, as summarised in Table 2-1.

Table 2-1 Database searches

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	12 th of July 2018	Locality (10 km)	(Office of Environment & Heritage 2018)
PlantNet Database	12 th of July 2018	Locality (10 km)	(Royal Botanic Gardens 2018)
Protected Matters Search Tool	12 th of July 2018	Locality (10 km)	(Department of Sustainability, Environment, Water, Population and Communities 2018)

2.4 Field Survey

Inspections of the site were undertaken on the 24th of June & 12th of July 2018. This included:

- Two quadrats & a random meander survey recording all species of plant encountered within the study area (Figure 2-1)
- Searching for specialised fauna habitat resources such as roosting/nesting hollows, foraging resources e.g. feed trees
- Targeted surveys for flora and fauna (Sections 2.5 & 2.6)
- Opportunistic fauna surveys during the flora survey

2.5 Flora Surveys

A combination of quadrat and traverse flora surveys was used to assess native floral diversity, dominant species, condition of vegetation communities and search for Threatened species within the study area. The flora survey effort was determined to exceed the suggested minimum survey requirements of the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (refer to table 3-2, Department of Environment and Conservation 2004).

Table 2-2 Suggested survey technique and effort for plant quadrats

Survey technique	Suggested minimum effort per stratification unit
Quadrat	1 quadrat for areas <2 ha
	2 quadrats for area 2-50 ha
	3 quadrats for areas 51-250 ha
	5 quadrats for areas 251-500 ha
	10 quadrats for areas 5,001-1,000 ha, plus 1 additional quadrat for each extra 100 ha thereof
Random Meander	30 minutes for each quadrat sampled within the same stratification unit as the quadrat

Source: *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation 2004).

2.5.1 Quadrat surveys

Quadrat surveys were completed to provide a quantitative examination of species abundance in each vegetation community. Quadrat surveys are also likely to detect inconspicuous species that may be missed by random meander or transect surveys (Department of Environment and Conservation 2004).

Two vegetation quadrats were placed randomly within the vegetation within the study area in an east-westerly direction to sample vegetation; the location co-ordinates for these quadrats are shown on (Figure 2-1). Vegetation quadrats were 400 m² (20 x 20 m) within which all floral species were identified and assigned a vegetative cover abundance rating based on the following modified Braun-Blanquet scale (Table 2-3).

Table 2-3 Modified Braun-Blanquet scale

Cover/abundance scale 1-6		
1	<5% - Rare or few individuals	3 or less individuals
2	<5% - Common	Consistent throughout plot
3	Cover >5% and <25%	
4	Cover >25% and <50%	
5	Cover >50% and <75%	
6	Cover >75%	

2.5.2 Random meander surveys

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (1993), whereby the recorder walks in a random manner throughout the site recording all species observed. The survey is continued until no additional species are observed within a patch. Random meander surveys also allow the boundaries between various vegetation communities and condition of vegetation to be recorded and are valuable for recording species that may not occur within quadrats including, Threatened species (Department of Environment and Conservation 2004).

Individual random meander surveys were separated whenever there was a significant change in vegetation community type or condition. For each random meander survey, the vegetation community was determined based on the dominant canopy species and the structure formation in accordance with Specht (1981) with reference to existing mapped vegetation communities. A random meander was conducted throughout the entire study area.

2.5.3 Vegetation condition

The condition of vegetation communities is an important criterion to determine suitable habitats for Threatened species and the conservation status of certain ecological communities. Vegetation within the study area was assigned to one of the following condition classes (refer Table 2-4).

Table 2-4 Vegetation community condition classes

Condition Class	Criteria
Good	Vegetation still retains the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover.
Moderate	Vegetation generally still retains its structural integrity, but has been disturbed and has lost some component of its original species complement. Weed invasion can be significant in such remnants
Poor	Vegetation that has lost most of its species and is significantly modified structurally. Often such areas now have a discontinuous canopy of the original tree cover and very few shrubs. Exotic species, such as introduced pasture grasses or weeds, replace much of the indigenous ground cover. Environmental weeds are often co dominant with the original indigenous species.

2.6 Terrestrial fauna

2.6.1 Fauna habitats

Fauna habitat assessments were undertaken to assess the likelihood of Threatened species of animal (those species identified from the literature and database review) to occur within the study area. Fauna habitat characteristics assessed included the:

- Structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- Presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- Composition of the ground cover vegetation, leaf litter, rocky outcrops and fallen timber to provide protection for ground-dwelling mammals, reptiles and amphibians
- Presence of waterways (ephemeral or permanent) and water bodies.

The assessment of these fauna habitat characteristics enabled an overall assessment of fauna habitat condition within the study area (refer Table 2-5).

Table 2-5 Fauna Habitat Condition Classes

Fauna habitat condition class	Description
Good	A full range of fauna habitat components are usually present (e.g. old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
Moderate	Some fauna habitat components may be missing (e.g. old growth trees, fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
Poor	Many fauna habitat elements in low quality remnants have been lost, including old growth trees (e.g. due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive past clearing.

2.6.2 SEPP 44 Koala habitat assessment

The site is located in the Wollondilly Local Government Area, which is listed under Schedule 1 of *State Environmental Planning Policy - 44 Koala Habitat Protection* (SEPP 44). This policy does applies to proposals assessed by a determining authority under Part 4 of the *Environmental Planning and Assessment Act 1979*, the likelihood of the site to be 'potential koala habitat' or 'core koala habitat' was assessed. Under *State Environmental Planning Policy - 44 Koala Habitat Protection*, the following definitions apply:

'Potential koala habitat' - areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

'Core koala habitat' - area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

2.6.3 Fauna survey

The presence of faunal species within the study area was determined primarily through consideration of suitable habitats, with species of animal identified opportunistically during the vegetation survey, habitat assessments and through direct targeted surveys. Although recording Threatened species during field survey can confirm their presence in an area, a lack of Threatened species records does not necessarily indicate the absence of the species from the study area when suitable habitat is present. By the very nature of their rarity, Threatened species are often difficult to detect. Suitable habitat is, therefore, an important factor to consider when determining the potential presence of Threatened species.

The following fauna surveys detailed below were conducted within the study area due to the presence of the following fauna habitat characteristics: ground cover vegetation, leaf litter, rocky outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians.

The assessment of these fauna habitat characteristics enabled an overall assessment of fauna habitat condition within the study area.

2.6.4 Diurnal Birds

Diurnal birds were recorded within the study area over 2.5 hour observation periods on one morning & one afternoon. During the survey the entire study area was traversed and birds were identified either from sightings or characteristic calls. The number of each species and the activity at the time of sighting (foraging, breeding, or flying) was also recorded.

Additional birds species not recorded during this survey period were also opportunistically recorded throughout the study area whilst completing vegetation surveys and habitat assessments.

Birds were observed and identified using binoculars. Calls were generally identified in the field by the observer. If an unknown call was heard it is recorded and identified using reference libraries.

2.6.5 Amphibians

Frog searches were completed at all locations where frogs were heard vocalising to confirm species identification. Species were recorded by sightings, captures and call characteristics.

Amphibians were surveyed by vocal call identification, by using a recorder to record male calls in suitable places and then comparing these to known calls. Amphibians were also surveyed by habitat searches.

Any amphibians found are visually identified and when required to be examined are handled with Latex gloves and kept moist until release.

Species of herpetofauna were also opportunistically recorded whilst completing vegetation surveys and habitat assessments.

2.6.6 Reptiles

Searches for reptiles in likely localities such as under rubbish debris, branches and leaf litter throughout the study area. Surveys were undertaken during diurnal visits to the site.

2.7 Significant Assessments

Significance assessments were carried out for threatened species, populations or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* that were known or predicted to occur in the project locality (10 kilometres from the study area) and that had a moderate to high likelihood of occurring within the study site based on suitable habitat or observation in the field.

For species, populations and communities listed under the *Threatened Species Conservation Act 1995* significance assessments were completed in accordance with threatened species assessment guidelines (Department of Environment and Climate Change 2007).

For species or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*, significance assessments were completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006).

2.8 Limitations

Within the study area varying degrees of non-uniformity of flora and fauna habitats are encountered. Hence no sampling technique can entirely eliminate the possibility that a species is present within a study area (e.g. species of plant present in the seed bank). The conclusions in this report are based upon data acquired for the study area and the environmental field surveys and are, therefore, merely indicative of the environmental condition of the study area at the time of survey, including the presence or otherwise of species. It should also be recognised that conditions of the study area, including the presence of threatened species, can change with time.

Habitat assessments were completed for all threatened fauna species identified as a result of the database searches (Table 2-1) to determine whether or not suitable habitat for threatened fauna species occurred within the study area. This is a more conservative approach and is likely to include species that are difficult to detect.

Figure 2-1 Flora survey locations within the study area



3. Results

3.1 Vegetation mapping

Two vegetation mapping projects have mapped vegetation within close proximity to the study area, these are: A Revised Classification and Map for the Coast and Eastern Tablelands. Native Vegetation Maps of the Cumberland Plain - Western Sydney (NSW National Parks and Wildlife Service 2002) & The Revised Classification and Map for the Coast and Eastern Tablelands vegetation (Tozer, Turner et al. 2010).

The Revised Classification and Map for the Coast and Eastern Tablelands vegetation (Tozer, Turner et al. 2010) vegetation mapping project was found to be the most accurate mapping project & vegetation communities have been aligned where appropriate to the vegetation communities.

3.2 Vegetation communities

Two vegetation communities: Cleared Land with Scattered Trees and DSF P146: Sydney Hinterland Transition Woodland (Underscrubbed/remnant canopy) was identified from the study area (Figure 3-1). Detailed descriptions of these communities have been provided below.

3.2.1 Cleared Land with Scattered Trees

Cleared Land with Scattered Trees this community is the result of previous vegetation clearing and the establishment of exotic pasture grasses and herbaceous weeds (Photograph 3-1). The vegetation condition class for this community was assessed as being in a low condition. This community was not consistent with any recognised community in vegetation mapping projects that cover the study area.

Trees were sparse to absent from within this community with only the occasional scattered occurrence of planted *Eucalyptus sp* being recorded. Trees were to a height of approximately 9-23 m with a projected foliage cover of >5%.

The understorey was dominated by exotic pasture grasses and herbaceous weeds, including The groundcover was dominated by the following exotic species: *Pennisetum clandestinum* (Kikuyu Grass), *Paspalum dilatatum* (Paspalum), *Lolium perenne* (Perennial Ryegrass), *Chloris gayana* (Rhodes Grass), *Bromus catharticus* (Prairie Grass), *Sida rhombifolia* (Paddy's Lucerne), *Solanum nigrum* (Black-berry Nightshade), *Senecio madagascariensis* (Fireweed), *Cirsium vulgare* (Spear Thistle) and *Verbena bonariensis* (Purpletop).

The ground layer was approximately 0.1-0.6m high with a projected foliage cover 85-95%.

One exotic climbing species *Araujia sericifera* (Moth Vine) was frequently recorded adjacent top fence lines.

Photograph 3-1 Cleared Land with Scattered Trees recorded from the study area



3.2.1 DSF P146: Sydney Hinterland Transition Woodland (Under-scrubbed/remnant canopy)

DSF P146: Sydney Hinterland Transition Woodland (Under-scrubbed/remnant canopy) was the least common vegetation community identified from within the study area (Figure 3-1).

The canopy was dominated by White Stringybark (*Eucalyptus globoidea*), *Eucalyptus notabilis*, *Eucalyptus punctata* (Grey Gum), *Eucalyptus crebra* (Thin-leaved Ironbark) with the occasional occurrence of Hard-leaved Scribbly Gum (*Eucalyptus sclerophylla*), *Eucalyptus resinifera* (Red-mahogany), *Corymbia gummifera* (Red Bloodwood) & *Eucalyptus tereticornis* (Forest Red Gum) being recorded. Canopy trees ranged in height from approximately 15-22m. The projected foliage cover of the canopy ranged from >5-30%.

Within the under-scrubbed variant of this community the following shrubs were recorded *Kunzea ambigua* (Tick Bush), *Acacia decurrens* (Sydney Green Wattle), *Acacia implexa* (Hickory), *Bursaria spinosa* (Blackthorn), *Leucopogon juniperinus* (Bearded Heath), & *Ozothamnus diosmifolius* (Paper Daisy). Shrubs were sparse to absent from the canopy variant of this community.

Groundcovers within the under-scrubbed variant were dominated by *Microlaena stipoides* (Meadow Grass), *Themeda australis* (Kangaroo Grass), *Austrostipa* sp, *Imperata cylindrica* (Blady Grass) & exotic *Paspalum dilatatum* (Paspalum).

The groundcover within the remnant canopy variant of this community was dominated by the following exotic species: *Pennisetum clandestinum* (Kikuyu Grass), *Paspalum dilatatum* (Paspalum), *Lolium perenne* (Perennial Ryegrass), *Chloris gayana* (Rhodes Grass), *Cirsium vulgare* (Spear Thistle) and *Verbena bonariensis* (Purpletop).

Native groundcover species were primarily absent from this community with only common cosmopolitan species e.g. *Dichondra repens* & *Viola hederacea* (Native Violet) being recorded at the base of remnant trees.



Photograph 3-2 Sydney Hinterland Transition Woodland (Under-scrubbed variant) within the study area



Photograph 3-3 Sydney Hinterland Transition Woodland (Remnant Canopy variant) within the study area

Figure 3-1 Field verified vegetation communities from the study area



3.3 Species of plant

A total of one hundred thirty-two (132) species of plant was recorded from the study area, of which ninety-one (91) were native (Appendix A).

Forty-one (41) species of weed were recorded from the study area (Appendix A). One weed: *Lantana camara* (Lantana) a weed of national significance (WON)* was recorded from the study area.

3.4 Species of animal

3.4.1 Amphibians

One common species of frog: Common Eastern Froglet (*Crinia signifera*) & Peron's Tree Frog was recorded calling from adjoining allotment to the north-west of the study area during surveys. One additional species were recorded by UBM (2014) this being the Bleating Tree Frog (*Litoria dentata*).

No amphibious breeding habitats were identified within the study area.

No threatened frogs listed under the TSC or EPBC Acts were identified within the study area, the habitat within the study area was not suitable for any threatened frogs species listed under both the TSC & EPBC Acts.

3.4.2 Reptiles

Two common species of reptile the Garden Skink (*Lampropholis guichenoti*) & the Eastern Water Skink (*Eulamprus quoyii*) were recorded within the study area. No other reptile species were identified during the site inspections.

3.4.3 Birds

Twenty species of bird were identified within the study area (Appendix B). The vegetation within the study area provides a range of foraging opportunities for birds.

The lack of diversity of tree and shrub species within the two vegetation communities provided limited nectar resources to maintain bird populations throughout the year.

No Glossy Black-cockatoo (*Calyptorhynchus lathamii*) or Gang-gang Cockatoo (*Callocephalon fimbriatum*). No Glossy-black or Gang-gang Cockatoos were identified from the study area despite targeted surveys being undertaken.

3.4.4 Mammals

Habitat for mammals was limited within the study area with remnant trees providing suitable foraging and marginal roosting/nesting habitat for mammals. Common species likely to utilise the remnant trees are those species adapted to urban/rural development e.g. the Brush-tailed Possum and the Common Ring-tail Possum. Habitats for threatened mammals were limited.

The blossoms of the canopy trees within the study area provide suitable foraging resources for the Grey-headed Flying-fox (*Pteropus poliocephalus*); this species was not however recorded from the study area during the site inspections. All foraging trees for this species are proposed to be retained within the study area.

No suitable caves for threatened cave dwelling bats were recorded from the study area. Four hollow-bearing trees were identified during the fauna surveys (Figure 2-1) which would provide a suitable roosting site for hollow-dependent microbats species to utilise.

3.4.5 Fauna habitat types

The suitability, size and configuration of the terrestrial fauna habitats were found to correlate broadly with the structure, floristics, connectivity and quality of the local vegetation community described above. These habitats mostly comprised of the Cleared Land with Scattered Trees & DSF P146: Sydney Hinterland Transition Woodland communities.

The condition class of the habitats within the Cleared Land with Scattered Trees was assessed as being in a poor condition whilst DSF P146: Sydney Hinterland Transition Woodland community was assessed as being in a poor-moderate containing some fauna habitat components e.g. feeding and roosting resources.

3.4.6 Fauna microhabitat features

Tree hollows

Hollows develop in *Eucalypts* when the tree is under some form of stress, heartwood decay is present and the tree is sufficiently large to persist when decayed (Gibbons and Lindenmayer 2002). As such, hollows are more likely to occur in older and larger trees; however the abundance and size of hollows may vary within and between species.

Tree hollows typically provide den and nesting habitat for a range of common birds and arboreal mammal species (Gibbons and Lindenmayer 2002), including providing potential habitat for a number of Threatened species including microchiropteran bats and large forest owls. Whether or not tree hollows are used by animals, and which species use them, depends on a number of factors, including hollow characteristics (diameter, height, depth), the number of hollows in a tree, tree health, size, location and spacing (Gibbons and Lindenmayer 2002). The proposal will not result in the removal of any hollow-bearing trees.

Feeding resources

Fauna occurring in the project locality are likely to use a range of foraging resources including both native and exotic species. Floral feeding resources were limited within the study area notwithstanding *Eucalypts* provide some seasonal foraging resources for mobile species to utilise when in flower.

3.4.7 SEPP44 Koala Habitat Assessment

Three Koala food trees (*Eucalyptus tereticornis*) Forest Red Gum, (*Eucalyptus sclerophylla*) Hard-leaved Scribbly Gum & (*Eucalyptus punctata*) Grey Gum listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection, was observed within the subject site. DSF P146: Sydney Hinterland Transition Woodland community contained less than the 15% density of these food trees indicated by SEPP 44 for classification as Potential Koala Habitat. The subject site is not considered to contain 'Potential Koala Habitat' as defined by SEPP 44.

No Koalas were observed during the fauna survey and there was no evidence of previous Koala habitation in the area. The subject site is also not considered to be 'Core Koala Habitat' as defined by SEPP 44.

As such the subject site is not considered to comprise Potential Koala Habitat as defined under SEPP 44 and no further assessment under this Policy is required.

3.5 Threatened biodiversity

This section details the threatened biodiversity recorded or likely to occur within the study area. This is based on those species recorded or predicted to occur within the locality from database searches (Table 2-1) and the nature of the habitats observed within the vicinity of the proposed works during field surveys (Appendices C and D).

No flora and fauna species were considered to have medium or high likelihood of occurrence within the study area; as such no significance assessment has been prepared.

3.5.1 Threatened ecological communities

Eleven endangered ecological communities were identified from desktop review to occur within the locality of the study area (Table 3-1).

Table 3-1 Endangered Ecological Communities known from the Locality

Scientific Name	Level of Threat
Blue Gum High Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	Endangered Ecological Community
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community
Maroota Sands Swamp Forest	Endangered Ecological Community
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	Endangered Ecological Community
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community
Shale/Sandstone Transition Forest	Endangered Ecological Community
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community
Sydney Turpentine-Ironbark Forest	Endangered Ecological Community
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	Endangered Ecological Community

No endangered ecological communities listed under the *Threatened Species Conservation Act 1995* or under the *Environment Protection and Biodiversity Conservation Act 1999* was recorded from the subject property or immediately adjacent.

3.5.2 Endangered populations

No threatened populations were identified from the desktop review to occur within the locality of the study area

3.5.3 Threatened Flora

Twenty-four threatened species of plant listed under the *TSC Act* and/or *EPBC Act* were predicted to occur within the locality of the study area based on database searches (refer Appendix B).

Based on targeted surveys within the study area none are considered to have suitable habitat within the study area. No further consideration is required for threatened flora species.

3.5.4 Threatened fauna

Fifty threatened fauna species were identified as a result of the database searches as occurring or having potential to occur within the locality of the study area (Appendix D).

Based on the habitat assessment and targeted surveys there is potential habitat within the study area for eleven threatened fauna species that may be impacted through the removal of foraging habitat (Appendix D). Impact assessments have been prepared for these species (Appendices E & F).

3.5.5 Migratory species

Migratory species are protected under the international agreement to which Australia is a signatory, including the Japan-Australia Migratory Bird Agreement, the China-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Eleven migratory species were identified from the Department of Sustainability, Environment, Water, Population and Communities (Department of Sustainability, Environment, Water, Population and Communities 2018) within the locality (Appendix D). None were recorded during the site inspections. Two migratory species were considered to have suitable habitat within the study area (Table 3-2).

Table 3-2 Migratory Species considered to have suitable habitat within the study area

Scientific Name	Common Name	EPBC Act
Birds		
<i>Monarcha melanopsis</i>	Black-faced Monarch	M
<i>Rhipidura rufifrons</i>	Rufous Fantail	M

The study area is not considered to be important habitat for any Migratory species in accordance with the EPBC Act.

3.6 Critical habitat

Critical habitat is listed under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*. Critical habitat is the whole or any part or parts of an area or areas of land comprising the habitat of an endangered species, an endangered population or an endangered ecological community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004).

The Directors-Generals of both the State and Federal departments of environment (Office of Environment & Heritage and the Department of Sustainability, Environment, Water, Population and Communities respectively) maintain a register of critical habitat. Habitat that is not listed on these register, however consistent with the definition above, may also be considered as critical habitat.

No listed critical habitat occurs within the study area and no critical habitat is likely to be affected by the proposal.

4. Impacts

The following discussion presents an assessment of the potential impacts of the proposal on biodiversity within the study area.

4.1 Impacts on threatened species, endangered populations and endangered ecological communities

Eleven threatened fauna species listed under the *TSC Act* and/ or the *EPBC Act* were recorded, predicted to occur, or have habitat within the vicinity (10 km radius) of the study area.

Impact assessments have been prepared for these species which has concluded that the proposal is not likely to have a significant impact upon threatened species, endangered populations or endangered ecological communities (Appendices E & F).

4.2 Key threatening processes

Key Threatening Process under the *Threatened Species Conservation Act* (NSW National Parks and Wildlife Service 2003) that are likely to further increase within the study area are:

- Clearing of native vegetation.
- Invasion of native plant communities by exotic perennial grasses.
- Infection of native plants by *Phytophthora cinnamomi* - key threatening process listing. The proposal has potential to introduce or spread *Phytophthora cinnamomi* within the development area and into adjacent bushland. Mitigation measures are to be implemented to prevent spread of *Phytophthora cinnamomi*. Mitigation measures have been put in place to reduce the chance of infection of *Phytophthora cinnamomi* into the study area.
- Human Caused Climate Change.

4.3 Mitigation measures

4.3.1 Fencing of the construction zone

When accessing construction sites, contractors are to use only the designated access sealed driveway. Upon commencing of clearing of vegetation machinery are to enter vegetation at right angles to the access track to avoid impacts upon retained vegetation. Suitable fixed fencing (e.g. three strand stock fencing) and colour tape or Para-webbing should be used to delineate the maximum allowable extent of the construction zone. If any tape is disturbed, it is to be immediately replaced along the appropriate alignment. Construction work outside this area will constitute a non-conformance with the contract terms.

Fences and Para-webbing delineating the construction zone are to remain intact during construction period. If any of these barriers are disturbed, it is to be repaired or replaced as soon as practicable.

4.3.2 Truck and machine wash down areas

Vehicles and other equipment to be used in clearing within the study area and general construction equipment (such as excavators etc) are to be received completely free of soil, seeds and plant material before entering the site to prevent the introduction of exotic plant species and pathogens, equipment failing inspection should be sent away for cleaning. Appropriate records of inspections shall be maintained.

Build-up of mud, soil and organic matter present on vehicles during wet and muddy conditions shall be manually removed prior to vehicles entering/leaving the construction site. Works and vehicular movements shall cease if wet and muddy conditions develop/persist during construction zone clearing to limit the movement of soil and organic matter onto, through and from the study area, minimising the potential for the spread of weeds.

4.3.3 Animal welfare

Animal injury has potential to occur throughout various construction operations. In the event that any sick, injured or orphaned native animals are located during construction, WIRES should be contacted to assist in capture, handling and welfare of the animal (contact No: 13000 WIRES or 1300 094 737).

A suitably qualified ecologist or wildlife handler should be on site during the felling of trees. Where possible, dead wood should be salvaged from felled trees and mounted into retained vegetation within the study area.

4.3.4 Nest boxes

To compensate for the loss of four hollow-bearing tree's replacement boxes at a ratio of 2:1 for each hollow removed are required to be installed within retained trees under the supervision of an Ecologist prior to the clearing of vegetation.

5. Significance Assessments

5.1 Background to the Seven Part Test

Projects assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* consider the significance of impacts on biodiversity following on the factors for consideration in section 5A of the *Environmental Planning and Assessment Act 1979* and the Department of Environment and Climate Change's *Threatened species assessment guidelines: The assessment of significance* (Department of Environment and Climate Change 2007). The factors for consideration under this assessment address the likelihood and significance of the impacts on Threatened species life cycle, habitat and recovery.

Threatened biodiversity listed under the *Environment Protection and Biodiversity Conservation Act 1999* require assessment following the *Principal Significant Impact Guidelines* (Department of the Environment and Heritage 2005). The factors for consideration under this assessment include considerable overlap with the state significance assessments. This assessment however also addresses conservation status, population size and area of occupancy, likelihood of the establishment of invasive species of introduction of disease in addition to species life cycle, habitat and recovery.

Eleven animal species have been recorded or are considered likely to occur within the study area (refer Table 5-1). Significance assessments for these species concluded that the proposal is unlikely to result in a significant impact to any Threatened species or community (Appendix C).

Table 5-1 Summary of significance assessments

Species Name		Conservation Status	
		State ¹	National ²
Threatened Fauna			
Bird			
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	
<i>Ninox strenua</i>	Powerful Owl	V	
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	
Mammals			
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	
<i>Miniopterus schreibersii</i>	Eastern Bent-wing Bat	V	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	

Notes:

1. State conservation status: V= Vulnerable, E1 = Endangered, (*Threatened Species Conservation Act 1995* and *Fisheries Management Act 1994*). * indicates species listed under the *Fisheries Management Act 1994*.

2. National conservation status: V = Vulnerable, (*Environment Protection and Biodiversity Conservation Act 1999*)

6. Conclusions

Targeted surveys did not identify any threatened flora, endangered population's, endangered ecological communities listed under the *TSC* or the *EPBC Acts* within the study area.

The study area was identified as containing suitable foraging habitat for eleven species of fauna: the Gang-gang Cockatoo, Glossy Black-Cockatoo, Powerful Owl, Little Lorikeet, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bent-wing Bat, Grey-headed Flying-fox, Eastern Freetail-bat, Yellow-bellied Sheathtail Bat and the Greater Broad-nosed Bat.

Significance assessments were undertaken for these Threatened fauna species. These assessments concluded that the proposal was unlikely to have a significant impact on these species. This was based on the following criteria:

- The security of larger threatened flora populations within the locality of the study area
- relatively small size of foraging and roosting habitat to be removed as part of the proposal
- larger areas of better quality vegetation were noted at the time of the survey to the north & north-east and within reserves and retained elsewhere within the study area.
- these species are all highly mobile and would utilise vegetation within the locality and not the study area exclusively

As such, the project is unlikely to have a significant impact on the ecological features of the local area.

7. References

- Australian Museum (2003). Great Egret factsheet, Australian Museum.
- Benson, D. and L. McDougall (1996). "Ecology of Sydney plant species Part 4: Dicotyledon family Fabaceae" *Cunninghamia* 4(4): 553-756.
- Bishop, T. (2000). *Field guide to the orchids of New South Wales and Victoria*. Sydney, University of New South Wales Press Ltd. Pty.
- Birds Tree Consultancy (2012) unpublished report titled *Tree Report and Arboricultural impact assessment for No 28 Balmoral Road, Kellyville*
- Briggs J.D. & Leigh J.H. (1996). *Rare or threatened Australian plants*. Revised edition CSIRO Publishing, Collingwood, Victoria.
- Churchill, S. (1998). *Australian Bats*. Sydney, Reed New Holland.
- Churchill, S. (2008). *Australian Bats*. Sydney, Allen & Unwin.
- Cogger, H. G. (2000). *Reptiles and Amphibians of Australia*. Sydney, Reed Books.
- Cropper, S. C. (1993). *Management of Endangered Plants*. Melbourne, CSIRO Australia.
- Crowley, G. M. and S. T. Garnett (2001). "Food value and tree selection by Glossy Black-Cockatoos *Calyptrorhynchus lathami*." *EMU* 26: 116-126.
- Office of Environment & Heritage (2014). *Bionet Atlas of NSW Wildlife*, Office of Environment & Heritage.
- Department of Environment and Climate Change (2007). *Threatened species assessment guidelines. The assessment of significance*. Hurstville, Department of Environment and Climate Change.
- Department of Environment and Climate Change. (2007). "Threatened species, populations and ecological communities." 2006, from <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>.
- Department of Environment and Climate Change. (2008). "Threatened species, populations and ecological communities." 2008, from <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>.
- Department of Environment and Conservation (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)*. Hurstville, Department of Environment and Conservation.
- Department of Environment and Conservation. (2005). "Threatened species, populations and ecological communities." 2006, from <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>.
- Department of Environment Climate Change & Water (2011). *Atlas of NSW Wildlife*, Department of Environment and Climate Change.
- Department of Environment and Conservation (2004) *Darwinia biflora* recovery plan
- Department of the Environment and Heritage (2005). EPBC Act - Principal Significant Impact Guidelines 1.1. Matters of National Environmental Significance. Canberra, Department of the Environment and Heritage.
- Department of the Environment and Heritage (2006). EPBC Act Policy Statement 1.1 Significant Impact Guidelines. Canberra, Department of the Environment and Heritage.
- Department of the Environment Water Heritage and the Arts. (2010). "Protected Matters Search Tool." from <http://www.deh.gov.au/erin/ert/epbc/index.html>
- Garnett, S. T. and G. M. Crowley (2000). *The Action Plan for Australian Birds*. Canberra, Environment Australia.
- Gibbons, P. and D. Lindenmayer (2002). *Tree Hollows and Wildlife Conservation in Australia*. Canberra, CSIRO Publishing.
- Harden, G. (1992). *Flora of New South Wales Volume 3*. Kensington, University of New South Wales Press Ltd.
- Harden, G. (1993). *Flora of New South Wales Volume 4*. Kensington, University of New South Wales Press Ltd.
- Harden, G. (2000). *Flora of New South Wales Volume 1 (Revised Edition)*. Kensington, University of New South Wales Press Ltd.
- Harden, G. (2002). *Flora of New South Wales Volume 2 (Revised Edition)*. Kensington, University of New South Wales Press Ltd.
- Higgins, P. J., Ed. (1999). *Handbook of Australian, New Zealand and Antarctic Birds Volume 4: Parrots to Dollarbirds*. Volume 4: Parrots to Dollarbird. Melbourne, Oxford University Press.
- Hoye, G. A. and P. D. Dwyer (1998). Large-eared Pied Bat. *The Mammals of Australia*. R. Strahan. Sydney, New Holland Publishers.
- James, T. (1997). Urban bushland biodiversity survey. Native flora in western Sydney. . Hurstville, NSW National Parks and Wildlife Service.
- Johnston, P. G. (1995). Long-nosed Potoroo. *The Mammals of Australia*. R. Strahan. Sydney, Reed New Holland: 301-302.
- McKilligan, N. (2005). *Herons, egrets and bitterns: their biology and conservation in Australia*. Collingwood, Victoria, CSIRO Publishing.
- NSW Fisheries (2004). Status and monitoring of the Australian Grayling in NSW, NSW Fisheries.
- NSW National Parks and Wildlife Service (1999). *Acacia bynoeana* threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Glossy Black-cockatoo threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Koala threatened species information. Hurstville, NSW National Parks and Wildlife Service.

- NSW National Parks and Wildlife Service (1999). Southern Brown Bandicoot threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Spotted-tailed Quoll threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Squirrel Glider threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Terms of licence under the Threatened Species Conservation Act 1995. Appendix B of the Integrated Forestry Operations Approval for the Upper North East Region.
- NSW National Parks and Wildlife Service (1999). Yellow-bellied Glider threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2000). *Persoonia acerosa* threatened species information. Hurstville, NSW National Parks and Wildlife Service. **2004.**
- NSW National Parks and Wildlife Service (2001). Giant Burrowing Frog threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2001). Grey-headed Flying Fox threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2001). *Persoonia nutans* threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2002). Threatened species of the upper north coast of New South Wales - Flora. Coffs Harbour, NSW National Parks and Wildlife Service, Northern Directorate.
- NSW National Parks and Wildlife Service (2003). Brush-tailed Rock Wallaby Warrumbungles endangered population threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2003). Draft Recovery Plan for the Koala. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2003). Invasion of native plant communities by exotic perennial grasses as a key threatening process- an overview. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2003). Recovery Plan for the Yellow-bellied Glider (*Petaurus australis*). Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (1999). Final determination to list the Giant Barred Frog as an endangered species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2000). Final determination to list *Acacia bakeri* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2000). Final determination to list Littlejohn's tree Frog as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2002). Final determination to list *Caladenia tessellata* as an endangered species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2002). Final determination to list the *Diuris aequalis* as an endangered species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Dept of Environment and Conservation and NSW Dept of Natural Resources (2006). Southeast NSW Native Vegetation Classification and Mapping - SCIV1. Sydney.
- NSW Fisheries (2004). Status and monitoring of the Australian Grayling in NSW, NSW Fisheries.
- NSW National Parks and Wildlife Service (1999). *Acacia bynoeana* threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Glossy Black-cockatoo threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Koala threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Spotted-tailed Quoll threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (1999). Terms of licence under the Threatened Species Conservation Act 1995. Appendix B of the Integrated Forestry Operations Approval for the Upper North East Region.
- NSW National Parks and Wildlife Service (1999). Yellow-bellied Glider threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2000). *Pimelea spicata* threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2001). Giant Burrowing Frog threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2001). Grey-headed Flying Fox threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2001). *Persoonia nutans* threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2002). Final Native Vegetation Mapping of the Cumberland Plain, Western Sydney. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2002). *Pultenaea parviflora* threatened species information. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2003). Draft Recovery Plan for the Koala. Hurstville, NSW National Parks and Wildlife Service.

- NSW National Parks and Wildlife Service (2003). Invasion of native plant communities by exotic perennial grasses as a key threatening process- an overview. Hurstville, NSW National Parks and Wildlife Service.
- NSW National Parks and Wildlife Service (2003). Recovery Plan for the Yellow-bellied Glider (*Petaurus australis*). Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (1998). Final determination to list *Grevillea parviflora* ssp. *parviflora* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (1998). Final determination to list *Pimelea curviflora* var *curviflora* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (1999). Final determination to list the Giant Barred Frog as an endangered species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2000). Final determination to list *Grevillea juniperina* ssp. *juniperina* as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2000). Final determination to list Littlejohn's tree Frog as a vulnerable species. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2000). Final determination to list *Marsdenia viridiflora* ssp. *viridiflora* as an endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas. Hurstville, NSW National Parks and Wildlife Service.
- NSW Scientific Committee (2002). Final determination to list *Micromyrtus minutiflora* as an endangered species. Hurstville, NSW National Parks and Wildlife Service.
- Payne, R. (1998) *Lake Macquarie Tetratheca juncea Interim Conservation Management Plan*. Unpublished Report prepared for the NSW National Parks and Wildlife Service, Lake Macquarie City Council and BHP Pty Ltd, September 1998.
- Pizzey, G. and F. Knight (1997). *Field Guide to the Birds of Australia*. Sydney, Angus and Robertson.
- Royal Botanic Gardens (2004). *PlantNet - The Plant Information Network System of Botanic Gardens Trust* (version 2.0). Sydney, Royal Botanic Gardens.
- Royal Botanic Gardens (2012). *PlantNet - The Plant Information Network System of Botanic Gardens Trust* (version 2.0). Sydney, Royal Botanic Gardens. **2005**.
- Royal Botanic Gardens. (2016). "PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)." from <http://plantnet.rbgsyd.nsw.gov.au/>.
- Schultz, M., R. Coles, et al. (1999). Large-eared Pied Bat *Chalinolobus dwyeri*. *The Action Plan for Australian Bats*. A. Duncan, G. Baker and M. N. Canberra, Environment Australia: 39-41.
- Specht, R. L. (1981). Major vegetation formation in Australia. *Ecological Biogeography of Australia*. A. Keast. The Hague, Junk: 163-298.
- Strahan, R. (1995). *The Mammals of Australia*. Sydney, Reed New Holland.
- Swift Parrot Recovery Team (2001). *Swift Parrot Recovery Plan*. Department of Primary Industries, Water and Environment (Tasmania), Hobart, Department of Primary Industries, Water and Environment.
- Thorp, J. and R. Lynch (2000). *The Determination of Weeds of National Significance*. Launceston, National Weeds Strategy Executive Committee.
- Tozer, M. G., K. Turner, et al. (2006). *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands*. Version 1.0. Hurstville, Department of Environment and Climate Change.
- Turner, V. and S. J. Ward (1995). Eastern Pygmy-possum. *The Mammals of Australia*. R. Strahan. Sydney, Reed New Holland: 217-218.
- Urban Bushland Management (2014) *Ecological investigations- 55 & 65 Bronzewing Street, Tahmoor*
- Webb, J. K. and R. Shine (1994). Habitat use by the broad-headed snake, *Hoplocephalus bungaroides*. Canberra, Environment Australia.
- Webb, J. K. and R. Shine (1998). "Ecological characteristic of an endangered snake species *Hoplocephalus bungaroides* (Serpentes: Elapidae)." *Animal Conservation* **1**: 185-193.

Appendix A

Species of flora recorded

Table 7-1 Flora species recorded within the study area

Family Name	Scientific Name	Common Name	Native
Adiantaceae			
	<i>Adiantum aethiopicum</i>	Common Maidenhair	Y
	<i>Cheilanthes sieberi ssp. sieberi</i>		Y
Alliaceae			
	<i>Agapanthus praecox</i>	Agapanthus	N
Anthericaceae			
	<i>Caesia parviflora</i>	Pale Grass-lily	Y
	<i>Laxmannia gracilis</i>		Y
Asparagaceae			
	<i>Asparagus aethiopicus</i>	Asparagus Fern	N
Asteraceae			
	<i>Bidens pilosa</i>	Cobbler's Pegs	N
	<i>Cirsium vulgare</i>	Spear Thistle	N
	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	N
	<i>Euchiton sphaericus</i>		Y
	<i>Hypochaeris glabra</i>	Smooth Catsear	N
	<i>Hypochaeris radicata</i>	Catsear	N
	<i>Lactuca serriola</i>	Prickly Lettuce	N
	<i>Olearia viscidula</i>	Wallaby Weed	Y
	<i>Osteospermum clandestinum</i>		N
	<i>Ozothamnus diosmifolius</i>	White Dogwood	Y
	<i>Senecio hispidulus</i>	Hill Fireweed	Y
	<i>Senecio madagascariensis</i>	Fireweed	N
	<i>Sonchus oleraceus</i>	Common Sowthistle	N
	<i>Taraxacum officinale</i>	Dandelion	N
Campanulaceae			
	<i>Wahlenbergia gracilis</i>	Sprawling or Australian Bluebell	Y
Caprifoliaceae			
	<i>Lonicera japonica</i>	Japanese Honeysuckle	N
Casuarinaceae			
	<i>Allocasuarina littoralis</i>	Black Sheoak	Y
Chenopodiaceae			
	<i>Einadia hastata</i>	Berry Saltbush	Y
	<i>Einadia trigonos</i>	Fishweed	Y
Clusiaceae			
	<i>Hypericum gramineum</i>	Small St John's Wort	Y
Commelinaceae			
	<i>Commelina cyanea</i>	Native Wandering Jew	Y
Convolvulaceae			
	<i>Dichondra micrantha</i>		Y
	<i>Dichondra repens</i>	Kidney Weed	Y
Cyperaceae			
	<i>Gahnia sieberiana</i>		Y
	<i>Lepidosperma laterale</i>		Y
	<i>Schoenus ericetorum</i>		Y
Dilleniaceae			
	<i>Hibbertia diffusa</i>		Y
Epacridaceae			
	<i>Leucopogon juniperinus</i>		Y
	<i>Lissanthe strigosa</i>	Peach Heath	Y
Euphorbiaceae			
	<i>Phyllanthus hirtellus</i>	Thyme Spurge	Y
Fabaceae (Faboideae)			
	<i>Bossiaea prostrata</i>		Y
	<i>Glycine tabacina</i>		Y
	<i>Hardenbergia violacea</i>	False Sarsaparilla	Y
	<i>Podolobium ilicifolium</i>	Prickly Shaggy Pea	Y
	<i>Pultenaea villosa</i>		Y

Family Name	Scientific Name	Common Name	Native
	<i>Trifolium repens</i>	White Clover	N
Fabaceae (Mimosoideae)			
	<i>Acacia decurrens</i>	Black Wattle	Y
	<i>Acacia implexa</i>	Hickory Wattle	Y
	<i>Acacia myrtifolia</i>	Red-stemmed Wattle	Y
	<i>Acacia terminalis</i>	Sunshine Wattle	Y
Goodeniaceae			
	<i>Goodenia hederacea</i>		Y
Haloragaceae			
	<i>Gonocarpus tetragynus</i>		Y
	<i>Gonocarpus teucroides</i>		Y
Iridaceae			
	<i>Watsonia angusta</i>		Y
Juncaceae			
	<i>Juncus continuus</i>		Y
Lauraceae			
	<i>Cassythia glabella</i>		Y
	<i>Cassythia pubescens</i>		Y
	<i>Cinnamomum camphora</i>	Camphor Laurel	N
Liliaceae			
	<i>Lilium formosanum</i>		N
Lobeliaceae			
	<i>Pratia purpurascens</i>	Whiteroot	Y
Lomandraceae			
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Y
	<i>Lomandra multiflora</i>		Y
	<i>Lomandra obliqua</i>		Y
Malvaceae			
	<i>Modiola caroliniana</i>	Red-flowered Mallow	N
	<i>Sida rhombifolia</i>	Paddy's Lucerne	N
Myrtaceae			
	<i>Corymbia gummifera</i>	Red Bloodwood	Y
	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Y
	<i>Eucalyptus globoidea</i>	White Stringybark	Y
	<i>Eucalyptus punctata</i>	Grey Gum	Y
	<i>Eucalyptus sclerophylla</i>	Hard-leaved Scribbly Gum	Y
	<i>Eucalyptus tereticornis</i>	Forest Red Gum	Y
	<i>Kunzea ambigua</i>	Tick Bush	Y
	<i>Leptospermum squarrosum</i>		Y
	<i>Leptospermum trinervium</i>		Y
	<i>Melaleuca thymifolia</i>		Y
Oleaceae			
	<i>Jasminum polyanthum</i>	White Jasmine	N
	<i>Ligustrum lucidum</i>	Large-leaved Privet	N
	<i>Ligustrum sinense</i>	Small-leaved Privet	N
	<i>Notelaea longifolia</i>	Large Mock-olive	Y
Oxalidaceae			
	<i>Oxalis perennans</i>		Y
Phormiaceae			
	<i>Dianella caerulea</i>		Y
	<i>Dianella revoluta</i> var. <i>revoluta</i>		Y
Phytolaccaceae			
	<i>Phytolacca octandra</i>	Inkweed	N
Pittosporaceae			
	<i>Billardiera scandens</i>	Appleberry	Y
	<i>Bursaria spinosa</i>	Native Blackthorn	Y
	<i>Pittosporum revolutum</i>	Rough Fruit Pittosporum	Y
	<i>Pittosporum undulatum</i>	Sweet Pittosporum	Y
Plantaginaceae			
	<i>Plantago lanceolata</i>	Lamb's Tongues	N

Family Name	Scientific Name	Common Name	Native
Poaceae			
	<i>Anisopogon avenaceus</i>	Oat Speargrass	Y
	<i>Aristida ramosa</i>		Y
	<i>Austrodanthonia racemosa</i>		Y
	<i>Austrodanthonia tenuior</i>		Y
	<i>Austrostipa</i> sp.		Y
	<i>Briza maxima</i>	Quaking Grass	N
	<i>Briza minor</i>	Shivery Grass	N
	<i>Bromus catharticus</i>	Prairie Grass	N
	<i>Bromus diandrus</i>	Great Brome	N
	<i>Cymbopogon refractus</i>	Barbed Wire Grass	Y
	<i>Cynodon dactylon</i>	Common Couch	Y
	<i>Dactylis glomerata</i>	Cocksfoot	N
	<i>Dichelachne crinita</i>	Longhair Plumegrass	Y
	<i>Echinopogon caespitosus</i>		Y
	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass	Y
	<i>Ehrharta erecta</i>	Panic Veldtgrass	N
	<i>Entolasia stricta</i>	Wiry Panic	Y
	<i>Eragrostis brownii</i>	Brown's Lovegrass	Y
	<i>Eragrostis curvula</i>	African Lovegrass	N
	<i>Lachnagrostis filiformis</i>		Y
	<i>Lolium perenne</i>	Perennial Ryegrass	N
	<i>Microlaena stipoides</i>		Y
	<i>Oplismenus aemulus</i> var. <i>aemulus</i>		Y
	<i>Panicum simile</i>	Two-colour Panic	Y
	<i>Paspalum dilatatum</i>	Paspalum	N
	<i>Pennisetum clandestinum</i>	Kikuyu Grass	N
	<i>Sporobolus africanus</i>	Parramatta Grass	N
	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Y
	<i>Themeda australis</i>	Kangaroo Grass	Y
	<i>Vulpia</i> sp.		Y
Polygonaceae			
	<i>Acetosa sagittata</i>	Rambling Dock	N
	<i>Acetosella vulgaris</i>	"Sorrel, Sheep Sorrel"	N
	<i>Rumex crispus</i>	Curled Dock	N
Proteaceae			
	<i>Grevillea robusta</i>	Silky Oak	Y
	<i>Hakea gibbosa</i>		Y
	<i>Persoonia linearis</i>	Narrow-leaved Geebung	Y
Rosaceae			
	<i>Rubus fruticosus</i>	Blackberry complex	N
Rubiaceae			
	<i>Opercularia diphylla</i>		Y
	<i>Pomax umbellata</i>		Y
Rutaceae			
	<i>Zieria smithii</i>	Sandfly Zieria	Y
Santalaceae			
	<i>Exocarpos cupressiformis</i>	Native Cherry	Y
Scrophulariaceae			
	<i>Veronica plebeia</i>	Trailing Speedwell	Y
Solanaceae			
	<i>Solanum chenopodium</i>		Y
	<i>Solanum prinophyllum</i>	Forest Nightshade	Y
	<i>Solanum pseudocapsicum</i>	Madeira Winter Cherry	N
Thymelaeaceae			
	<i>Pimelea linifolia</i>		Y
Verbenaceae			
	<i>Verbena bonariensis</i>	Purpletop	N
	<i>Verbena rigida</i>	Veined Verbena	N

Appendix B

Species of animal recorded

Table 7-2 Fauna species recorded during flora and fauna survey

Family Name	Common Name	Scientific Name	Enviro Ecology (2018)	UBM (2014)	TSC Act
Amphibians					
Hylidae	Bleating Tree Frog	<i>Litoria dentata</i>	O	O	
Hylidae	Peron's Tree Frog	<i>Litoria peronii</i>	O	O	
Myobatrachidae	Common Eastern Froglet	<i>Crinia signifera</i>	O	O	
Reptiles					
Scincidae	Eastern Water Skink	<i>Eulamprus quoyii</i>	O	O	
Scincidae	Garden Skink	<i>Lampropholis guichenoti</i>	O		
Birds					
Accipitridae	Black-shouldered Kite	<i>Elanus axillaris</i>		O	
Ardeidae	White-necked Heron	<i>Ardea pacifica</i>	O	O	
Artamidae	Australian Magpie	<i>Gymnorhina tibicen</i>	O	O	
Cacatuidae	Galah	<i>Cacatua roseicapilla</i>	O	O	
Cacatuidae	Long-billed Corella	<i>Cacatua tenuirostris</i>	O	O	
Cacatuidae	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	O	O	
Campephagidae	Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>		O	
Corvidae	Australian Raven	<i>Corvus coronoides</i>	O	O	
Dicruridae	Grey Fantail	<i>Rhipidura fuliginosa</i>	O	O	
Dicruridae	Magpie-lark	<i>Grallina cyanoleuca</i>	O	O	
Dicruridae	Willie Wagtail	<i>Rhipidura leucophrys</i>	O	O	
Falconidae	Nankeen Kestrel	<i>Falco cenchroides</i>		O	
Halcyonidae	Laughing Kookaburra	<i>Dacelo novaeguineae</i>	O	O	
Hirundinidae	Welcome Swallow	<i>Hirundo neoxena</i>	O	O	
Maluridae	Superb Fairy-wren	<i>Malurus cyaneus</i>	O	O	
Meliphagidae	Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>		O	
Meliphagidae	Little Wattlebird	<i>Anthochaera chrysoptera</i>		O	
Meliphagidae	Noisy Friarbird	<i>Philemon corniculatus</i>		O	
Meliphagidae	Noisy Miner	<i>Manorina melanocephala</i>	O	O	
Pachycephalidae	Rufous Whistler	<i>Pachycephala rufiventris</i>		O	
Pardalotidae	Striated Thornbill	<i>Acanthiza lineata</i>		O	
Pardalotidae	Yellow Thornbill	<i>Acanthiza nana</i>	O	O	
Psittacidae	Crimson Rosella	<i>Platycercus elegans</i>	O	O	
Psittacidae	Eastern Rosella	<i>Platycercus eximius</i>	O	O	
Sturnidae	Common Myna	<i>Acridotheres tristis</i>	O	O	
Mammals					
Phalangeridae	Common Brushtail Possum	<i>Trichosurus vulpecula</i>	Sc		
Petauridae	Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>	Sc		
Molossidae	Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>		A	V
Molossidae	White-striped freetail bat	<i>Austronomus australis</i>		A	
Vespertilionidae	Chocolate Wattled Bat	<i>Chalinolobus morio</i>		A	
Vespertilionidae	Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>		A	V
Vespertilionidae	Eastern Forest Bat	<i>Vespadelus pumilus</i>		A	
Vespertilionidae	Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		A	
Vespertilionidae	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		A	V
Canidae	Fox	<i>Vulpes vulpes</i>	Sc	O	
Felidae	Cat (feral)	<i>Felis catus</i>	O	O	

Family Name	Common Name	Scientific Name	Enviro Ecology (2018)	UBM (2014)	TSC Act
Leporidae	Rabbit	<i>Oryctolagus cuniculus</i>	Sc	O	

Key:

A - Anabat II	C	-	Call Identification
D - Diggings	Ct	-	Cage Trap
E - Elliot Trap	Fl	-	Flying over study area
O - Observation	P	-	Call Playback Response
F - Feather	S	-	Habitat Search
Sp - Spotlight	Sc	-	Scat, Track

Appendix C

Threatened flora species recorded in the locality

Appendix C Threatened Flora species recorded in the locality

This appendix details the Threatened species of plant that have either been recorded in the local area based on records the Bionet *Atlas of NSW Wildlife* Office of Environment & Heritage, 2018, data received 12th of August 2018 and records from the Royal Botanical Gardens. Threatened species with habitat likely to occur in the locality were also considered based on records from the *EPBC Protected Matters Search Tool* Department of Sustainability, Environment, Water, Population and Communities 2018, data received 12th of August 2018.

Table 7-3 Threatened flora species recorded in the locality

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Epacridaceae	<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V		2K	Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps {Harden, 1992 #3}. Usually found in sites with a strong shale influence {NSW National Parks and Wildlife Service, 2002 #67}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Epacridaceae	<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	V	2V	Restricted chiefly to the Woronora and Grose Rivers and Stokes Creek, Sydney catchments and the Royal National Park. One old record from the Grose River. Grows in woodland on sandstone {Royal Botanic Gardens, 2004 #9}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Myrtaceae	<i>Darwinia peduncularis</i>		V		3Ri	Occurs from Hornsby to Hawkesbury River and west to Glen Davies where it grows in dry sclerophyll forest on sandstone hillsides and ridges {Harden, 2002 #5}. Known to occur along watercourses {Benson, 2001 #181}. Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone {Department of Environment and Climate Change, 2007 #1653}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Fabaceae (Faboideae)	<i>Dillwynia tenuifolia</i>		V	V	2Vi	Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite {Harden, 2002 #5}. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include <i>Eucalyptus fibrosa</i> , <i>E. sclerophylla</i> , <i>Melaleuca decora</i> , <i>Daviesia ulicifolia</i> , <i>Dillwynia juniperina</i> and <i>Allocasuarina littoralis</i> {James, 1997 #69}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Fabaceae (Faboideae)	<i>Pultenaea parviflora</i>		E1	V	2E	Restricted to the Cumberland Plain where it grows in dry sclerophyll forest on Wiannamatta shale, laterite or alluvium {Harden, 2002 #5}. Locally abundant within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. Also occurs in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland {NSW National Parks and Wildlife Service, 2002 #82; James, 1997 #69}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Fabaceae (Mimosoideae)	<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	3V	Occurs south of Dora Creek-Morriset area to Berrima and the Illawarra region and west to the Blue Mountains. It grows mainly in heath and dry sclerophyll forest on sandy soils {Harden, 2002 #5}. Seems to prefer open, sometimes disturbed sites such as trail margins and recently burnt areas. Typically occurs in association with <i>Corymbia gummifera</i> , <i>Eucalyptus haemastoma</i> , <i>E. gummifera</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> , <i>Banksia serrata</i> and <i>Angophora bakeri</i> {NSW National Parks and Wildlife Service, 1999 #61}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Fabaceae (Mimosoideae)	<i>Acacia gordonii</i>		E1	E	2K	Occurs in the lower Blue Mountains from Bilpin to Faulconbridge and also in the Glenorie district. Grows on sandstone outcrops and amongst rock platforms in dry sclerophyll forest and heath {Harden, 2002 #5; NSW Scientific Committee, 1997 #298}. Specifically this species occurs in Sydney Sandstone Ridgetop Communities {James, 1997 #69}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Fabaceae (Mimosoideae)	<i>Acacia pubescens</i>	Downy Wattle	V	V	3Va	Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravely soils often with ironstones {Harden, 2002 #5; NSW National Parks and Wildlife Service, 2003 #14}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Myrtaceae	<i>Darwinia biflora</i>		V	V	2Va	Occurs from Cheltenham to Hawkesbury River where it grows in heath on sandstone or in the understorey of woodland on shale-capped ridges {Harden, 2002 #5}. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated over-storey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath {Department of Environment and Climate Change, 2008 #1913}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Myrtaceae	<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	V	V	2Vi	Occurs from Tomago to the Royal National Park where it grows in coastal shrub heath in sandy soils on sandstone {Harden, 2002 #5}.	Low No suitable habitat exists from the study area for this species.
Myrtaceae	<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	3V	Occurs from Niangala to Glenn Innes where it grows in grassy sclerophyll woodland on shallow relatively infertile soils on shales and slates (Harden, 1991; DLWC, 2001). Endemic on the NSW Northern Tablelands, of limited occurrence, particularly in the area from Walcha to Glen Innes; often on porphyry or granite (Brooker and Kleinig 1999).	Low No suitable habitat exists from the study area for this species.
Myrtaceae	<i>Eucalyptus scoparia</i>		E1	V	2Vi	Occurs in Queensland and reaches its southern limit in NSW. In NSW it is known from three locations all near Tenterfield in the far northern New England Tableland Bioregion where it grows on well drained granitic hilltops, slopes and outcrops, often as scattered trees in open forest and woodland {Royal Botanic Gardens, 2004 #9}.	Low No suitable habitat exists from the study area for this species.
Myrtaceae	<i>Leptospermum deanei</i>		V	V	2V	Only occurs near the watershed of Lane Cove River where it grows on forested slopes {Harden, 2002 #5}. Woodland on lower hills and slopes or near creeks, sandy alluvial soil or sand over sandstone. Occurs in Riparian Scrub- e.g. <i>Tristaniopsis laurina</i> , <i>Baechea myrtifolia</i> , Woodland- e.g. <i>Eucalyptus haemstoma</i> and Open Forest - e.g. <i>Angophora costata</i> , <i>Leptospermum trinervium</i> and <i>Banksia ercifolia</i> .	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Myrtaceae	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	V	3Ri	Occurs between Buladelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea {Harden, 2002 #5}. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities {Department of Environment and Climate Change, 2008 #1913}.	Low No suitable habitat exists from the study area for this species.
Orchidaceae	<i>Pterostylis gibbosa</i>		E1	E	2E	Occurs in the southern part of the Central Coast region with a disjunct population in the Hunter Valley. Grows among grass in sclerophyll forest {Harden, 2002 #5}. In the Illawarra it grows in Coastal Grassy Red Gum Forest and in Lowland Woollybutt-Melaleuca forest {NSW National Parks and Wildlife Service, 2003 #73}.	Low No suitable habitat exists from the study area for this species.
Orchidaceae	<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E		Known now only from Freemans Reach to Picton district. Grows in Sydney Sandstone Gully Forest in shallow or skeletal soils over sandstone shelves, often near streams {Harden, 1993 #4; James, 1997 #69; Department of Environment and Climate Change, 2007 #1653}	Low No suitable habitat exists from the study area for this species.
Polygonaceae	<i>Persicaria elatior</i>	Tall Knotweed	V	V	3V	Occurs infrequently in coastal regions where it grows in damp places especially beside streams and lakes. Also occasionally occurs in swamp forest or associated with disturbance {Department of Environment and Conservation, 2005 #762; Harden, 2000 #2}.	Low No suitable habitat exists from the study area for this species.
Proteaceae	<i>Grevillea parviflora</i> ssp. <i>parviflora</i>	Small-flower Grevillea	V	V		Mainly known from the Prospect area (but now extinct there) and lower Georges River to Camden, Appin and Cordeaux Dam areas, with a disjunct populations near Putty, Cessnock and Cooranbong. Grows in heath or shrubby woodland in sandy or light clay soils usually over thin shales {NSW Scientific Committee, 1998 #78; Harden, 2002 #5}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Proteaceae	<i>Persoonia bargoensis</i>		E1	V	2V	Grows in woodland to dry sclerophyll forest, on sandstone and laterite. Restricted to the Bargo area {Harden, 2002 #5}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Proteaceae	<i>Persoonia glaucescens</i>	Mittagong Geebung	E1	V	2V	Occurs from Picton to Berrima where it grows in woodland to dry sclerophyll forest on sandstone {Harden, 2002 #5} ridge-tops, plateaux and upper slopes. Prefers the interface between Lucas Heights and the Hawkesbury and Gynea Soil Landscapes. Commonly associated canopy species are <i>Corymbia gummiifera</i> , <i>Eucalyptus sieberi</i> and <i>E. sclerophylla</i> as well as <i>E. pauciflora</i> {NSW National Parks and Wildlife Service, 2000 #102}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Proteaceae	<i>Persoonia hirsuta</i>		E1	E	3Ki	Occurs in central coast and central tableland districts where it grows in woodland to dry sclerophyll forest on sandstone {Harden, 2002 #5} and rarely shale {NSW Scientific Committee, 1998 #64}. Often occurs in areas with clay influence, in the ecotone between shale and sandstone {James, 1997 #69}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Rhamnaceae	<i>Pomaderris brunnea</i>		V	V	2V	Confined to the Colo and Upper Nepean Rivers where it grows in open forest {Harden, 2000 #2}; in western Sydney (Camden to Picton area) known from sandy alluvium on levee and creek banks {James, 1997 #69}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	TSC Act ¹	EPBC Act ³	ROTAP ²	Habitat	Likelihood of occurrence within the study area
Thymelaeaceae	<i>Pimelea spicata</i>		E1	E	3Ei	This species occurs in two disjunct areas: in coastal districts from Lansdowne to Shellharbour, and in Cumberland Plain Woodland inland to Penrith. In western Sydney it grows on Wianamatta Shales in Greybox - Ironbark Woodland with <i>Bursaria spinosa</i> and <i>Themeda australis</i> . In the Illawarra, it occurs on well structured clay soils in grassland or open woodland (NSW National Parks and Wildlife Service, 2000 #75; Harden, 2000 #2; James, 1997 #69).	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.
Tremandraceae	<i>Tetratheca glandulosa</i>		V	V	2V	Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub (Harden, 1992 #3). Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridge tops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridge top Woodland (Map Unit 10ar). Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae (Department of Environment and Climate Change, 2008 #1913).	Low Targeted surveys have been undertaken for this species which failed to detect this species within the study area. No impact assessment is considered to be warranted for this species.

1) V= Vulnerable, E1 = Endangered (TSC Act) E2= Endangered Population **2)** ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. 1 = Species only known from one collection. 2 = Species with a geographic range of less than 100km in Australia. 3 = Species with a geographic range of more than 100km in Australia, X = Species presumed extinct; no new collections for at least 50 years. E = Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate, V = Vulnerable species at risk of long-term disappearance through continued depletion. R = Rare, but not currently considered to be endangered. K = Poorly known species that are suspected to be threatened. C = Known to be represented within a conserved area. a = At least 1,000 plants are known to occur within a conservation reserve(s). i = Less than 1,000 plants are known to occur within a conservation reserve(s). The reserved population size is unknown. t = The total known population is reserved. + = The species has a natural occurrence overseas. **3)** V = Vulnerable, E = Endangered (*Environment Protection and Biodiversity Conservation Act 1999*).

Appendix D

Threatened fauna species recorded in the locality

Appendix D Threatened Fauna species recorded in the locality

This appendix details the Threatened species of plant that have either been recorded in the local area based on records the *Atlas of NSW Wildlife* Department of Environment & Heritage, 2018, data received 12th of August 2018 and records from the Royal Botanical Gardens. Threatened species with habitat likely to occur in the locality were also considered based on records from the *EPBC Protected Matters Search Tool* Department of Sustainability, Environment, Water, Population and Communities 2018, data received 12th of August 2018.

Table 7-4 Threatened fauna species recorded in the locality

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Amphibians					
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin, from Wollemi National Park in the north and extending south to Jervis Bay; and a southern population occurring in disjunct pockets from about Narooma south into eastern Victoria. In the northern population there is a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek-lines and along slow flowing to intermittent creek-lines. The vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. They have also been observed occupying artificial ponded structures such as fire dams, gravel 'borrows', detention basins and box drains that have naturalised over time and are still surrounded by other undisturbed habitat. In the southern population, records from Narooma, Bega, Bombala and eastern Victoria appear to be associated with Devonian igneous and sedimentary formations and Ordovician metamorphics and are generally from more heavily timbered areas. However, again there appears to be an association with ridge-tops, headwaters and slow flowing streams. Do not appear to inhabit areas that have been cleared for agriculture or for urban development. Breed in summer and autumn in burrows in the banks of small creeks. Often spends significant periods of time underground during unfavourable conditions and to avoid detection during the day. (Cogger 2000; NSW National Parks and Wildlife Service 2001).	Low No suitable habitat was recorded from the study area for this species.
<i>Litoria littlejohni</i>	Heath Frog	V	V	Distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern Victoria. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats (NSW Scientific Committee 2000).	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Terrestrial species, found in rainforest, Antarctic beech forest or wet sclerophyll forest. The species depends on freshwater streams and riparian vegetation for breeding and habitation. No records are known from riparian habitat that has been disturbed (Cogger 2000; NSW Scientific Committee 2003).	Low No suitable habitat was recorded from the study area for this species.
<i>Mixophyes iteratus</i>	Giant Barred Frog	E1	E	Terrestrial species which occurs in rainforests, antarctic beech or wet sclerophyll forests. Feeds on insects and smaller frogs (Cogger 2000). The species is associated with permanent flowing drainages, from shallow rocky rainforest streams to slow-moving rivers in lowland open forest. It is not known to utilise still water areas (NSW Scientific Committee 1999). More prevalent at lower altitudes and in larger streams than its congeners, although has been recorded up to 1000 metres asl. (NSW National Parks and Wildlife Service 1999).	Low No suitable habitat was recorded from the study area for this species.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		Occurs within 160 km of Sydney where it is restricted to Hawkesbury Sandstone. It breeds in deep grass and debris adjacent to ephemeral drainage lines. When not breeding individuals are found scattered on sandstone ridges under rocks and logs (Cogger 2000).	Low No suitable habitat was recorded from the study area for this species.
Fish					
<i>Macquaria australasica</i>	Macquarie Perch		E	The natural range of Macquarie Perch included the upper and middle reaches of the Murray-Darling basin as well as the Shoalhaven and Hawkesbury Rivers. However, this species has recently been sighted in only a few localities within these river systems. Preferred habitat is deep holes covered with rocks, and spawning occurs above shallow running water. Macquarie Perch is a schooling species (Department of the Environment and Water Resources, 2007).	Low No suitable habitat was recorded from the study area for this species.
<i>Prototroctes maraena</i>	Australian Grayling		V	It is a mid-water, freshwater species that occurs most commonly in clear, gravelly streams with a moderate flow. Prefers deep, slow flowing pools (NSW Fisheries 2004).	Low No suitable habitat was recorded from the study area for this species.
Invertebrates					
<i>Petalura gigantea</i>	Giant Dragonfly	E1		Found in permanent wetlands, both coastal and upland from moss Vale northwards to southern Queensland (Department of Environment and Conservation 2005).	Low No suitable habitat was recorded from the study area for this species.
Birds					
<i>Apus pacificus</i>	Fork-tailed Swift		M	Breeds from central Siberia eastwards through Asia, and is migratory, wintering south to Australia. Individuals never settle voluntarily on the ground and spend most of their lives in the air, living on the insects they catch in their beaks (Higgins 1999).	Low No suitable habitat was recorded from the study area for this species.
<i>Ardea alba</i>	Great Egret		M	Great Egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. In Australia, the breeding season of the Great Egret is normally October to December in the south and March to May in the north. This species breeds in colonies, and often in association with cormorants, ibises and other egrets. (Australian Museum 2003).	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Ardea ibis</i>	Cattle Egret		M	<i>Subspecies A. i. coromanda</i> is found across the Indian subcontinent and Asia as far north as Korea and Japan, and in South-east Asia, Papua New Guinea and Australia (McKiligan 2005).	Low No suitable habitat was recorded from the study area for this species.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens (Pizzey and Knight 1997).	Low No suitable habitat was recorded from the study area for this species.
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		Occurs in eucalypt woodland and forest with Casuarina/Allocasuarina spp. Characteristically inhabits forests on sites with low soil nutrient status, reflecting the distribution of key Allocasuarina species. The drier forest types with intact and less rugged landscapes are preferred by the species. Nests in tree hollows (NSW National Parks and Wildlife Service 1999; Garnett and Crowley 2000).	Low No suitable habitat was recorded from the study area for this species.
<i>Ninox strenua</i>	Powerful Owl	V		A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, casuarina or callitris pine forest and woodland. It often roosts in dense vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands (Garnett and Crowley 2000).	Low/Medium Suitable habitat for this species was recorded from the subject site. Despite this no individuals were recorded during targeted surveys.
<i>Tyto tenebricosa</i>	Sooty Owl	V		Occurs in wet eucalypt forest and rainforest on fertile soils with tall emergent trees. Typically found in old growth forest with a dense understorey but also occurs in younger forests if nesting trees are present nearby. It nests in large hollows within eucalypts and occasionally caves. It hunts in open and closed forest for a range of arboreal and terrestrial mammals including introduced species and sometimes birds (Garnett and Crowley 2000).	Low No suitable habitat was recorded from the study area for this species.
<i>Climacteris picumnus</i>	Brown Treecreeper	V		Occurs in eucalypt woodland and adjoining vegetation. Feeds on ants, beetles and larvae on trees and from fallen timber and leaf litter. Usually nests in hollows (Garnett and Crowley 2000).	Low No suitable habitat was recorded from the study area for this species.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1		Require sparsely grassed, lightly timbered, open forest of woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. Feed on a range of invertebrates and small vertebrates, as well as seeds and shoots (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	Low No suitable habitat was recorded from the study area for this species.
<i>Hieraaetus morphnoides</i>	Little Eagle	V		The little eagle is a medium sized bird, the Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia Woodlands of interior NSW are also used. Nest in tall living trees within a remnant patch, where pairs build a large nest stick nest in winter.	Low No suitable habitat was recorded from the study area for this species.
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V		Habitat; woodlands and dry open sclerophyll forest usually dominated by eucalypts including mallee associations. It has been recorded from shrublands and heathlands and various forms of modified habitat including regenerating forest and very occasionally in moist forest and rainforests.	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1		Require sparsely grassed, lightly timbered, open forest of woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. Feed on a range of invertebrates and small vertebrates, as well as seeds and shoots {NSW National Parks and Wildlife Service, 1999 #53; NSW National Parks and Wildlife Service, 2003 #54}.	Low No suitable habitat was recorded from the study area for this species.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V		Found in dry eucalypt woodland particularly those containing ironbark and box. Occurs within areas of annual rainfall between 400-700 mm. Feed on insects, nectar and lerps {Garnett, 2000 #21}.	Low/Medium A targeted survey was undertaken for this species which failed to detect this species within the study area.
<i>Petroica phoenicea</i>	Flame Robin	V		Breeds in upland tall moist eucalypt forest and woodland often on ridges and slopes. Prefers clearing or areas with open understorey. The groundlayer of breeding habitat is dominated by native grasses and shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest and also in herb fields heathlands shrublands and sedgeland in high altitudes.	Low No suitable habitat was recorded from the study area for this species.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Low No suitable habitat was recorded from the study area for this species.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards	Low No suitable habitat was recorded from the study area for this species.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	M	Occurs in coastal areas including islands, estuaries, inlets, large rivers, inland lakes and reservoirs. Builds a huge nest of sticks in tall trees near water, on the ground on islands or on remote coastal cliffs (Pizzey and Knight 1997).	Low No suitable habitat was recorded from the study area for this species.
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April (Pizzey and Knight 1997).	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Lathamus discolor</i>	Swift Parrot	E1	E	Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Daringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering <i>Acacia pycnantha</i> , is indicated. Sites used vary from year to year. (Garnett and Crowley 2000),(Swift Parrot Recovery Team 2001).	Low No suitable habitat was recorded from the study area for this species.
<i>Merops ornatus</i>	Rainbow Bee-eater		M	Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings (Higgins 1999).	Low No suitable habitat was recorded from the study area for this species.
<i>Monarcha melanopsis</i>	Black-faced Monarch		M	Occurs in rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest and in more open woodland when migrating (Pizzey and Knight 1997).	Low/Medium A targeted survey was undertaken for this species which failed to detect this species within the study area.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Occurs in heavily vegetated gullies, in forests and taller woodlands. During migration it is found in coastal forests, woodlands, mangroves, trees in open country and gardens (Pizzey and Knight 1997).	Low A targeted survey was undertaken for this species which failed to detect this species within the study area.
<i>Stagonopleura guttata</i>	Diamond Firetail	V		Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee. Most populations occur on the inland slopes of the dividing range. Feed on seeds, mostly of grasses {Garnett, 2000 #21}.	Low A targeted survey was undertaken for this species which failed to detect this species within the study area
<i>Lophoictinia isura</i>	Square-tailed Kite	V		This species hunts primarily over open forest, woodland and mallee communities as well as over adjacent heaths and other low scrubby habitats in wooded towns. It feeds on small birds, their eggs and nestlings as well as insects. Seems to prefer structurally diverse landscapes (Garnett and Crowley 2000).	Low/Medium A targeted survey was undertaken for this species which failed to detect this species within the study area.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	V		Occurs in a wide range of eucalypt dominated vegetation with a grassy understorey and is often found on rocky ridges or in gullies. It feeds on seeds and insects and builds domed nests on the ground {Garnett, 2000 #21}.	Low A targeted survey was undertaken for this species which failed to detect this species within the study area
<i>Petroica boodang</i>	Scarlet Robin	V		The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	Low A targeted survey was undertaken for this species which failed to detect this species within the study area.
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range (Pizzey and Knight 1997).	High This species was not recorded during recent surveys however was recorded by UBM (2014).
<i>Melanodryas cucullata</i>	Hooded Robin	V		Found in south-eastern Australia, generally east of the Great Dividing Range. Found in eucalypt woodland and mallee and acacia shrubland. This is one of a suite of species that has declined in woodland areas in south-eastern Australia {Traill, 2000 #42; Garnett, 2000 #21}.	Low A targeted survey was undertaken for this species which failed to detect this species within the study area
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E1	EM	Occurs mostly in box-ironbark forests and woodland and prefers the wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with <i>Casuarina cunninghamiana</i> and <i>Amyema cambagei</i> are important for feeding and breeding. Important food trees include <i>Eucalyptus sideroxylon</i> (Mugga Ironbark), <i>E. albens</i> (White Box) , <i>E. melliodora</i> (Yellow Box) and <i>E. leucoxylo</i> (Yellow Gum) (Garnett and Crowley 2000).	Low No suitable habitat was recorded from the study area for this species.
Invertebrates					
<i>Meridolum carneovirens</i>	Cumberland Plain Land Snail	E1		Restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. It is typically found under logs and other debris, amongst leaf litter and bark around bases of trees. It is also sometimes found under grass clumps and where possible it will burrow into loose soil {NSW National Parks and Wildlife Service, 1999 #41}.	Low No suitable habitat was recorded from the study area for this species.
Mammals					
<i>Bettongia gaimardi</i>	Tasmanian Bettong	E4	X	<i>Bettongia gaimardi</i> is found in terrestrial, temperate habitats including grasslands, grassy woodlands, dry eucalyptus forests, and sclerophyll forests (i.e., forests containing plants with hard, short and usually spiky leaves). This species is found from sea level to elevations around 1,000 m.	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Occurs in moderately wooded habitats and roosts in caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins. Thought to forage below the forest canopy for small flying insects (Churchill 1998).	Low/Medium Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service 1999). Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large un-fragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 1999).	Low No suitable habitat was recorded from the study area for this species.
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high (Churchill 1998).	Low/Medium Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
<i>Phascolarctos cinereus</i>	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum <i>Eucalyptus tereticornis</i> , Grey Gum <i>E. punctata</i> , Monkey Gum <i>E. cypellocarpa</i> and Ribbon Gum <i>E. viminalis</i> . In coastal areas, Tallowwood <i>E. microcorys</i> and Swamp Mahogany <i>E. robusta</i> are important food species, while in inland areas White Box <i>E. albens</i> , Bimble Box <i>E. populnea</i> and River Red Gum <i>E. camaldulensis</i> are favoured (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	Low A targeted survey was undertaken for this species which failed to detect this species within the study area.
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		Found in a range of habitats from rainforest through sclerophyll forest to tree heath. It feeds largely on the nectar and pollen of banksias, eucalypts and bottlebrushes and sometimes soft fruits. It nests in very small tree holes, between the wood and bark of a tree, abandoned birds nests and shredded bark in the fork of trees (Turner, 1995 #25).	Low No suitable habitat was recorded from the study area for this species.
<i>Isodon obesulus</i>	Southern Brown Bandicoot	E1	E	Occurs in a variety of habitats in south-eastern Australia, including heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland and woodland. Many of the habitats are prone to fire (NSW National Parks and Wildlife Service 1999).	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Miniopterus schreibersii</i>	Eastern Bent-wing Bat	V		Usually found in well timbered valleys where it forages on small insects above the canopy. Roosts in caves, old mines, stormwater channels and sometimes buildings and often return to a particular nursery cave each year (Churchill 1998).	High This species was recorded previously recorded within the subject property by UBM (2014). An Impact Assessment has been prepared for this species (Appendix E).
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It has a preference for rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres (NSW National Parks and Wildlife Service 2003).	Low No suitable habitat was recorded from the study area for this species.
<i>Phascolarctos cinereus</i>	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum <i>Eucalyptus tereticornis</i> , Grey Gum <i>E. punctata</i> , Monkey Gum <i>E. cypellocarpa</i> and Ribbon Gum <i>E. viminalis</i> . In coastal areas, Tallowwood <i>E. microcorys</i> and Swamp Mahogany <i>E. robusta</i> are important food species, while in inland areas White Box <i>E. albens</i> , Bimble Box <i>E. populnea</i> and River Red Gum <i>E. camaldulensis</i> are favoured (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	Low No suitable habitat was recorded from the study area for this species.
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Disjunct distribution along coastal south-east Australia from near Gladstone in Queensland, to south-west Victoria and in Tasmania. Found from sea level up to 1500 metres in altitude generally in areas with rainfall greater than 760 millimetres. In NSW, it is found throughout coastal and sub-coastal areas. Occurs in a range of habitats: coastal forest and woodland with a moderately dense heathy understorey, dense coastal scrubs or heath, wet and dry sclerophyll forest and sub-tropical, warm temperate and cool temperate rainforest of the eastern slopes and highlands. Often associated with gullies and forest ecotones. Open areas are used for foraging while areas of dense groundcover or understorey provide areas for shelter and protection from predators. Relatively thick ground cover is a major habitat requirement and it seems to prefer areas with light sandy soils. Feeds at dusk on roots, tubers, fungi, insects and their larvae and other soft bodied animals in the soil. Moves up and down slope as food resources become seasonally available (Johnston 1995; NSW National Parks and Wildlife Service 1999).	Low No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Pseudomys fumeus</i>	Smoky Mouse	E1	E	The Smoky Mouse is currently limited to a small number of sites in western, southern and eastern Victoria, south-east NSW and the ACT. In NSW there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. The Smoky Mouse appears to prefer heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria) to sub-alpine regions of up to 1800 metres, but sometimes occurs in ferny gullies. Seeds and fruits from leguminous shrubs form the main summer and autumn diet, with some invertebrates, e.g., Bogong Moths in the high country. Hypogeal (truffle-like) fungi dominate in winter and spring, with some flowers, seeds and soil invertebrates. May occur singly, as pairs or small communal groups based around patches of heath, sometimes comprising a male and up to five females sharing a burrow system. Breeding is in spring with one or two litters produced of up to four young. Nesting burrows have been found in rocky localities among tree roots and under the skirts of Grass Trees <i>Xanthorrhoea</i> spp. The persistence of colonies appears to be very ephemeral. It is not known how much this is due to natural fluctuations in food availability, but predation from feral carnivores appears to be implicated.	Low No suitable habitat was recorded from the study area for this species.
<i>Petauroides volans</i>	Greater Glider	V		The Greater Glider inhabits Eucalyptus forests and woodlands as this species feeds exclusively on Eucalyptus buds and leaves. They occupy tree hollows in the day and tree canopies at night (Department of Environment and Climate Change 2007).	Low No suitable habitat was recorded from the study area for this species.
<i>Petaurus australis</i>	Yellow-bellied Glider	V		Restricted to tall, mature eucalypt forest in high rainfall areas of temperate to sub-tropical eastern Australia. Feeds on nectar, pollen, the sap of eucalypts and sometimes insects. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows and year round food resources are available from a mixture of eucalypt species {NSW National Parks and Wildlife Service, 1999 #44; NSW National Parks and Wildlife Service, 2003 #45}.	Low No suitable habitat was recorded from the study area for this species.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species. Feeds on the flowers and nectar of eucalypts and native fruits including lilly pillies. It roosts in the branches of large trees in forests or mangroves (Churchill 1998; NSW National Parks and Wildlife Service 2001).	Low/Medium Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		Thought to live in sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge (Churchill 1998).	High This species was recorded previously recorded within the subject property by UBM (2014). An Impact Assessment has been prepared for this species (Appendix E).

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
<i>Myotis adversus</i>	Large-footed Myotis	V		Colonies occur in caves, mines, tunnels, under bridges and buildings. Colonies always occur close to bodies of water where this species feeds on aquatic insects (Churchill 1998).	Low/Medium Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V		Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts in tree hollows. Thought to be a migratory species (Churchill 1998).	Low/Medium Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings (Churchill 1998).	High This species was recorded previously recorded within the subject property by UBM (2014). An Impact Assessment has been prepared for this species (Appendix E).
Reptiles					
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	A nocturnal species that occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb and Shine 1994; Webb and Shine 1998).	Low No suitable habitat was recorded from the study area for this species.

1) V= Vulnerable, E1 = Endangered (TSC Act) E2= Endangered Population 2) ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. 1 = Species only known from one collection. 2 = Species with a geographic range of less than 100km in Australia. 3 = Species with a geographic range of more than 100km in Australia, X = Species presumed extinct; no new collections for at least 50 years. E = Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate, V = Vulnerable species at risk of long-term disappearance through continued depletion. R = Rare, but not currently considered to be endangered. K = Poorly known species that are suspected to be threatened. C = Known to be represented within a conserved area. a = At least 1,000 plants are known to occur within a conservation reserve(s). i = Less than 1,000 plants are known to occur within a conservation reserve(s). The reserved population size is unknown. t = The total known population is reserved. + = The species has a natural occurrence overseas. 3) V = Vulnerable, E = Endangered (Environment Protection and Biodiversity Conservation Act 1999).

Appendix E

TSC Assessments of Significance

Assessment of Significance

Section 5A of the EPA Act (1979) requires that the consent authority take into account seven factors when deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. If a significant impact is judged likely to occur, a Species Impact Statement (SIS) is required.

In most instances, the consent authority is Council. In certain circumstances, where a higher level assessment is triggered, concurrence from the Office of Environment and Heritage may be required.

Some terms require definition for the assessment and departmental guidelines have been used (*Threatened Species Assessment Guidelines – the assessment of significance* DECC 2007).

The “subject site” is defined as the area directly affected by the proposal.

The “study area” is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area extends as far as is necessary to take all potential impacts into account.

The “local occurrence” of a community is that which occurs in the study area or beyond to include those areas where the movement of individuals and genetic exchange can be demonstrated

The “risk of extinction” is the likelihood that the local occurrence of the community will become extinct in either the short or long term as a result of direct or indirect impacts arising from the proposal.

The “composition” of the community includes both plant and animal species as well as its physical structure

The following 7 part test of significance relies on the ecological assessment provided in Sections 2 & 3, & Appendices C & D above and should be read as such. It is considered that the study area provides potential habitat for the following threatened species and will be assessed accordingly in the following seven-part test:

Species Name		Conservation Status	
		State ¹	National ²
Threatened Fauna			
Bird			
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	
<i>Ninox strenua</i>	Powerful Owl	V	
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	
Mammals			
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	
<i>Miniopterus schreibersii</i>	Eastern Bent-wing Bat	V	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V	
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	

The '7 part test of significance' is as follows.

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

Detailed flora investigations of the study area, together with habitat assessments and targeted surveys, have resulted in the identification of potential habitat for a variety of threatened species. An assessment of these species is as follows:

Gang-gang Cockatoo (*Callocephalon fimbriatum*)

The Gang-gang Cockatoo is associated with a variety of woodland and forest habitats, and occasionally more open areas in south-eastern New South Wales and Victoria. This species has been observed in eucalypt forests and exotic trees, and is known to feed on the seeds of native shrubs and trees, in addition to some exotic species such as the Hawthorn and Cupressus species. The Gang-gang Cockatoo nests in hollows in large, dead trees.

The subject site contains suitable foraging habitat for this species. This species was not recorded during the site survey. The surrounding area contains extensive amounts of high quality foraging habitat for this species. Therefore, it is considered that the proposal is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

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

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 (Crowley and Garnett 2001). They breed in hollow trees or stumps usually in Eucalypts. It is considered that potential foraging habitat exists from the subject site due to the occurrence of *casuarina* sp. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Glossopsitta pusilla* (Little Lorikeet)**

Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland (McAlpine, Heyenga et al. 2007), Little Lorikeets were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively. They are also reported as feeding on fruits, particularly those of

mistletoes (Higgins and Peter 2002). Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

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

The Powerful Owl inhabits mature rainforest and wet and dry eucalypt forest utilising Eucalypt forests and woodlands and adjacent cleared areas for foraging. Large trees with hollows at least 0.5m deep are required for shelter and breeding (Department of Environment and Conservation 2005). Mated pairs of Powerful Owl roost together or separately, maintaining several roost sites throughout their territory which are used in rotation shifting with the availability of prey. This species was recorded during the targeted surveys. It is considered that the subject site provides marginal foraging habitat for this species. No suitable nesting/roosting sites. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Chalinolobus dwyeri* (Large-eared Pied Bat)**

It is probable that the Large-eared Pied Bat forages for insects below the forest canopy. During the day these bats may roost in caves, mine tunnels and the abandoned nests of Fairy Martins (Hoye and Dwyer 1998). The Large-eared Pied Bat may also utilise tree hollows (Schultz, Coles et al. 1999). The Large-eared Pied Bat is mainly found in drier habitat including dry sclerophyll and woodland, east and west of the Great Dividing Ranges. However Hoye (Hoye and Dwyer 1998) suggest that from records of the species in subalpine woodland, moist eucalypt forest and near rainforest, it may tolerate a greater range of habitats. The distribution of this bat ranges from inland and south-eastern QLD to central-eastern and north-eastern NSW. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Falsistrellus tasmaniensis* (Eastern False Pipistrelle)**

The Eastern False Pipistrelle usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Miniopterus schreibersii* (Eastern Bent-wing Bat)**

The Eastern Bentwing-bat is confined to areas where there are caves with potential temperature, humidity and physical dimensions to permit breeding. This species occupies a range of habitats, mainly near the coast and utilises caves, old mines, stormwater channels, under bridges and occasionally buildings for roosting. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area,

the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

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

The Grey-headed Flying-fox is found in a variety of habitats including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas (Churchill 2008). Grey-headed Flying Foxes congregate in large camps of up to 200,000 individuals, depending on availability of surrounding blossoming plants, from early until late summer (Churchill 2008). Camps are commonly formed in gullies, typically not far from water and in vegetation with a dense canopy. Roost sites are an important resource where mating, birth and rearing of young occurs as well as providing refuge (Strahan 1995) These bats eat the fruit or blossoms of more than 80 species of plants. Their major food source is eucalypt blossom and native fruits from a variety of tree species. Native figs (*Ficus spp*) account for a large percentage of the fruit eaten. They are also known to rain orchids of cultivated fruit. The Grey headed Flying-fox has a nightly feeding range of 20 to 50km from their camp (Churchill 2008).

It is considered that the study area provides potential foraging habitat for this species. The proposal is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

***Mormopterus norfolkensis* (Eastern Freetail-bat)**

The Eastern Freetail-bat forages above and within the canopy of open forests and woodlands, feeding on small insects. The Eastern Freetail-bat is thought to roost predominantly in tree hollows and occasionally in buildings. It is considered that the study area provides potential foraging habitat for this species. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)**

The Yellow-bellied Sheathtail-bat inhabits open country, mallee, eucalypt forests, rainforests, heathland and water bodies. The Yellow-bellied Sheathtail-bat roosts in tree hollows and has been found inhabiting the abandoned nests of Sugar Gliders. It is considered that the study area provides potential foraging habitat for this species. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Scoteanax rueppellii* (Greater Broad-nosed Bat)**

The Greater Broad-nosed Bat inhabits open forests and woodlands, foraging throughout these forest types and also along creeks and small river systems. This species roosts in tree hollows and occasionally old buildings. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

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

No endangered populations were identified from the desktop review to occur within the locality of the study area.

Therefore it is considered that the action proposed is not likely to have an adverse effect on the life cycle of these species that constitute the endangered populations such that a viable local population of these species is likely to be placed at risk of extinction.

- c) In the case of a critically endangered or endangered ecological community, whether the action proposed:**

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

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

N/A

- d) In relation to the habitat of threatened species, populations or ecological community:**

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

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

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

Response:

i.) The proposal will entail the disturbance/modification of 2.046ha of Cleared land with scattered trees and 2ha of DSF P146: Sydney Hinterland Transition Woodland (Under-scrubbed/remnant canopy) which provides foraging habitat for threatened fauna species.

ii.) Despite this the proposal will not fragment or isolate currently connected areas of habitat. Connectivity of vegetation across the study area will remain connected to surrounding lands.

All threatened fauna species which are potentially to be impacted upon are highly mobile and capable of flight and movement across large distances and would not utilise the habitats within the study area exclusively.

Therefore, it is considered that known habitat for a threatened species within the local area and the region are unlikely to become isolated or fragmented as a result of the proposal, as such it is considered that the proposal is unlikely to create an important impact on the long-term survival of threatened species in the locality and is not considered to be significant.

Response:

The redevelopment of the site will not further isolate the community from other areas of habitat. The habitats within the subject area already highly fragmented subject lot is predominantly cleared as a result of the existing use and are surrounded by barriers such as main roads and other residences that intervene between existing areas of habitat. These areas are, however, functionally connected by highly mobile keystone species such as bird and bat pollinators and will remain so in the post development landscape.

Response:

The habitat to be removed is of poor/moderate quality due to its small size, location within a rural property, highly modified understorey and many of the trees are in poor condition. It cannot of itself be considered to be important to the long term survival of the community in the local area.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

The site has not been identified as critical habitat within the provisions of the *TSC Act* (1995).

Therefore this matter does not require any further consideration.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Recovery Plans have been prepared for the following species:

- Grey-headed Flying-fox.

The proposed development is generally consistent with the objectives or actions listed in the priority action statements for the aforementioned species.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposal is likely to entail or perpetuate the following key threatening process (KTP) under the *TSC Act* within the site.

- Infection of native plants by *Phytophthora cinnamomi*.
- Human Caused Climate Change.

Conclusion

The proposal will entail the disturbance/modification of DSF P146: Sydney Hinterland Transition Woodland (Under-scrubbed/remnant canopy) which provides (habitat) for threatened species.

Critical habitat will not be affected and the proposal will not interfere with the recovery actions for threatened species. The impact to habitats for threatened species, endangered populations & endangered ecological communities from the locality is not considered to be significant.