Attachment 4
to
Item 2.1.1

Flora and Fauna Assessment Report – 79, 95 and 100 Bells Lane & 457 Bells Line of Road, Kurmond NSW (Dated: 17/09/2019, Reference: 19 – 8216 – A)

Date of meeting: 17 August 2023
Location: By audio-visual link
Time: 10:00 a.m.

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FLORA AND FAUNA ASSESSMENT REPORT

79, 95 and 100 Bells Lane

& 457 Bells Line of Road

KURMOND NSW

PREPARED FOR: Mr I & Mrs J Hopkins; Mr W & Mrs L Attard

OUR REFERENCE: 19 – 8216 - A

ISSUE DATE: 17 / 09 / 2019

CONTROLLED DOCUMENT

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19 – 8216 - A	A	17 / 09 / 2019

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Executive Summary

This report describes the biological environment of 79, 95 and 100 Bells Lane & 457 Bells Line of Road, Kurmond NSW and assesses the potential effects on threatened and migratory species, endangered populations and ecological communities of the proposed Gateway Determination. The report is to satisfy a condition of the Gateway Determination issued by NSW Planning and Environment on 23 June 2018 for the re-zoning and sub-division of the above-mentioned properties into a total of sixteen residential blocks of varying sizes.

A desktop search for threatened species within a 10 km radius of the site was generated, and a flora and fauna assessment were undertaken to ascertain if any threatened species were on site or might use the site. The critically endangered ecological community Shale Sandstone Transition Forest was mapped as being on the four sites, a large area will be retained along the riparian habitat, and some areas of this community were assessed as being in a degraded condition. A SEPP 44 assessment concluded the site should be classed as potential koala habitat.

No other threatened species, threatened populations or threatened ecological communities listed on the schedules of the *Threatened Species Conservation Act* 1995 *(Interim for the Biodiversity Conservation Act* 2016), or the *Environment Protection and Biodiversity Conservation Act* 1999 were recorded in the study area.

Following the application of the seven factors from Section 5A of the *Environmental Planning and Assessment Act* 1979, as required by the *Threatened Species Conservation Act* 1995*,* in accordance with relevant assessment guidelines, it is concluded that the proposal is unlikely to have a significant effect on threatened species, endangered populations, ecological communities, or their habitats. A Species Impact Statement is not required for the proposal.

Following consideration of the administrative guidelines for determining significance under the *Commonwealth Environment Protection & Biodiversity Conservation Act* 1999, it is concluded that the proposal is unlikely to have a significant impact on matters of National Environmental Significance or Commonwealth land, and a referral to the Commonwealth Environment Minister is not necessary.

Several impact mitigation and amelioration strategies have been recommended for the proposal. These strategies would mitigate the effects of future development proposal on threatened species, endangered populations, ecological communities, or their habitats and minimise the impacts of the proposal on the flora and fauna values of the study area in general.

Additional field survey was conducted by Michelle Evans on 12 August 2019 to address Council requirements as identified in their letter dated 15 April 2019.

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CERTIFICATION

The results presented in this report are a true and accurate record. Flora and fauna investigations have been prepared in consideration of the schedules and requirements of the *Threatened Species Conservation Act* 1995 and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999. The results of this survey report are available to the public for future use and have been supplied to the NSW Department of Planning, Industry and Environment for inclusion in the *Atlas of NSW Wildlife Database.*

Survey and assessment of threatened biodiversity has been undertaken by an experienced and qualified environmental scientist. Michelle Evans has extensive experience with flora and fauna surveys and the interpretation of conservation significance in NSW. Michelle holds a scientific license issued under s132C of the *National Parks and Wildlife Act* 1974.

DEFINITIONS

Activity	A project, development, undertaking, activity or series of activities, or an alteration of any of these things.
AHD	Australian Height Datum
TSC Act	NSW *Threatened Species Conservation Act 1995*
BoM	Bureau of Meteorology
cm	Centimeter
DCP	Development Control Plan
DoE	Department of Environment
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GDA	Geocentric Datum of Australia
Habitat	An area occupied, whether periodically or constantly by a species, population or ecological community.
ha	Hectare
km	Kilometer
LEP	Local Environmental Plan
LGA	Local Government Area
m	Meter
MGA	Map Grid of Australia
mm	Millimeter
NSW DPIE	NSW Department of Planning, Industry and Environment
SEPP	State Environmental Planning Policy
Site	The area of the property on which the proposed development would occur.
Study Area	The properties of 79, 95 and 100 Bells Lane, Kurmond and 457 Bells Line of Road, Kurmond and adjacent properties, including areas which would reasonably impact or be impacted by the proposed development.
Threatened Biodiversity	Threatened species, populations, ecological communities or their habitats.
Vegetation Community	An assemblage of native flora species known to occur in association as a result of topography, soil landscape and rainfall.

1. Introduction

EnviroTech Pty LTD (EnviroTech) has been engaged by Montgomery Planning Solutions (MPS) to prepare a prepare a Flora and Fauna assessment for 79, 95 and 100 Bells Lane and 457 Bells Line of Road, Kurmond NSW (hereafter the Subject Sites). This report assessed the presence of threatened ecological communities, populations or species, as well as habitat for threatened flora and fauna. It is written in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979, *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*. The present report has been prepared to satisfy a condition of the Gateway Determination issued by NSW Planning and Environment on 23 June 2018 for the re-zoning and sub-division of the above-mentioned properties into a total of eighteen residential blocks of varying sizes.

2. Aims

The aim of this report is to produce a flora and fauna assessment to:

- Assess the ecological resources of the study site;
- Fulfil the requirements of the *Environmental Planning and Assessment Act* 1979 (EP&A Act)*;*
- To assess the impact of the development on matters of conservation significance;
- Assess the potential for threatened flora and fauna species and Threatened Ecological Communities (TECs) to occur within the study site which may be listed under commonwealth and state legislation;
- Suggest measures, which may alleviate the disturbance, in alignment with the NSW *Biodiversity conservation Act 2016 (BC Act),* and the *Environmental Conservation and Biodiversity Act 1999* (EPBC Act).

The specific objectives of the report are to:

- Conduct a database search of the study site;
- Plan and undertake field surveys, designed in accordance with the *Working Draft Threatened Biodiversity Assessment Guidelines for Developments and activities* 2004;
- Identify habitat for threatened species on the study site that are listed in the schedules of the BC Act and the EPBC Act that are known or are likely to occur in the study area;
- Undertake a Test of Significance in accordance with the BC Act and Significant Impact Assessment in accordance with the EPBC Act for threatened communities, populations and species that might be impacted by the proposal, either directly or indirectly;
- Undertake an assessment for SEPP 44, and,
- Provide recommendations to mitigate the impacts of the proposed action.

3. Project Context

The present assessment applies to four properties (subject sites) as listed in Table 1 and shown in Figure 1.

Table 1: Subject Sites

	Subject Site			
	Site 1	Site 2	Site 3	Site 4
Address	79 Bells Lane, Kurmond NSW 2757	95 Bells Lane, Kurmond NSW 2757	100 Bells Lane, Kurmond NSW 2757	457 Bells Line of Road, Kurmond NSW 2757
Lot/DP	Lot 38 in DP7565	Lot 12 in DP11049	Lot 50 in DP7565	Lot 31 in DP7565
Zoning [A]	RU1 – Primary Production	RU1 – Primary Production	RU1 – Primary Production	RU1 – Primary Production
Local government area	Hawkesbury City Council			

A – As per the Hawkesbury LEP 2012

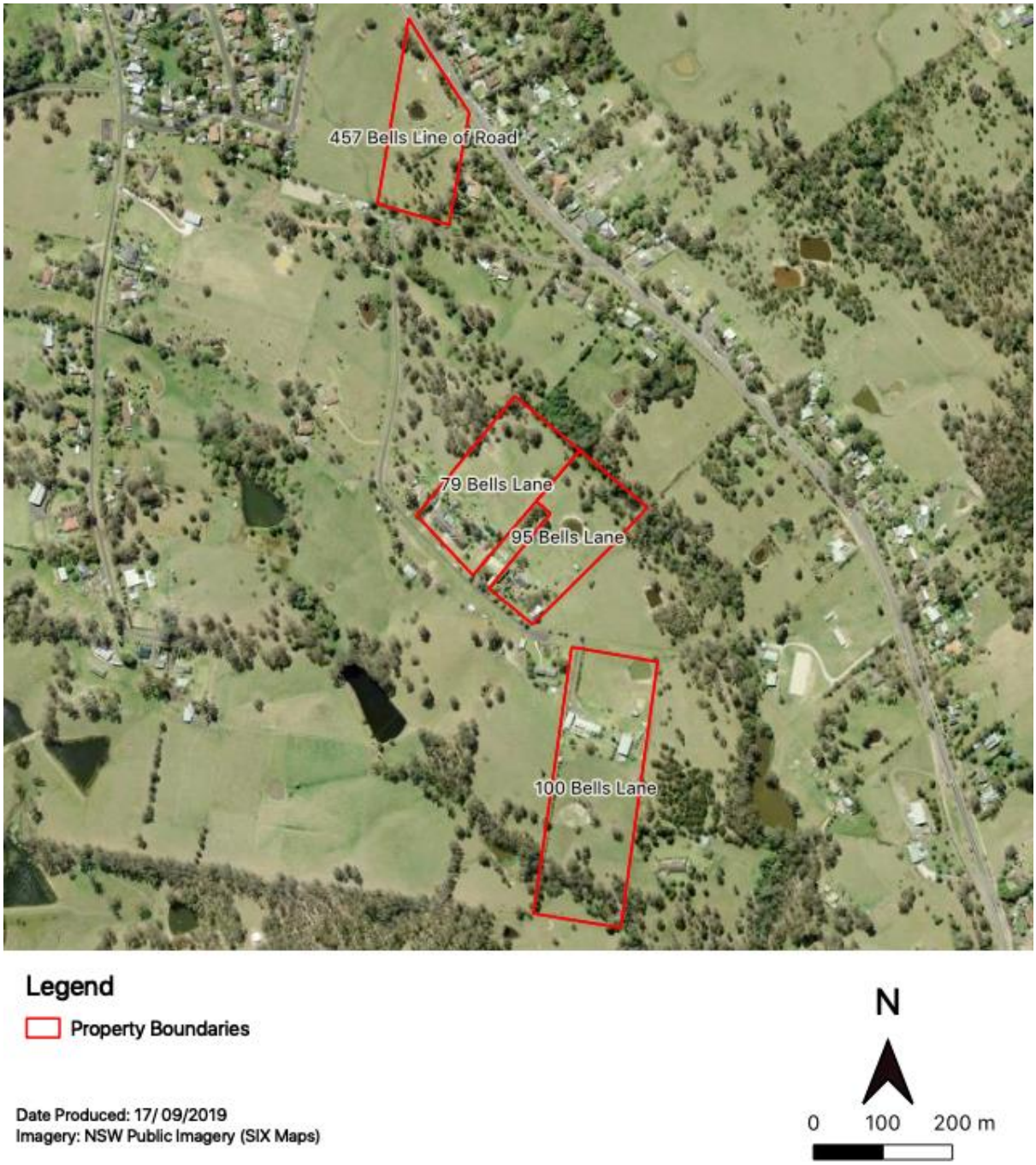


Figure 1: Aerial Map of 79, 95 and 100 Bells Lane and 457 Bells Line of Road, Kurmond (Six Maps).

4. Description of Study Area and proposed development

The four subject sites cover a total of 12.474 ha, their current land use and context is provided in Table 2. A planning proposal to allow development is proposed for the four sites.

Table 2: Description of study area

	Subject Site			
	Site 1	Site 2	Site 3	Site 4
Size of Property	2.751 ha	2.404 ha	4.944 ha	2.375 ha
Current land use	Rural	Rural	Rural	Rural
Site Description	Man-made structures: a residential dwelling, associated garden sheds, a pool and a farm dam.	Man-made structures: a residential dwelling, associated garden sheds, a pool and a farm dam.	Man-made structures: a residential dwelling, associated garden sheds, a pool, a farm dam and sealed carpark. A portion of the site is fenced off for livestock.	Man-made features: a residential dwelling, a garden shed, sealed access track/road and a farm dam.
	Aquatic environment: an unnamed first order stream is mapped on the north-eastern corner of the site. The stream is a tributary of Redbank Creek, part of the Hawkesbury River system.	Aquatic environment: an unnamed first order stream is mapped parallel to northern boundary of the site. The stream is a tributary of Redbank Creek, part of the Hawkesbury River system.	Aquatic environment: Two unnamed second order streams are located on the southern portion of the land. The streams are tributaries of Redbank Creek, part of the Hawkesbury River system.	Aquatic environment: none
Proposed land use	Planning proposal to allow development of a subdivision			

5. Proposed Development

A planning proposal to sub-divide the four sites into smaller lots is proposed. At the time the present assessment was prepared, the proposed subdivision of the sites are as follows:

- Site 1 (79 Bells Lane): five lots of size between 4,400 and 6,400 m^2 (Figure 2)
- Site 2 (95 Bells Lane): four lots of size between 4,000 and 12,000 m^2 (Figure 2)
- Site 3 (100 Bells Lane): three lots of size between 12,000 and 17,000 m^2 (Figure 3)
- Site 4 (457 Bells Line of Road): four lots of size between 5,200 and 6,300 m^2 (Figure 4)

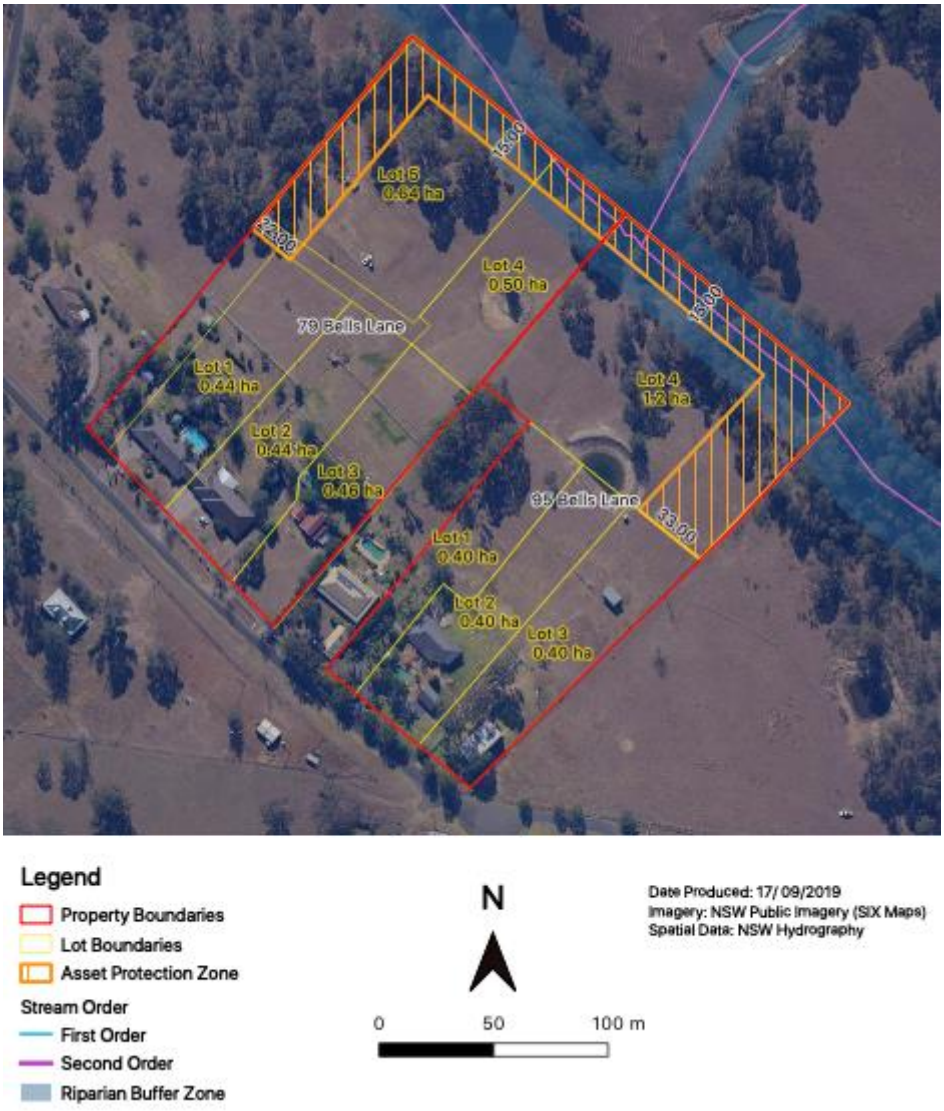


Figure 2: Potential lot layout and APZ at 79 and 95 Bells Lane, Kurmond NSW.

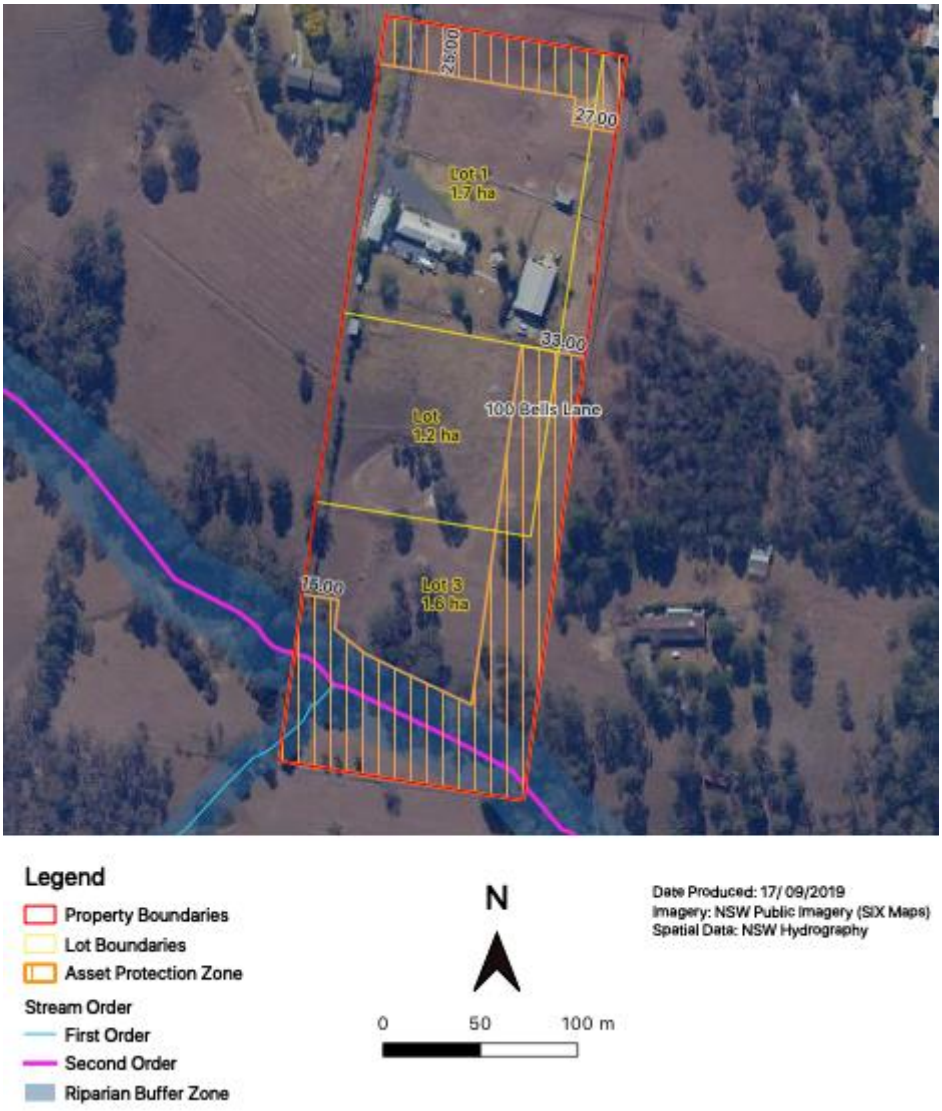


Figure 3: Potential lot layout and APZ for 100 Bells Lane, Kurmond NSW.

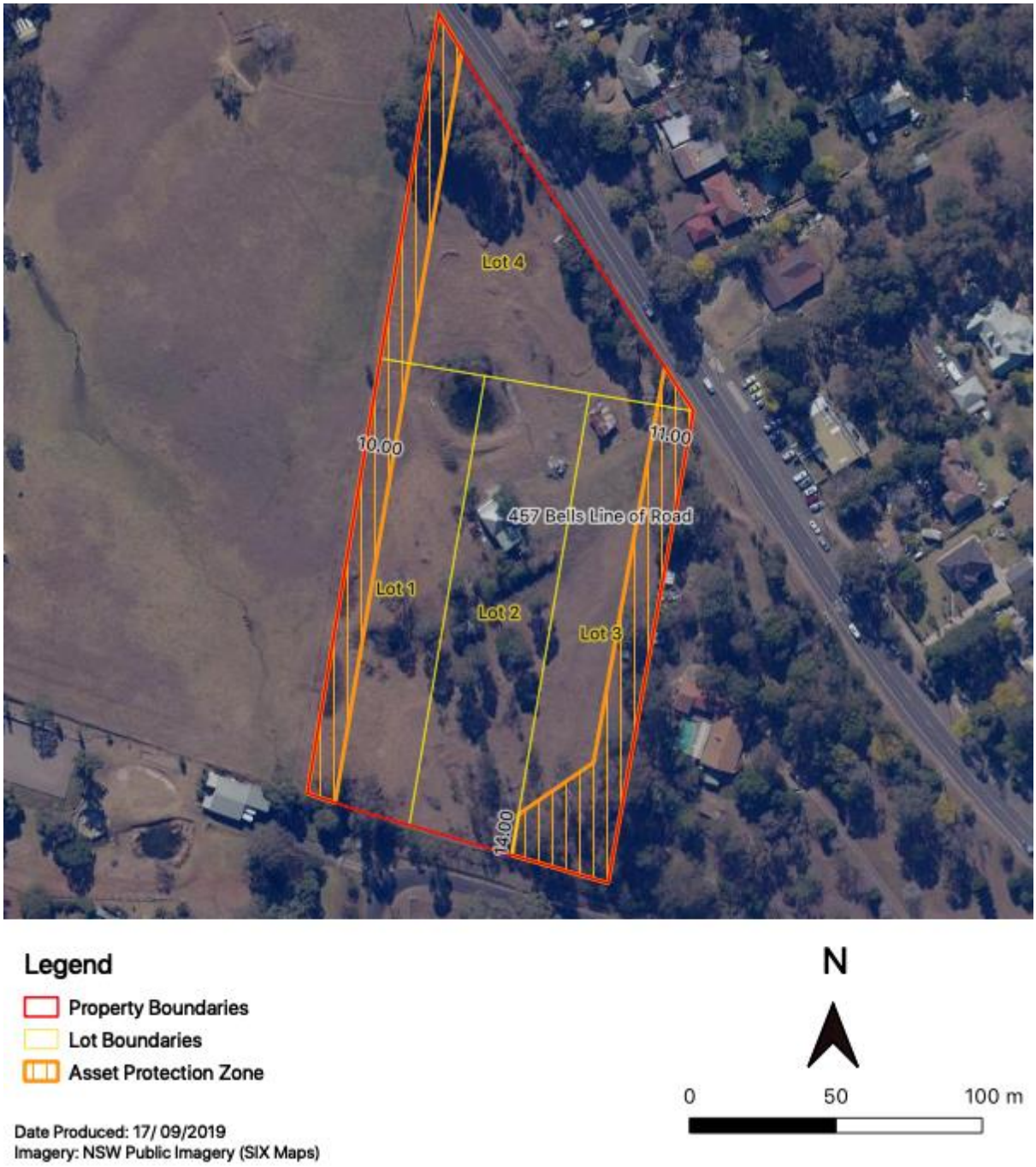


Figure 4: Potential lot layout and APZ for 457 Bells Line of Road, Kurmond NSW.

N

6. Legislative Requirements and International Agreements

Threatened Species Conservation Act 1995 (New South Wales)

The central aim of the NSW *Threatened Species Conservation Act 1995* (TSC Act) is to protect any threatened flora and fauna occurring in NSW, omitting marine plants and fish. The Act provides information for the identification, conservation and recovery of threatened species

as well as their associated populations and communities, and any threats that are imposed on those species. If a proposed action is likely to have an effect on a threatened species, population or ecological community, then this is considered in the development approval process. If the impact is considered significant then a Species Impact Statement (SIS) must be prepared and submitted to the Director General and further agreement and approval is needed. In certain circumstances, the Minister for the Environment may additionally be consulted.

Biodiversity Conservation Act 2016 (New South Wales)

The TSC Act was repealed in 2016 and replaced by the NSW *Biodiversity Conservation Act 2016* (BC Act). The requirements of the BC Act for development assessments do not come into effect within the Hawkesbury local government area (LGA) until the 24th November 2019. Therefore, the present assessment was undertaken as per requirements of the TSC Act, which still applies to the subject sites.

Environmental Planning and Assessment Act 1979

The primary objective of the Environmental Planning and Assessment Act 1979 is focused on the protection of the environment. This includes the protection of native flora and fauna, threatened species, populations, ecological communities and their associated habitats. The secondary objective of this act is to implement the precautionary principle, outlined in the Protection of the Environment Administration Act 1991. Under section 5A of the Act and Section 94 of the Threatened Species Conservation Act 1995, seven listed factors collectively termed the '7-part assessment of significance', allows the determination of the likely impact of a proposed action on threatened species, population or endangered ecological communities. If the proposed action is assessed as likely to have an effect on any of these, then a SIS is required.

State Environmental Planning Policy 44 – SEPP 44 (NSW)

State Environmental Planning Policy 44 (SEPP 44) aims to encourage the proper conservation of areas of natural vegetation that provide habitat for koalas, to ensure a permanent free-living population over their present range and reverse the current trend of koala habitat decline. The objectives of SEPP 44 are achieved by:

- Requiring the preparation of management plans before development consent can be granted in relation to areas of core koala habitat;
- Encouraging the identification of areas of core koala habitat; and
- Encouraging the inclusion of areas of core koala habitat in environment protection zones.

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is legislation of the Commonwealth. In accordance with this act, all proposed actions are to be assessed to determine impacts on Matters of National Environmental Significance. These matters include: World heritage properties; Natural heritage; Wetlands of national importance (RAMSAR, CAMBA, JAMBA and ROKAMBA wetlands); Threatened species and ecological communities; Migratory species; Marine areas in the Commonwealth; and Nuclear actions.

International migratory animal agreements include:

a. Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a Range State under the Convention;
b. The recognised agreement between Australia and the People's Republic of China for the Protection of Migratory Birds in Danger of Extinction and their Environment (CAMBA);
c. The recognised agreement between Australia and the Republic of Korea on the Protection of Migratory Birds (ROKAMBA); and,
d. The recognised agreement between Australia and Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).

If the proposed action is likely to affect a Matter of National Environmental Significance, it is necessary that this action is assessed via the EPBC Acts 'considerations' assessment. If there is likely to be a significant impact on these matters, referral to the Commonwealth Environment Minister is required for review. Approval for the proposed action may then be granted, so long as accompanied control measures alleviate likely impacts.

Biosecurity Act 2015 (New South Wales)

The Biosecurity Act 2015 provides for the management of pest animals and exotic plants (weeds). The NSW Biosecurity Act 2015 came into effect on 1 July 2017, effectively replacing the Noxious Weeds Act 1993, and 13 other Acts, with a single Act. Under the Biosecurtiy Act 2015, the responsibility to all landowners to control exotic species is known as a General Biosecurity Duty.

The General Biosecurity Duty states "*Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.*" The general biosecurity duty applies to all weeds listed in Schedule 3 of the Biosecurity Act (also included as Weeds of National Significance (WoNS). The Act also provides for management of primary weeds as listed for LGAs in the NSW Weed Wise website (https://weeds.dpi.nsw.gov.au/).

6.1 Other legislative requirements

The four sites are located within the Hawkesbury LGA, where the following planning instruments apply:

- Hawkesbury LEP 2012. The terrestrial biodiversity map (Figure 5)
- Hassell (2011) *Hawkesbury Residential Land Strategy 2011*. As part of this strategy, the Kurmond Kurrajong Investigation Area applies to the sites, including the following:
    - Landscape Character Study of Kurmond and Kurrajong (Figure 6).
    - Vegetation mapping and 'Biodiversity Priority Rank' (Figure 7).

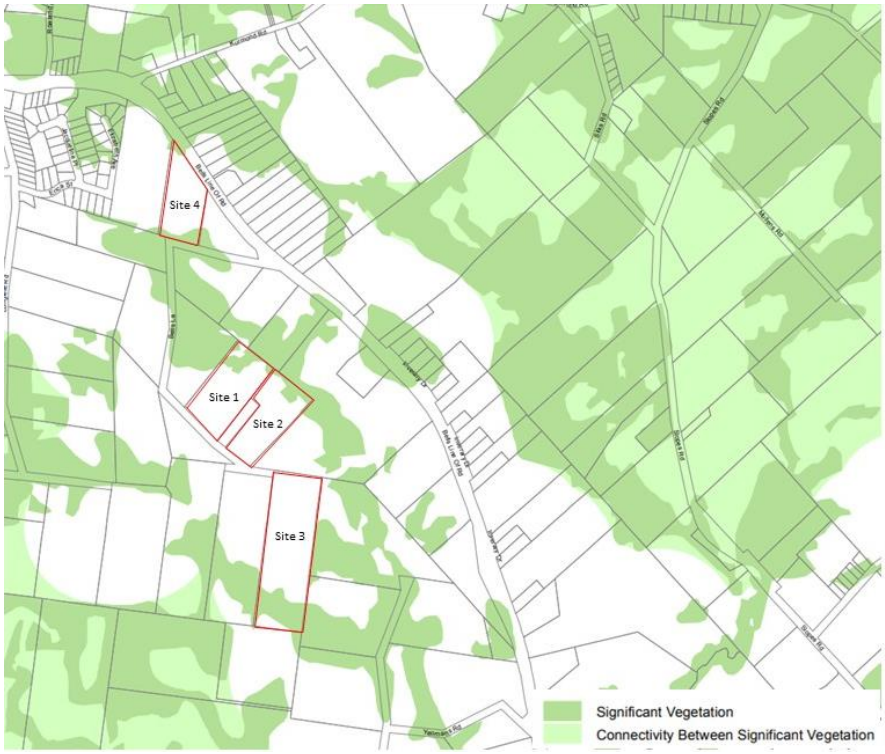


Figure 5: Terrestrial Biodiversity Map (Hawkesbury LEP 2012).

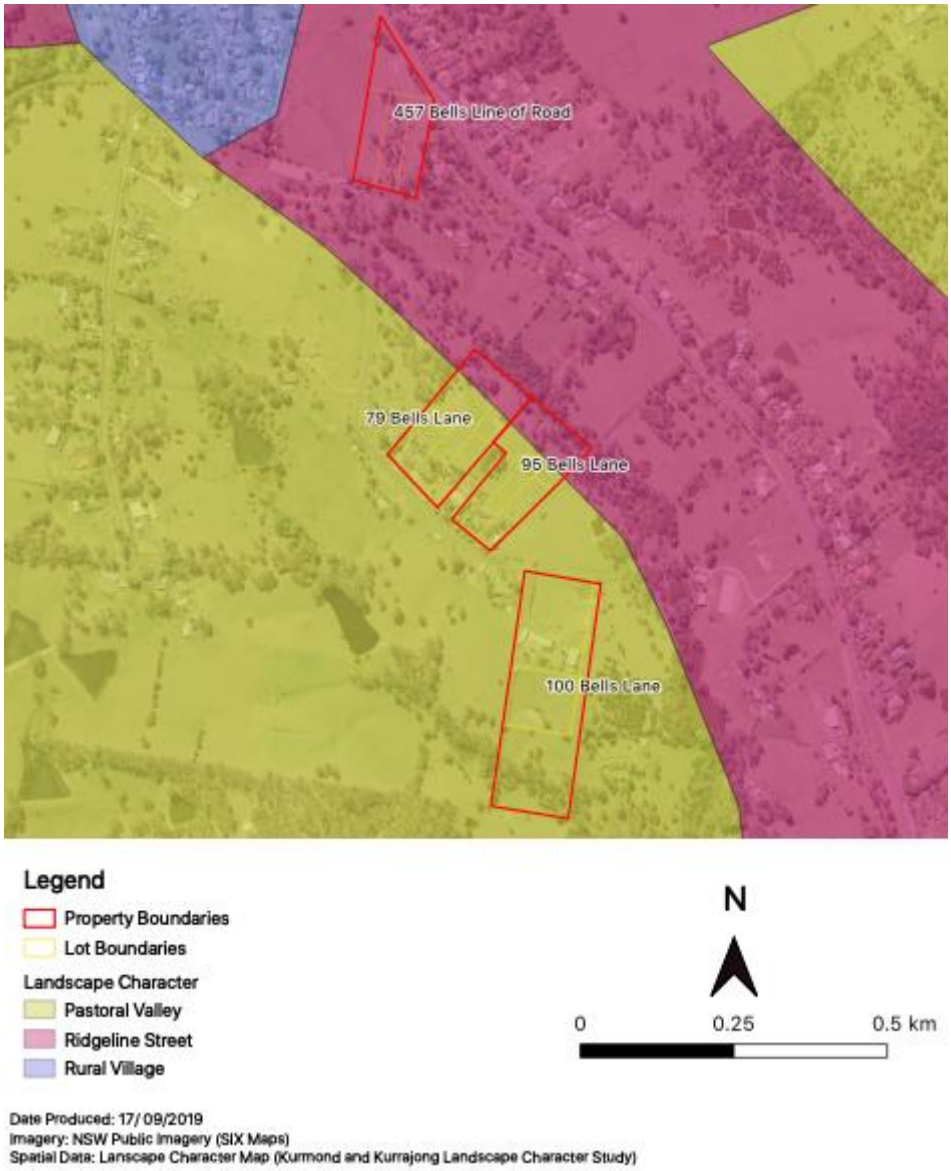


Figure 6: Landscape Character Map (Kurmond and Kurrajong Landscape Study).

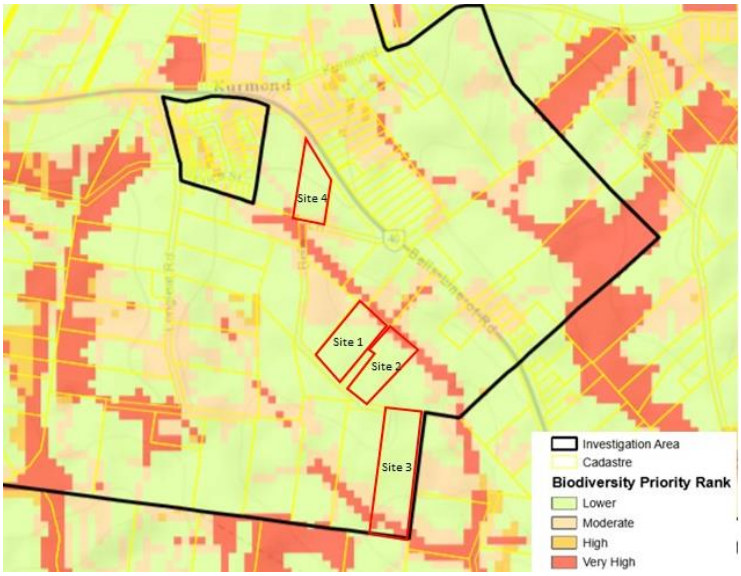


Figure 7: Biodiversity Priority Rank (Ecological – Biodiversity Priority Rank for Kurmond Kurrajong Investigation Area)

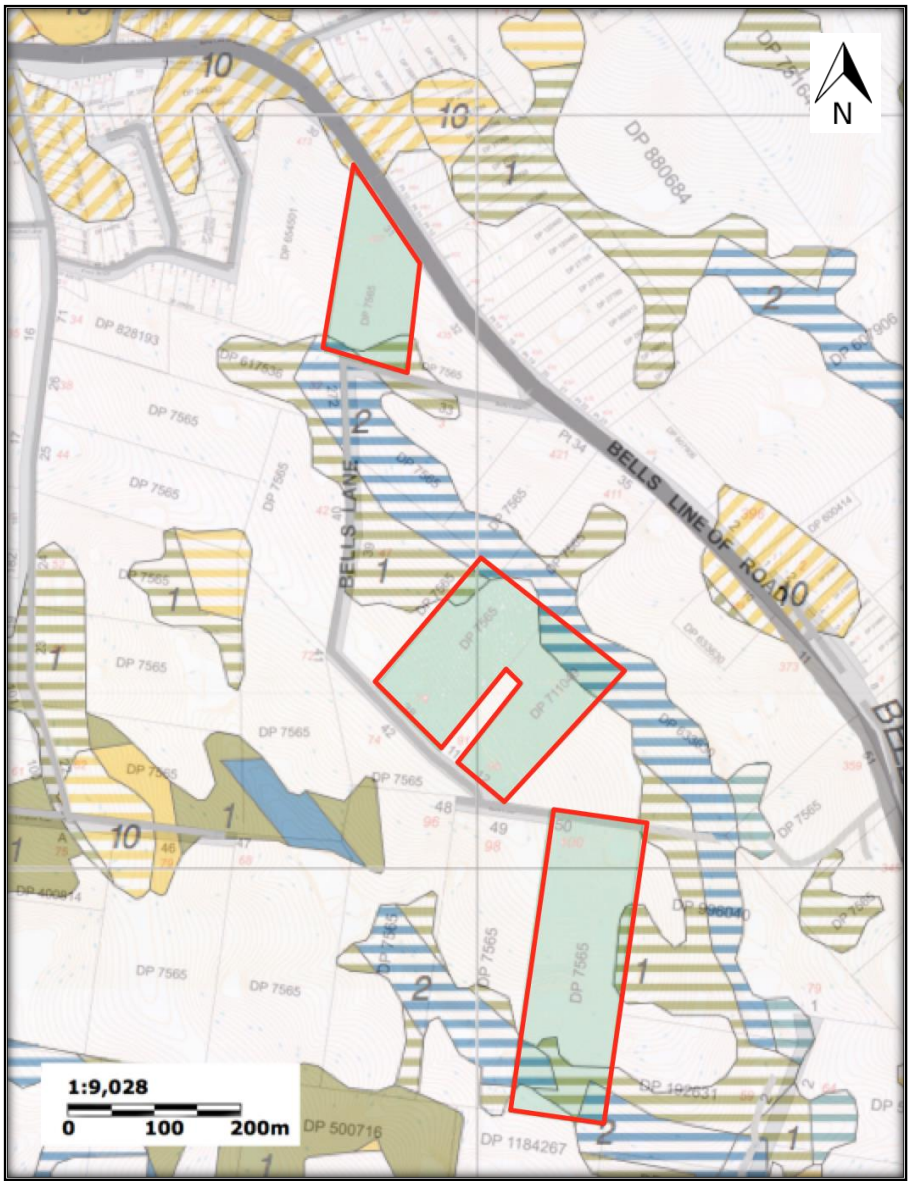
7. Methodology

7.1 Literature and Database Search

A database review was conducted prior to undertaking onsite surveys. This was done to give Envirotech ecologists an insight into which threatened biodiversity and/or migratory species should be targeted during field surveys. Table 4 provides an overview of the desktop review.

The following databases were questioned with regards to threatened biodiversity:

- The NSW BioNet Atlas for search of threatened biodiversity (TECs, threatened populations and species) listed under the TSC Act.
- Protected Matters Search Tool (PMST) to identify threatened biodiversity (TECs, threatened populations and species; and migratory species) listed under the EPBC Act (see PMST report in Appendix 1)
- The NSW Vegetation Information System was questioned to identify existing vegetation mapping for the site. The Cumberland Plain vegetation mapping project was used (website: https://www.environment.nsw.gov.au/surveys/CumberlandPlainVegetationMappingProject.htm). In accordance with Map 15 – Hawkesbury LGA Western Section, the following vegetation communities are likely to occur within the sites (see Figure 6):
    - Shale Sandstone Transition Forest (Low Sandstone Influence) (<10% canopy cover).
    - Shale Sandstone Transition Forest (High Sandstone Influence) (<10% canopy cover within the sites.



1 = Shale Sandstone Transition Forest (Low Sandstone Influence) (<10% canopy cover).

2 = Shale Sandstone Transition Forest (High Sandstone Influence) (<10% canopy cover).

Figure 8: Vegetation map for 79, 95 and 100 Bells Lane & 457 Bells Line of Road, Kurmond (Cumberland Plain Maps 2002 – Map 15: Hawkesbury LGA Western Section).

7.2 Vegetation Assessment

The degree to which the vegetation on the site resembled natural, undisturbed vegetation was used to determine the habitat potential of the site. This included the following criteria:

- The composition of the species (diversity, degree of weed invasion); and

- Structure of the vegetation (how many original layers of vegetation existed).

Criteria used to evaluate the habitat values of the are described in Table 3.

Table 3: Criteria used to assess habitat quality for threatened flora

Score	Criteria
Good	There is a high diversity of species, no weeds are extant or those weeds that are present only occur on the edges of the study site, the vegetation represents many layers (i.e. ground, shrub, canopy layers) and these are readily identifiable;
Moderate	There are a high number of native species, some weed invasion but these only occur in small patches, one or more of the vegetation layers are disturbed but these are relatively intact;
Poor	There is a low number of native species, many of the plants that are on the site consist of exotic species that occur in dense patches, more than one of the vegetation layers has been disturbed or removed;
Cleared and Disturbed	This represents a significantly modified landscape that has less than three native species, invasive species are mostly dominant, there is little representation of vegetation layers, the soil profile is disturbed and there is the likelihood that the area will not regenerate to its natural condition and that revegetation techniques would need to be implemented in order to achieve this.

7.3 Terrestrial Flora Survey

The methodology employed was designed in accordance with the *Working Draft Threatened Biodiversity Assessment Guidelines for Developments and activities (2004).* Table 4 refers to specific techniques employed.

Table 4: Survey techniques employed to target threatened flora

Date	Survey Type	Description	Ecologist (Position)	Effort (hours)	Is this in accordance with Guidelines?
18 Sept 2018	Random Meander	The site was traversed and the flora species observed were recorded.	Shane Malloney (Senior Ecologist)	9	Yes
12 Aug 2019	Random Meander	The site was traversed and the flora species observed were recorded.	Michelle Evans	7	Yes

	(Principal Ecologist)	

7.4 Terrestrial Fauna Survey

An Envirotech ecologist undertook a fauna survey on the site on the 18th of September 2018. A secondary visit was undertaken the 12th of August 2019.

Table 5: Dates, effort and type of Fauna survey undertaken at the site.

Date	Survey Type	Description	Effort	Is this in accordance with Guidelines?
18th Sept 2018 + 12th Aug 2019	Fauna	See Table 8 below for the techniques undertaken to survey for threatened fauna.	9 Hours	Yes, however the survey was limited in effort and time (See section 3.5)

Methodology employed was in accordance with the *Working Draft Threatened Biodiversity Assessment Guidelines for Developments and activities (2004)* and consisted of the following survey methods (Table 6):

Table 6: Survey techniques employed to target threatened fauna.

Survey Type	Description	Does this match guidelines?
Frog	The site was surveyed for potential habitat and any calls emitted from species present.	Yes, however the survey was limited in effort and time (See section 3.5)
Reptile Search	A targeted habitat search was undertaken, across the entire site. Techniques used to locate species included peeling back loose bark from trees, upturning logs and disturbing leaf litter.	Yes, however the survey was limited in effort and time (See section 3.5)
Koala Search and Habitat Assessment	A targeted search for the koala including nocturnal spotlighting and call playback, with diurnal searches for scats and scratchings and individuals.	Yes

Survey Type	Description	Does this match guidelines?
Bird point Count Survey	Point count surveys were undertaken onsite, for a period of 20 minutes, using both visual and aural detection.	Yes, however the survey was limited in effort and time (See section 3.5).
Opportunistic (Diurnal)	The site was traversed with emphasis on searches for mammal scats, tracks, burrows, diggings and scratchings.	Yes

7.5 Limitations of the Report

The methodological design employed for the purposes of this report was habitat based, in accordance with Section 5A of the *Environment Planning and Assessment Act* 1979.

In respect to the timing of the survey and the survey effort employed, a considerable continuum of fauna and flora species and assessments of the ecological processes that are likely to be imposed on the study site, have been derived through desktop searches, and background and literature searches. Therefore, a full inventory of flora and fauna and the ecological processes likely to occur on the study site and surroundings cannot be fully provided in this report.

It is also acknowledged that the presence and detection of threatened and migratory species can alter in respect to time, which includes seasonal weather and climatic cycles. These limitations have been mitigated by identifying any potential habitat for flora and fauna species and by assessing the likelihood of occurrence of these species, with respect to previous records, the habitat present, the land use on the study site and the landscape context of the wider area.

The report has collected data from publicly available data sources and is bound by the limitations of the collection, processing and management of those databases used.

Nevertheless, the techniques used in this investigation are considered adequate to gather the data necessary to assess the impacts of the proposal on the flora and fauna and habitats in the study area.

8. Results

8.1 Ground-truthed vegetation within the Sites

8.1.1 Ground-truthed vegetation within 79 Bells Lane, Kurmond NSW

The site has a residential dwelling on its southern portion, adjacent to Bells Lane. Vegetation within the site can be sub-divided in three types as follows (see Figure 9):

- Cleared and disturbed land with remnant trees: This section is in the south-western portion of the site, adjacent to Bells Line where the residential dwelling and other structures (e.g. garden shed, sealed access road) are present. Vegetation in this section is predominantly exotic, with planted trees, shrubs and lawn. Native species are limited to few remnant trees. Native trees in this section include eucalypt trees (*Eucalyptus fibrosa* and *E. crebra*) and Prickly Leaved Tea Tree (*Melaleuca styphelioides*).
- Cleared and disturbed land: This section consists of open paddocks with exotic grass groundcover. No native trees or other native layer is present therein.
- Shale Sandstone Transition Forest in poor to moderate condition: Remnant native canopy is present in two patches on the northern portion of the site, particularly along the first order stream (dry at time of inspection). Vegetation in this zone varies, with most of the area having a very poor or absent shrub and groundcover due to historical grazing and land management activities. The dominant canopy species within this mapped area were *Eucalyptus fibrosa*, *Eucalyptus creba* and *Alphitonia exelsa*, with *Backhousia myrtifolia* and *Melaleuca styphiloides* in the mid storey/upper shrub layer. The lower shrub layer and the groundcover contained *Bursaria spinosa* and native grasses and shrubs. The riparian area includes introduced grasses and shrubs/trees including Small and Large Leaved Privet which dominated the mid-stratum within this area (see Photograph 1).

Shale Sandstone Transition Forest is a vegetation community listed as a Critically Endangered Ecological Community (CEEC) under the TSC Act (now BC Act) and the EPBC Act.

Photograph 1: View of the riparian area in the northern portion of 79 Bells Lane

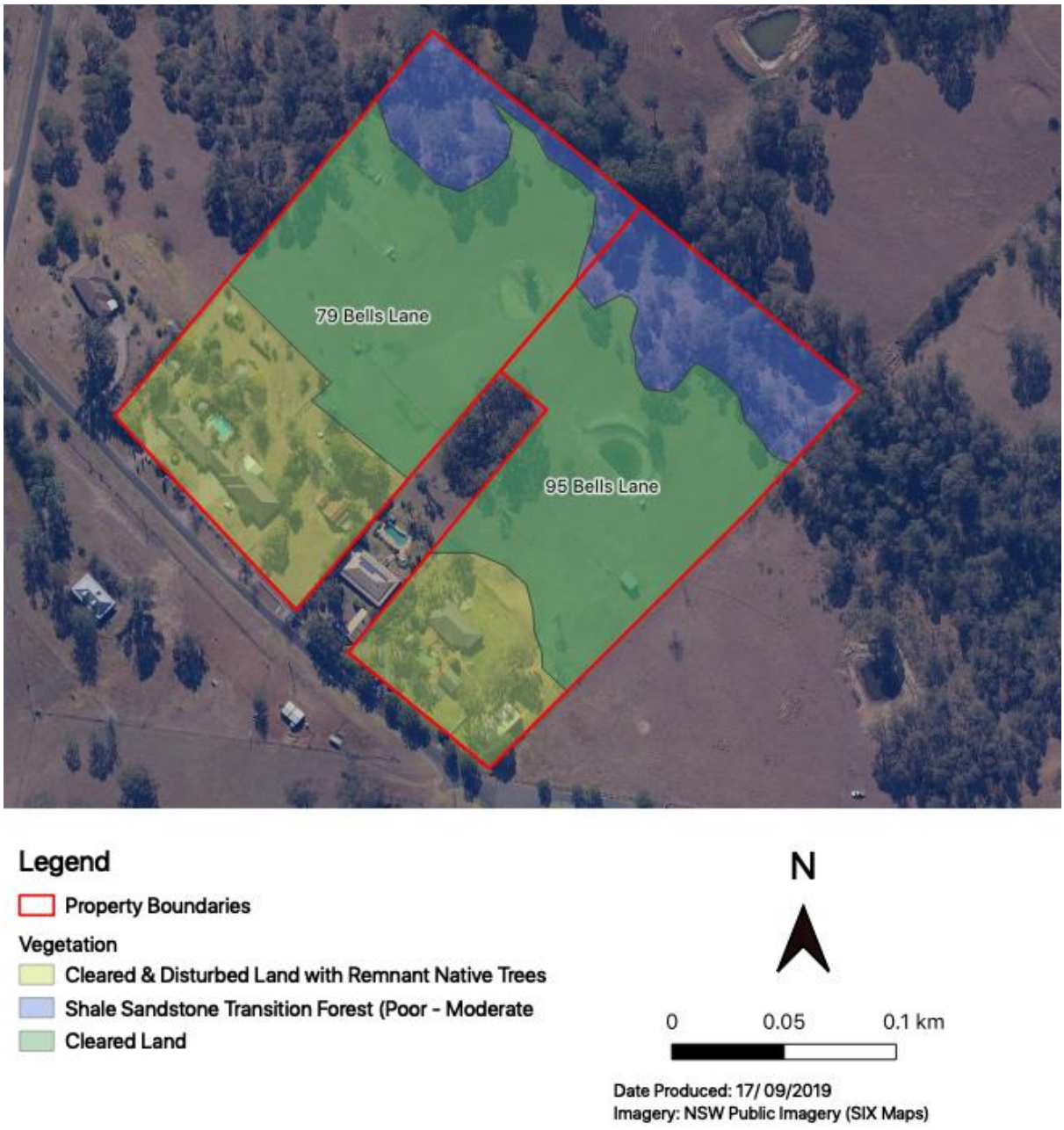


Figure 9: Ground-truthed Vegetation at 79 and 95 Bells Lane, Kurmond

8.1.2 Ground-truthed vegetation within 95 Bells Lane, Kurmond NSW

Vegetation in 95 Bells Lane comprises three types as follows (see Figure 9):

- Cleared and Disturbed land: Located on the southern portion of the lot and adjacent to Bells Lane, this area includes the build structures (i.e. residential dwelling, garden sheds,

sealed access tracks). Vegetation in this area is mainly exotic planted species, with few remnant trees (*Eucalyptus fibrosa*).

- Cleared and Disturbed land with remnant trees: cleared land with two paddock trees (*Eucalyptus fibrosa*).
- Shale Sandstone Transition Forest in poor to moderate condition: Native canopy vegetation was observed along the watercourse (dry at time of inspection) at the rear of the property. The mid and lower stratum of this vegetation community has been highly modified/cleared due to historical grazing and land management activities. The dominant canopy species within this mapped area were *Eucalyptus fibrosa* and *Eucalyptus creba*. The lower shrub layer and the groundcover contained *Bursaria spinosa* and native grasses and shrubs.

Shale Sandstone Transition Forest is a vegetation community listed as a Critically Endangered Ecological Community (CEEC) under the TSC Act (now BC Act) and the EPBC Act.

Photograph 2: View of the riparian area on the northern end of 95 Bells Lane

8.1.3 Ground-truthed vegetation within 100 Bells Lane, Kurmond NSW

The site is located at the end of Bells Lane and consists of a residential dwelling, garage and large shed. Much of the lot has been cleared due to historical grazing and land management practices. Vegetation at the site consist of (see Figure 10):

- Cleared and Disturbed land: Most of the site has been cleared and includes planted exotic species with exotic lawns. This vegetation area does not constitute native vegetation.

- Paddock trees: A trees is located on the mid-southern portion of the site. This tree is *Ecucalyptus punctata*.
- Shale Sandstone Transition Forest in poor to moderate condition: Two patches of remanet vegetation are present in the southern portion of the site. These patches are:
    - Patch in poor condition: A patch of young trees (*Eucalyptus punctata*) surrounding the farm dam. The stems of these trees are small, suggesting that they are planted. SSTS in this patch are of poor condition due to the lack of mid and low stratum.
    - Patch in low to moderate condition: the second patch of native vegetation is present along the riparian area in the southern portion of the site. Species located within this area included *Eucalyptus fibrosa*, *Eucalyptus creba*, *Alphitonia exelsa*, *Backhousia myrtifolia* and *Melaleuca styphiloides*. This patch also contains numerous introduced grasses and shrubs.

Shale Sandstone Transition Forest is a vegetation community listed as a Critically Endangered Ecological Community (CEEC) under the TSC Act (now BC Act) and the EPBC Act.

Photograph 3: Looking towards the southern boundary of 100 Bells lane, cleared paddocks in the foreground and riparian vegetation in the background.

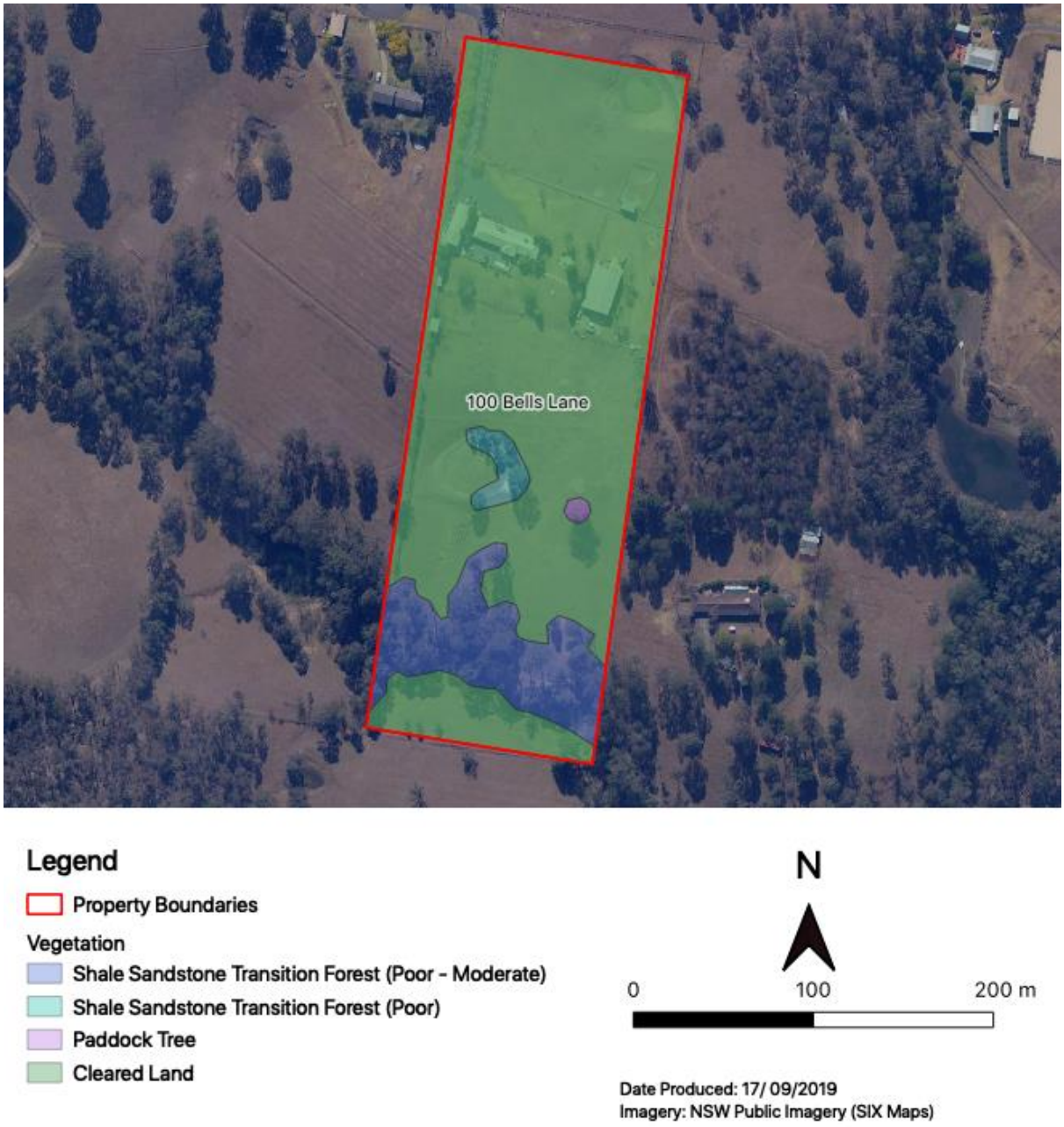


Figure 10: Ground-truthed Vegetation at 100 Bells Lane, Kurmond

8.1.4 Ground-truthed vegetation within 457 Bells Line of Road, Kurmond NSW

This site is situated in the north most location out of the four subject sites. The north eastern lot boundary runs adjacent to Bells Line of Road. The site consists of a small dwelling and abandoned Colourbond shed situated amongst paddocks with sparse native canopy. Much of the lot has been cleared of lower and mid stratum vegetation due to historical grazing and land management practices. Current vegetation within the site includes (see Figure 11):

- Cleared and Disturbed land: Most of the site has been cleared and includes mainly species in lawns. This vegetation area does not constitute native vegetation.

- Shale Sandstone Transition Forest (poor condition): remnant trees present in otherwise cleared land are present on the southern part of the site. The lack of ground and shrub layer results in these treed areas having a low ecological value, therefore the vegetation has been assigned with as having poor condition

Shale Sandstone Transition Forest is a vegetation community listed as a Critically Endangered Ecological Community (CEEC) under the TSC Act (now BC Act) and the EPBC Act.

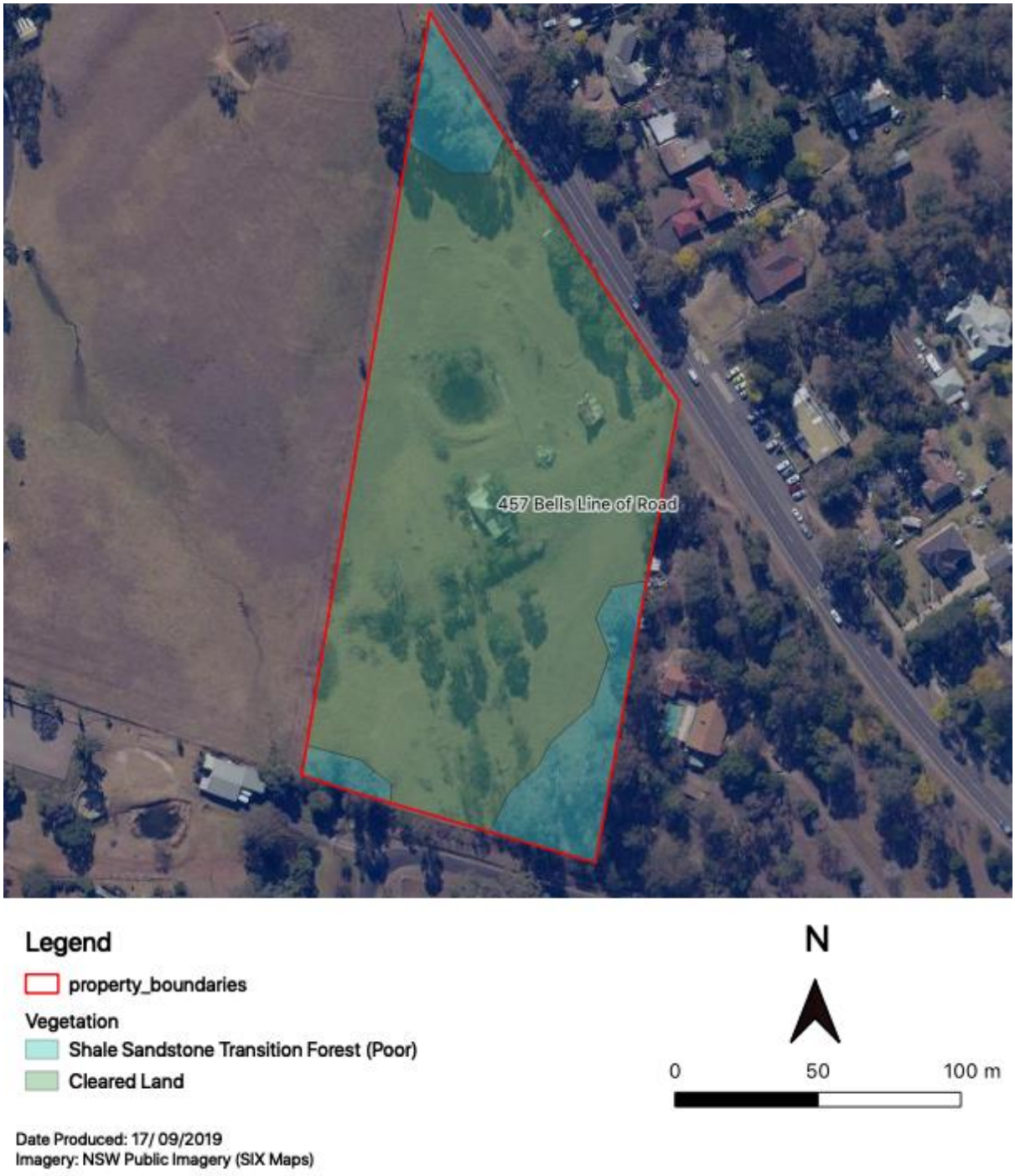


Figure 11: Ground-truthed Vegetation at 457 Bells Line of Road, Kurmond

8.2 Threatened Ecological Communities

Shale Sandstone Transition Forest in poor to moderate condition was recorded within the four sites. Shale Sandstone Transition Forest is a vegetation community listed as a Critically Endangered Ecological Community (CEEC) under the TSC Act (now BC Act) and the EPBC Act

8.3 Habitat Assessment

The study area indicates significant disturbances in the past, such as clearing and grazing. At present there are paddocks on all the sites, with scattered trees and a covering of introduced grasses, with poor to moderate habitat restricted to riparian areas within 79, 95 and 100 Bells Lane. The sites are found adjacent to and surrounded by other large areas of predominantly cleared farms.

The fauna habitat ranges from a tall canopy (up to 25m), to a well-developed mid storey and shrub layer down to a lower stratum in the riparian areas of 79, 95 and 100 Bells Lane. Most of all sites consists of open paddocks with canopy trees down to a grassy groundcover.

Limited habitat values were recorded within the sites, these are summarized in Table 7.
The presence of these components indicates that the sites have limited habitat values that could provide substandard foraging and roosting habitat for fauna. Overall, it is considered that no habitat critical to the foraging, breeding, roosting or dispersal needs of any species are present within the site. The proposed development would not threaten the local or regional presence of any native fauna.

Table 7: Description of fauna habitat values.

Habitat Value	**Site 1**	**Site 2**	**Site 3**	**Site 4**
Hollow Bearing Trees	None	None	None	A split in bark of a Eucalyptus tree was observed. The split is approximately 10 cm wide.
Stags	None	None	None	None

Habitat Value	Site 1	Site 2	Site 3	Site 4
Connectivity	Very limited connectivity value restricted to the riparian corridor.	Very limited connectivity value restricted to the riparian corridor.	Very limited connectivity value restricted to the riparian corridor.	The site is in a cleared landscape. Vegetation patches at the site have very limited connectivity value with land to the east.
Waterways	First order stream on the north-eastern corner of the site.	First order stream parallel to the northern boundary.	Two second order streams on the southern portion of the site.	None
Rocky Outcrops	None Limited rock bounders present in riparian habitat. These do not constitute rocky outcrops.	None Limited rock bounders present in riparian habitat. These do not constitute rocky outcrops.	None Limited rock bounders present in riparian habitat. These do not constitute rocky outcrops.	None
Leaf Litter	None	None	None	None
Nectar, flowering plants	In canopy and paddock trees	In canopy and paddock trees	In canopy and paddock trees	In canopy and paddock trees
Loose bark	Limited	Limited	Limited	Limited
Roosting trees	Limited	Limited	Limited	Limited
Koala Habitat	The sites are identified as potential koala habitat (see Appendix 6). Approximately 15% of trees recorded within the four sites are Forest Red Gum (*Eucalyptus tereticornis*) a koala feed tree.			

8.4 Fauna Species

8.4.1 Fauna Species Recorded

A total of 33 fauna species were recorded across the four sites, including two amphibians, 26 birds, three mammals and two reptiles.

The full list of fauna species recorded is presented in Appendix 2.

8.4.2 Threatened fauna recorded

No threatened species were recorded within the four sites.

8.5 Flora Species

8.5.1 Flora Species Recorded

A total of 97 flora species were recorded across the four sites, including 40 exotic and 57 native species.

The full list of fauna species recorded is presented in Appendix 2.

8.5.2 Weeds recorded

A total of 40 exotic species were recorded within the four sites, including five primary weeds and three weeds on national significance (WoNS).

Under the Biosecurity Act 2015, all weeds need to be managed by landowners. Primary weeds recorded were: Bridal Creeper (*Asparagus asparagoides*), Fireweed (*Senecio madagascariensis*), Blackberry (*Rubus fruticosus*), Lantana (*Lantana camara*) and a Willow (*Salix alba*).

The WoNS recorded are Fireweed (*Senecio madagascariensis*), Lantana (*Lantana camara*) and Bridal Creeper (*Asparagus asparagoides*).

8.5.3 Threatened flora species recorded

No threatened flora species were recorded within the four sites.

8.6 Key Threatening Processes

A list of the "Key Threatening Processes", listed under the *Environmental Protection and Biodiversity Conservation Act* 1999 and *Threatened Species Act* 1995 was generated by conducting a desktop search of the *Species Profile and Threats* database. During the site inspection, the presence or absence of these processes occurring on the site were documented, with additional threats not otherwise being listed but considered and listed in Table 8 below.

Where the proposal is shown to contribute to KTP, these are further considered in Section 5 and Appendix 4.

Table 8: Key threatening processes relating to the development.

Threatening Process	**Act**	**Likely to Occur on site at present**	**Proposal may contribute**

Bushrock removal	*TSC*	No	No
Clearing of native vegetation	*TSC/EPBC*	No	Yes
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	*TSC/EPBC*	No	No
Invasion of native plant communities by exotic perennial grasses	*TSC*	Yes	Maybe (future)
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	*TSC/EPBC*	Yes	Potentially (future)
Infection of native plants by *Phytophthora cinnamomi*	*TSC/EPBC*	No	Unlikely (future)
Invasion and establishment of exotic vines and scramblers	*TSC*	Unlikely	Maybe (future)
Invasion, establishment and spread of Lantana (*Lantana camara*)	*TSC*	Unlikely	Unlikely
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	*TSC*	Unlikely	Unlikely
Loss of hollow-bearing trees	*TSC*	No	No
Removal of dead wood and dead trees	*TSC*	No	Unlikely

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8.7 Records of Threatened Biodiversity

Identification of threatened biodiversity was undertaken based on results of searches in the BioNet Atlas and in the protected matters search tool (PMST). An assessment of likelihood of occurrence of identified threatened biodiversity was undertaken and presented herein.

8.7.1 BioNet Atlas

The BioNet Atlas was interrogated for records of threatened species within the 10km locality. The species identified in the BioNet Atlas were included in the Likelihood of Occurrence table (see Section 8.7.3)

8.7.2 Matters of National Environmental Significance

Matters of National Environmental Significance (MNES) listed under the *EPBC Act* were identified by generating a Protected Matters Search Tool (PMST) Report (see Appendix 1). The PMST report includes threatened ecological communities (TECs), threatened flora and fauna species, as well as migratory species within the 10km locality. Identified MNES within the locality included:

- **8** listed threatened ecological communities;
- **60** listed threatened species; and
- **17** listed migratory species.

The likelihood of occurrence of these NMES was assessed (see Section 8.7.3).

Under the precautionary principle, an assessment of the likelihood that the proposed development will have a significant impact on these species has been undertaken in accordance with the Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (Australian Government Department of the Environment 2013) and is provided in Appendix 5.

In summary, the proposed action is not likely to have a significant impact on these species for the following reasons:

- *The loss of habitat is not likely to lead to a long-term decrease in the size of an important population of a species.*
- *The proposed action will not impact any known or important populations of these species.*
- *The site does not provide habitat that is critical to the survival of these species.*
- *It is unlikely that the proposal will disrupt the breeding cycle of an important species.*
- *The removal of foraging and breeding habitat will unlikely modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species are likely to decline.*
- *The proposed action would not result in an increase in invasive species, including weeds that would be detrimental to any of these species.*
- *It is unlikely that the proposal will introduce disease that may cause the species to decline.*
- *The proposed action is unlikely to interfere substantially with the recovery of the species.*
- *No critical foraging or breeding habitat has been identified within the subject site.*

8.7.3 Likelihood of Occurrence Assessment

A likelihood of occurrence assessment was undertaken for all TECs and species identified as likely to occur within the sites (see Appendix 3). Table 9 shows a total of 72 threatened species and one threatened ecological community (TEC) which were identified as likely to occur within the sites.

Table 9: Summary of Threatened Species identified as likely to occur within the sites

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[1][2]	Likelihood
Amphibia				
Heleioporus australiacus Giant Burrowing Frog	Vulnerable	Vulnerable	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Burrows below the soil surface or in the leaf litter. Breeds in soaks or pools within first or second order streams.	**Possible**
Litoria aurea Green and Golden Bell Frog	Endangered	Vulnerable	Inhabits marshes, dams and stream-sides, particularly those containing *Typha* spp. or *Eleocharis* spp. Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as *Gambusia holbrooki,* have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	**Possible**
Litoria littlejohni Littlejohn's Tree Frog	Vulnerable	Vulnerable	Found in perched swamps, upper reaches of permanent streams, dams, ditches, isolated pools, flooded hollows, creeks, streams and lagoons. Breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath-based forests and woodlands where it shelters under leaf litter and low vegetation.	**Possible**

[1] NSW Office of Environment & Heritage, Threatened Species, <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>
[2] Australian Government Department of the Environment, Species Profile and Threats Database, <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Aves				
Anthochaera phrygia Regent Honeyeater	Critically Endangered	Critically Endangered	Inhabits dry open forests and woodlands that have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Generalist forager, though it feeds mainly on the nectar from a small number of Eucalypts that produce high volumes. Usually makes open, cup shaped nests in horizontal branches or forks in mature Eucalypts, sheoaks and mistletoe *haustoria*.	**Possible**
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	-	Found in woodlands and dry open sclerophyll forests, usually dominated by Eucalypts including mallee associations. Also recorded in shrublands and heathlands and various modified habitats including regenerating forests; very occasionally in moist forests or rainforests. Prefers understorey typically open with sparse Eucalypt saplings, Acacias and other shrubs, including heath. Ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber.	**Possible**
Callocephalon fimbriatum Gang-gang Cockatoo	Vulnerable	-	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	**Possible**
Calyptorhynchus lathami Glossy Black-Cockatoo	Vulnerable	-	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. *Allocasuarina littoralis* and *A. torulosa* are important foods. Inland populations feed on a wide range of sheoaks, including *Allocasuaraina diminuta* and *A. gymnathera* belah is also utilised and may be a critical food source for some populations. Dependent on large hollow-bearing eucalypts for nest sites.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Chthonicola sagittata Speckled Warbler	Vulnerable	-	Lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Large, relatively undisturbed remnants are required for the species to persist in an area. Pairs are sedentary and occupy a territory of about 10 ha, slightly larger when not breeding. The rounded, domed, roughly built nest is located in a slight hollow in the ground or the base of a low dense plant, between August and January.	**Possible**
Cuculus optatus Oriental Cuckoo	-	Migratory	Winters in coastal parts of northern and eastern Australia. Found in forest canopy, open wooded areas and orchards.	**Possible**
Daphoenositta chrysoptera Varied Sittella	Vulnerable	-	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. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	**Possible**
Glossopsitta pusilla Little Lorikeet	Vulnerable	-	Forages primarily in the canopy of open Eucalyptus forest and woodland but also finds food in *Angophora*, *Melaleuca* and other tree species, riparian habitats particularly are used. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain populations. Feeds mostly on nectar and pollen, also on native fruits and only rarely in orchards. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	**Possible**
Grantiella picta Painted Honeyeater	Vulnerable	Vulnerable	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping Eucalypts, she-oak, paperbark or mistletoe branches.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Hieraaetus morphnoides Little Eagle	Vulnerable	-	Occupies open eucalypt forest, woodland or open woodland, Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	**Possible**
Hirundapus caudacutus White-throated Needletail	-	Vulnerable	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. Recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows.	**Possible**
Lathamus discolor Swift Parrot	Endangered	Critically Endangered	Migrates to the Australian south-east mainland between March and October, where they occur in areas where Eucalypts are flowering profusely or where there are abundant lerp infestations. They return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by *Eucalyptus globulus*.	**Possible**
Lophoictinia isura Square-tailed Kite	Vulnerable	-	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	**Possible**
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	Vulnerable	-	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially *Eucalyptus sideroxylon, E. albens, E. microcarpa, E. melliodora, E. blakelyi* and *E. tereticornis*. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. The compact, suspended, cup-shaped nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Ninox connivens Barking Owl	Vulnerable	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats due to the higher density of prey on these fertile soils. Nesting occurs during mid-winter and spring but is variable between pairs and across years.	**Possible**
Ninox strenua Powerful Owl	Vulnerable	-	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. Roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera, Allocasuarina littoralis, Acacia melanoxylon, Angophora floribunda, Exocarpus cupressiformis* and a number of Eucalypt species. Nests in large tree hollows (at least 0.5 m deep), in large Eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	**Possible**
Pachycephala olivacea Olive Whistler	Vulnerable	-	Inhabits wet forests above about 500 m. May move to lower altitudes during cold weather. Forages in trees, shrubs and on the ground.	**Possible**
Petroica boodang Scarlet Robin	Vulnerable	-	Found in forests and woodlands. Habitat usually contains abundant logs and fallen timber. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. Nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat**[12]	**Likelihood**
Petroica phoenicea Flame Robin	Vulnerable	-	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. Breeds in spring to late summer. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. Builds an open cup nest made of plant materials and spider webs.	**Possible**
Rhipidura rufifrons Rufous Fantail	-	Migratory	Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as *Eucalyptus microcorys, E. cypellocarpa, E. delegatensis, E. pilularis or E. resinifera*; usually with a dense shrubby understorey often including ferns. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including *Eucalyptus maculata, E. melliodora*, ironbarks or stringybarks, often with a shrubby or heath understorey.	**Possible**
Rostratula australis Australian Painted-snipe	Endangered	Endangered	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Threatened Ecological Communities				
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	-	Critically Endangered	Occurs at the transition between shales and sandstones of the Wianamatta and Hawkesbury Groups, including the transitional Mittagong Formation. Occurs as forest or woodland and may have a primarily shrubby or primarily grassy understorey or be a mixture. Canopy is a mix of species typically including two or more of the following: *Eucalyptus punctata, E. crebra, E. fibrosa* subsp. *fibrosa, E. tereticornis* subsp. *tereticornis, E. resinifera* subsp. *resinifera, E. eugenioides* (or *E. globoidea* depending on local species present and degree of sandstone influence) and *Angophora bakeri*. Where present the mid layer of the understorey varies in structure and floristics. Where present, the small tree layer is likely to be dominated by Eucalypt species and *Allocasuarina littoralis*. Where shrubs are present, the mid layer is likely to be dominated by *Bursaria spinosa* in areas with low sandstone influence, with other common species including *Leucopogon juniperinus, Kunzea ambigua, Persoonia linearis, Ozothamnus diosmifolius* and *Hibbertia aspera*. Where present, the ground layer of the understorey is typically diverse and dominated by grasses and herbs including: *Aristida vagans, Austrostipa pubescens, Cheilanthes sieberi* subsp. *sieberi*, *Dichondra repens, Echinopogon ovatus, Entolasia marginate, Entolasia stricta, Lepidosperma laterale, Lomandra multiflora, Microlaena stipoides* var. *stipoides, Oxalis perennans, Pimelea linifolia* subsp. *linifolia, Pomax umbellata, Phyllanthus hirtellus, Pratia purpurascens, Solanum prinophyllum* and *Themeda australis*. The ground layer may also contain small shrubs, including *Hibbertia aspera.*	**Mapped/Observed**
Flora				
Acacia bynoeana Bynoe's Wattle	Endangered	Vulnerable	Occurs on sandy soils, in heath or dry sclerophyll forest. Appears to have preference for open sites, sometimes disturbed, such as recently burnt areas, and roadside spoil mounds and trail margins. Grows with overstorey species including Scribbly Gum, Red Bloodwood, Narrow-leaved Apple, Saw Banksia and Parramatta Red Gum.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[12]**	**Likelihood**
Acacia gordonii	Endangered	Endangered	Found in healthlands, woodland and dry sclerophyll forest, within or amongst rock platforms on sandstone outcropping. Grows on Hawkesbury Sandstone substrate, with some laterite and residual clay influence, which is nutrient poor and well drained. Overstorey species include *Eucalyptus eximia, E. gummifera, E. squamea* and *E. piperita.*	**Possible**
Acacia pubescens Downy Wattle	Vulnerable	Vulnerable	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Found in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Flowers from August to October. The pods mature in October to December.	**Possible**
Allocasuarina glareicola	Endangered	Endangered	Grows in Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora*. Common associated understorey species include *Melaleuca nodosa, Hakea dactyloides, Hakea sericea, Dillwynia tenuifolia, Micromyrtus minutiflora, Acacia elongata, Acacia brownei, Themeda australis* and *Xanthorrhoea minor*.	**Possible**
Asterolasia elegans	Endangered	Endangered	Occurs on Hawkesbury sandstone. Found in sheltered forests on mid to lower slopes and valleys. The canopy at known sites includes *Syncarpia glomulifera* subsp. *glomulifera, Angophora costata, Eucalyptus piperita, Allocasuarina torulosa* and *Ceratopetalum gummiferum*.	**Possible**
Cynanchum elegans White-flowered Wax Plant	Endangered	Endangered	Occurs at the edge of dry rainforest vegetation. May also be associated with littoral rainforest, *Leptospermum laevigatum – Banksia integrifolia* subsp. *integrifolia* coastal scrub; *Corymbia maculata* aligned open forest and woodland; *Melaleuca armillaris* scrub to open scrub; and *Eucalyptus tereticornis* aligned open forest and woodland.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Dillwynia tenuifolia	Vulnerable	-	Found in scrubby/dry heath habitat. In western Sydney may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. Flowering occurs sporadically through the year with a peak from August to March depending on environmental conditions.	**Possible**
Epacris sparsa	Vulnerable	Vulnerable	Grows in Riparian Sandstone Scrub, where it is found on the base of cliffs or rock faces, on rock ledges or among rocks in the riparian flood zone. Often in small pockets of damp clay soil, chiefly on south-west facing slopes. Can occur in rocky sites the scrub vegetation is dominated by *Tristaniopsis laurina, Leptospermum trinervium, Allocasuarina littoralis, Acacia longifolia, Grevillea sericea* and *Lomandra fluviatilis*.	**Possible**
Eucalyptus aggregata Black Gum	Vulnerable	Vulnerable	Grows in the lowest parts of the landscape. Grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Often grows with other cold-adapted eucalypts, such as *Eucalyptus pauciflora, E. viminalis, E. rubida, E. stellulata* and *E. ovata*. Black Gum usually occurs in an open woodland formation with a grassy groundlayer dominated either by *Poa labillardierei* or *Themeda australis*, but with few shrubs. Also occurs as isolated paddock trees in modified native or exotic pastures.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[12]**	**Likelihood**
Grevillea juniperina subsp. *juniperina* Juniper-leaved Grevillea	Vulnerable	-	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest. Associated canopy species within Cumberland Plain Woodland and Shale/Gravel Transition Forest include *Eucalyptus tereticornis, E. moluccana, E. crebra, E. fibrosa* and *E. eugenioides*. Understorey species include *Bursaria spinosa, Dillwynia sieberi, Ozothamnus diosmifolius, Daviesia ulicifolia, Acacia falcata, Acacia parramattensis, Themeda australis, Aristida ramosa, Cymbopogon refractus, Eragrostis brownii, Cheilanthes sieberi, Dianella revoluta* and *Goodenia hederacea*. In Castlereagh Woodland on more sandy soils the dominant canopy species are *Eucalyptus fibrosa, E. sclerophylla, Angophora bakeri* and *Melaleuca decora*. Understorey species include *Melaleuca nodosa, Hakea sericea, Cryptandra spinescens, Acacia elongata, Gonocarpus teucrioides, Lomandra longifolia* and the threatened species *Dillwynia tenuifolia, Pultenaea parviflora, Micromyrtus minutiflora* and *Allocasuarina glareicola*. Flowering may occur sporadically throughout the year, but particularly between July and October.	**Possible**
Haloragis exalata subsp. *exalata* Wingless Raspwort	Vulnerable	Vulnerable	Appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	**Possible**
Haloragodendron lucasii Hal	Endangered	Endangered	Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels. Flowering occurs from August to November with fruits appearing from October to December.	**Possible**
Homoranthus darwinioides	Vulnerable	Vulnerable	Grows in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand. Forms small shrubs or shrublets, often in tangled masses. Flowers in spring or from March to December.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[12]**	**Likelihood**
Leucopogon exolasius Woronora Beard-heath	Vulnerable	Vulnerable	Inhabits woodland on sandstone and sandy alluvium and prefers rocky hillsides along creek banks. Occupies areas with low nutrient soils, up to an altitude of 100 m above sea.	**Possible**
Leucopogon fletcheri subsp. *fletcheri*	Endangered	-	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Flowers August to September. Fruit produced October.	**Possible**
Melaleuca deanei Deane's Melaleuca	Vulnerable	Vulnerable	Occurs in sandy soils, woodlands and wet heath on sandstone. Found in mostly ridgetop woodland, with fewer sites in heath on sandstone.	**Possible**
Micromyrtus minutiflora	Endangered	Vulnerable	Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments. Sporadic flowering, June to March.	**Possible**
Olearia cordata	Vulnerable	Vulnerable	Found on sandstone ridges in dry open sclerophyll forest and open shrubland.	**Possible**
Persicaria elatior Knotweed	Vulnerable	Vulnerable	Normally grows in damp places, including coastal with swampy areas, along watercourses, streams and lakes, swamp forest and disturbed areas.	**Possible**
Persoonia hirsuta Hairy Geebung	Endangered	Endangered	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations.	**Possible**
Persoonia nutans Nodding Geebung	Endangered	Endangered	Found on aeolian and alluvial sediments in northern populations, in a range of sclerophyll forest and woodland habitats, including Agnes Banks Woodland, Castlereagh Scribbly Gum and Cooks River /Castlereagh Ironbark Forest. Also, grows on tertiary alluvium in southern populations, which may also extent into shale sandstone transitional communities.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Pimelea curviflora var. *curviflora*	Vulnerable	Vulnerable	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots.	**Possible**
Pimelea spicata Spiked Rice-flower	Endangered	Endangered	Found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. The co-occurring species in the Cumberland Plain sites are *Eucalyptus moluccana, E. tereticornis* and *E. crebra. Bursaria spinosa* is often present at sites and *Themeda australis* is usually present in the groundcover. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites. The IIIlawarra populations usually occur in one of two communities - a woodland or a coastal grassland. Woodland sites are dominated by *E. tereticornis E. eugenioides,* with a groundcover dominated by *Themeda australis* and *Lomandra longifolia*. The grassland sites are dominated by *Themeda australis* and *Lomandra longifolia*, with *Imperata cylindrica*. A shrubby layer, where present, is dominated by *Acacia sophorae* and *Westringia fruticosa* with *Banksia integrifolia*.	**Possible**
Pomaderris brunnea Rufous Pomaderris	Endangered	Vulnerable	Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Flowers appear in September and October. The species has been found in association with *Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa* and *Kunzea ambigua.*	**Possible**
Pterostylis gibbosa Illawarra Greenhood	Endangered	Endangered	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. A deciduous orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[12]**	**Likelihood**
Pterostylis saxicola Sydney Plains Greenhood	Endangered	Endangered	Occurs in shallow soil depressions above cliff lines on sandstone rock shelves. Associated with sclerophyll forest or woodland and in heathy forest, supported by shale or shale/sandstone transitional soils (including sandy soils). Also found in sandstone boulder crevices, often near streams. Grows at altitudes between 10 and 60 m, in small groups, loose colonies or as scattered individuals.	**Possible**
Pultenaea glabra Smooth Bush-pea	Vulnerable	Vulnerable	Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Flowers September to November, fruit matures October to December.	**Possible**
Pultenaea parviflora	Endangered	Vulnerable	Common in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays, as well as transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. *Eucalyptus fibrosa* is usually the dominant canopy species. Flowering peaks in September.	**Possible**
Rhizanthella slateri Eastern Underground Orchid	Vulnerable	Endangered	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Flowers September to November.	**Possible**
Thelymitra kangaloonica Kangaloon Sun Orchid	Critically Endangered	Critically Endangered	Found in heath, scrub, woodlands/open woodlands and open forest habitat. Occurs in areas where shale capping is found on sandstone in shale-sandstone transitional areas including Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes. Grows on ridgetops, upper slopes, and less commonly on mid-slope sandstone benches. Common soils include shallow yellow, clayey/sandy loam, often with stony lateritic fragments on ridgetops. Associated with *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. racemosa,* and/or *E. sparsifolia*.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[12]**	**Likelihood**
Thesium australe Austral Toadflax	Vulnerable	Vulnerable	Found in grassland on coastal headlands and grassy woodland, shrubland or grassland at inland locations. Commonly found with *Themeda australis*. Occurs on soils derived from sedimentary, igneous and metamorphic geology, including peaty loams and black clay loams to yellow podzolics. Commonly present at damp sites.	**Possible**
Zieria involucrata	Endangered	Vulnerable	Found on Hawkesbury Sandstone, and Quaternary alluvium and Narrabeen Group sandstone. Mostly found lower on lower to mid slopes and valleys in sheltered forests but may also be found in drier vegetation. The canopy typically includes *Syncarpia glomulifera* subsp*. glomulifera, Angophora costata, Eucalyptus agglomerata* and *Allocasuarina torulosa*.	**Possible**
Gastropoda				
Pommerhelix duralensis Dural Land Snail	Endangered	Endangered	Has a strong affinity for communities in the interface region between shale and sandstone-derived soils, with forested habitats that have good native cover and woody debris. Favours sheltering under rocks or inside curled-up bark. Also observed resting in exposed areas such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	**Possible**
Meridolum corneovirens Cumberland Plain Land Snail	Endangered	-	Primarily inhabits the critically endangered ecological community Cumberland Plain Woodland and grassy open woodland with occasional dense patches of shrubs. Also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. Lives under litter, bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. Generally active at night.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Insecta				
Synemon plana Golden Sun Moth	Endangered	Critically Endangered	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the ground layer is dominated by wallaby grasses. Occurs in landscapes which are typically low and open with the bare ground between tussocks thought to be an important microhabitat feature. Adults are short-lived (one to four days) and do not feed, the larvae are thought to feed exclusively on the roots of wallaby grasses. Breeding in the ACT is Nov to Dec but may differ in other areas.	**Possible**
Mammalia				
Cercartetus nanus Eastern Pygmy-possum	Vulnerable	-	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation. Tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	Vulnerable	Roosts in cave entrances, crevices in cliffs, old mine workings and the disused, bottle-shaped mud nests of the Fairy Martin. Frequents low to mid-elevation dry open forest and woodland close to these features. Females raise young in maternity roosts from November to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.	**Possible**
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	Endangered	Found in a variety of areas including open forest, rainforest, woodland, coastal heath and inland riparian forest. Uses tree hollows, logs, rock outcrops, small caves and rocky cliff faces as dens. Uses flat rocks amongst boulder sites, rocky stream beds or banks and rocky cliff faces as latrine sites.	**Possible**
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in Eucalypt hollows but has also been found under loose bark on trees or in buildings. Breeding occurs in late spring to early summer. Hibernates in winter.	**Possible**
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Vulnerable	-	Found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	**Possible**
Miniopterus australis Little Bent-winged Bat	Vulnerable	-	Found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forages for small insects beneath the canopy of densely vegetated habitats.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[12]	Likelihood
Miniopterus orianae oceanensis Large Bent-winged Bat	Vulnerable	-	Caves are the primary roosting habitat. Also uses derelict mines, storm-water tunnels, buildings and other man-made structures. Forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves. Hunts in forested areas, catching moths and other flying insects above the tree tops.	**Possible**
Petauroides volans Greater Glider	-	Vulnerable	Feeds exclusively on Eucalypt leaves, buds, flowers and mistletoe. Shelters during the day in tree hollows and will use up to 18 hollows in their home range.	**Possible**
Petaurus australis Yellow-bellied Glider	Vulnerable	-	Occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Extracts sap by incising the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Dens are created (often in family groups) in hollows of large trees.	**Possible**
Phascolarctos cinereus Koala	Vulnerable	Vulnerable	Inhabits Eucalypt woodlands and forests. Feeds on the foliage of more than 70 Eucalypt species and 30 non-Eucalypt species, but in any one area will select preferred browse species.	**Possible**
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Vulnerable	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies close to water in vegetation with a dense canopy. Feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. Also forages in cultivated gardens and fruit crops.	**Possible**
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Vulnerable	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat**[12]	**Likelihood**
Scoteanax rueppellii Greater Broad-nosed Bat	Vulnerable	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m.	**Possible**

9. Assessment of Potential Impacts

9.1 Direct Impacts

9.1.1 Vegetation Clearing

Direct impact of the proposal is clearing to provide adequate asset protection zones (APZ). APZ for the proposed subdivision proposal had been identified in EnviroTech (2019) *Bushfire Hazard Assessment Report – 79, 95 & 100 Bells Lane & 457 Bells Line of Road, Kurmond NSW 2757 (report 19-8233)*. Based on the bushfire report and due to APZ requirements, vegetation clearing will be required as shown in Table Z below.

Table 10: Direct Impacts due to APZ requirements in the proposed lots

Site	Proposed Lot	APZ requirements	Direct Impacts
79 Bells Lane	1	None	N/A
	2	None	N/A
	3	None	N/A
	4	None	N/A
	5	Proposed Lot 5 will require an APZ of 22m along the north-western boundary and an APZ of 15m along the north-eastern boundary.	Potential clearing of trees in the future development area and reduction of canopy cover in the APZ. Vegetation within the identified APZ constitutes a CEEC.
95 Bells Lane	1	None	N/A
	2	None	N/A
	3	None	N/A
	4	Proposed Lot 4 will require an APZ of 15m along the north-eastern boundary and an APZ of 33m along the eastern boundary	Potential clearing of trees in the future development area and reduction of canopy cover in the APZ. Vegetation within the identified APZ constitutes a CEEC.
100 Bells Lane	1	Proposed Lot 1 will require an APZ of 25m on its northern boundary and an APZ of 27m on the northern end of the eastern boundary.	None
	2	Proposed Lot 2 will require an APZ of 33m from the eastern lot boundary.	None

	3	Proposed Lot 3 will require the following APZ buffers: • 33m along most of its eastern boundary; • 15m at the southern end of the western boundary; and • A 15m APZ from the stream on the southern end.	Trimming of trees and reduction of canopy cover. Reduction of canopy cover in an CEEC along the riparian corridor.
457 Bells Line of Road	1	APZ required: • 10m along the western boundary	Trimming of trees.
	2	None	NA
	3	APZ required: • 11m along 2/3 of the eastern boundary; and • 14m on the southern portion.	Vegetation Clearing. Vegetation requiring clearing is a listed CEEC.
	4	APZ required: • 10m along the western boundary	Vegetation Clearing. Vegetation requiring clearing is a listed CEEC.

9.2 Indirect Impacts

Indirect impacts likely to occur as result of the subdivision proposal and subsequent development would include impacts on riparian habitat and edge effects.

9.2.1 Indirect Impacts on Riparian Habitat

Disturbed remnant patches of trees are present along riparian corridors in three sites (79 Bells Lane, 95 Bells Lane and 100 Bells Lane). Reduction in canopy cover in riparian corridors has the potential to indirectly affect the river habitat due to increased potential for weed invasion, erosion and sedimentation. Therefore, potential indirect effects on the riparian habitat likely to be associated with any future residential development have the potential to further exacerbate degradation of the riparian habitat. The following indirect effects should be considered during future development design:

- localised and downstream changes in stream hydrology;
- invasion by exotic plant and animal species; and
- increase in sedimentation.

9.2.2 Edge Effects

Edge effects are changes in habitat conditions (such as degree of humidity and exposure to light or wind) and occur at the ecotone between different types of vegetation (e.g. forest vs grassland). Edge

effects are inherent or natural in nature but can have negative impacts if they alter ecological processes. Edge effects are intensified at the interface between native vegetation and cleared or build up areas as habitat modification (e.g. isolation and fragmentation) and habitat loss (e.g. vegetation clearing) events occur rapidly and prevent organisms (flora and fauna) to assimilate changes.

Removal of vegetation induces edge effects as it causes new environmental conditions to develop along the edges of cleared environments. The removal of vegetation generally promotes invasion of exotic species and/or disturbance tolerant native plants. The clearing of vegetation may in turn promote the influx of pest species such as foxes and feral cats that use edges to stalk and ambush prey. Native animals such as owls and microchiropteran bats also use edge environments for hunting.

Native vegetation at three of the sites is restricted to disturbed patches with remnant native trees and these vegetated areas have already been exposed to edge effects due to historical clearing. Therefore, potential additional edge effects associated with any future residential development are expected to be minimal. The following edge effects should be considered during future development design:

- minor changes in microclimate;
- localised and downstream changes in stream hydrology;
- invasion by exotic plant and animal species; and
- increase in sedimentation.

Appropriate management and mitigation measures including weed control and erosion and sediment shall be included in any future development proposal.

10.Impact Assessment

Determination of the likelihood of threatened species, populations or ecological communities or their habitats, as listed under State legislation occurring in the study area indicates that the proposed development may impact species and communities listed in Table 9. In accordance with the requirements of the *EP&A Act*, an assessment of significance has been prepared for threatened biodiversity listed under the *Threatened Species Conservation Act* 1995. The *TSC Act* has been used to determine whether the proposed development is likely to significantly affect threatened species or ecological communities, or their habitats.

Full impact assessment is presented in Appendix 4. A summary of the findings reported in Appendix 4 is presented herein.

10.1 Assessment of Significance

The following tables provide a summary of the assessment of significance for:

- Amphibians: Table 10
- Birds: Table 11
- Flora: Table 12
- Insects: Table 13
- Gastropods: Table 14

Table 10: Summary of assessment of significance for amphibians.

Significant Impact Criteria	Amphibian - ***Heleioporus australiacus*** **(Giant Burrowing Frog)** - ***Litoria aurea*** **(Green and Golden Bell Frog)** - ***Litoria littlejohni*** **(Littlejohn's Tree Frog)**
(a) Life Cycle	Not likely to be affected.
(b) Ecological Community	No ecological communities will be directly impacted by the proposal.
(c) Habitat	Habitat is well represented within the wider study area. The vegetation within the site affords low-quality foraging habitat for the above-mentioned species. Removal of habitat from the site is not likely to result in a significant impact to the above-mentioned species.
(d) Area of Outstanding Biodiversity Value	No Areas of Outstanding Biodiversity Value have been identified in or in the vicinity of the study area.
(e) Key Threatening Processes	The proposed will not constitute the action of any Key Threatening Processes impacting the above-mentioned species.

Table 11: Summary of assessment of significance for birds.

Significant Impact Criteria	Birds - ***Anthochaera phrygia*** **(Regent Honeyeater)** - ***Artamus cyanopterus cyanopterus*** **(Dusky Woodswallow)** - ***Callocephalon fimbriatum*** **(Gang-gang Cockatoo)** - ***Calyptorhynchus lathami*** **(Glossy Black-Cockatoo)** - ***Chthonicola sagittata*** **(Speckled Warbler)** - ***Daphoenositta chrysoptera*** **(Varied Sittella)** - ***Glossopsitta pusilla*** **(Little Lorikeet)** - ***Grantiella picta*** **(Painted Honeyeater)** - ***Hieraaetus morphnoides*** **(Little Eagle)** - ***Lathamus discolour*** **(Swift Parrot)** - ***Lophoictinia isura*** **(Square-tailed Kite)** - ***Melithreptus gularis gularis*** **(Black-chinned Honeyeater)** - ***Ninox connivens*** **(Barking Owl)** - ***Ninox strenua*** **(Powerful Owl)** - ***Pachycephala olivacea*** **(Olive Whistler)** - ***Petroica boodang*** **(Scarlet Robin)** - ***Petroica phoenicea*** **(Flame Robin)** - ***Rostratula australis*** **(Australian Painted-snipe)**
(a) Life Cycle	Not likely to be affected.
(b) Ecological Community	No ecological communities will be directly impacted by the proposal.
(c) Habitat	Habitat is well represented within the wider study area. The vegetation within the site affords low-quality foraging habitat for the above-mentioned species. Removal of habitat from the site is not likely to result in a significant impact to the above-mentioned species.
(d) Area of Outstanding Biodiversity Value	No Areas of Outstanding Biodiversity Value have been identified in or in the vicinity of the study area.
(e) Key Threatening Processes	The proposed will not constitute the action of any Key Threatening Processes impacting the above-mentioned species.

Table 12: Summary of assessment of significance for flora.

Significant Impact Criteria	Flora
	- ***Acacia bynoeana*** **(Bynoe's Wattle)** - ***Acacia gordonii*** - ***Acacia pubescens*** **(Downy Wattle)** - ***Allocasuarina glareicola*** - ***Asterolasia elegans*** - ***Cynanchum elegans*** **(White-flowered Wax Plant)** - ***Dillwynia tenuifolia*** - ***Epacris sparsa*** - ***Eucalyptus aggregata*** **(Black Gum)** - ***Grevillea juniperina subsp. juniperina*** - ***Haloragis exalata subsp. exalata*** **(Wingless Raspwort)** - ***Haloragodendron lucasii*** - ***Homoranthus darwinioides*** - **Leucopogon exolasius (Woronora Beard-heath)** - ***Leucopogon fletcheri subsp. fletcheri*** - ***Melaleuca deanei*** **(Deane's Melaleuca)** - ***Micromyrtus minutiflora*** - ***Olearia cordata*** - **Persicaria elatior (Knotweed)** - ***Persoonia hirsuta*** **(Hairy Geebung)** - **Persoonia nutans (Nodding Geebung)** - **Pimelea curviflora var. curviflora** - ***Pimelea spicata*** **(Spiked Rice-flower)** - ***Pomaderris brunnea*** **(Rufous Pomaderris)** - ***Pterostylis gibbosa*** **(Illawarra Greenhood)** - ***Pterostylis saxicola*** **(Sydney Plains Greenhood)** - ***Pultenaea glabra*** **(Smooth Bush-pea)** - ***Pultenaea parviflora*** - ***Rhizanthella slateri*** **(Eastern Underground Orchid)** - ***Thelymitra kangaloonica*** **(Kangaloon Sun Orchid)** - ***Thesium australe*** **(Austral Toadflax)** - ***Zieria involucrata***
(a) Life Cycle	Not likely to be affected.
(b) Ecological Community	No ecological communities will be directly impacted by the proposal.
(c) Habitat	Habitat is well represented within the wider study area. The vegetation within the site affords low-quality foraging habitat for the above-mentioned species. Removal of habitat from the site is not likely to result in a significant impact to the above-mentioned species.
(d) Area of Outstanding Biodiversity Value	No Areas of Outstanding Biodiversity Value have been identified in or in the vicinity of the study area.

Significant Impact Criteria	**Flora** - ***Acacia bynoeana* (Bynoe's Wattle)** - ***Acacia gordonii*** - ***Acacia pubescens* (Downy Wattle)** - ***Allocasuarina glareicola*** - ***Asterolasia elegans*** - ***Cynanchum elegans* (White-flowered Wax Plant)** - ***Dillwynia tenuifolia*** - ***Epacris sparsa*** - ***Eucalyptus aggregata* (Black Gum)** - ***Grevillea juniperina subsp. juniperina*** - ***Haloragis exalata subsp. exalata* (Wingless Raspwort)** - ***Haloragodendron lucasii*** - ***Homoranthus darwinioides*** - **Leucopogon exolasius (Woronora Beard-heath)** - ***Leucopogon fletcheri subsp. fletcheri*** - ***Melaleuca deanei* (Deane's Melaleuca)** - ***Micromyrtus minutiflora*** - ***Olearia cordata*** - **Persicaria elatior (Knotweed)** - ***Persoonia hirsuta* (Hairy Geebung)** - **Persoonia nutans (Nodding Geebung)** - **Pimelea curviflora var. curviflora** - ***Pimelea spicata* (Spiked Rice-flower)** - ***Pomaderris brunnea* (Rufous Pomaderris)** - ***Pterostylis gibbosa* (Illawarra Greenhood)** - ***Pterostylis saxicola* (Sydney Plains Greenhood)** - ***Pultenaea glabra* (Smooth Bush-pea)** - ***Pultenaea parviflora*** - ***Rhizanthella slateri* (Eastern Underground Orchid)** - ***Thelymitra kangaloonica* (Kangaloon Sun Orchid)** - ***Thesium australe* (Austral Toadflax)** - ***Zieria involucrata***
(e) Key Threatening Processes	The proposed will not constitute the action of any Key Threatening Processes impacting the above-mentioned species.

Table 13: Summary of assessment of significance for insects.

Significant Impact Criteria	Insects - *Synemon plana* (Golden Sun Moth)
(a) Life Cycle	Not likely to be affected.
(b) Ecological Community	No ecological communities will be directly impacted by the proposal.
(c) Habitat	Habitat is well represented within the wider study area. The vegetation within the site affords low-quality foraging habitat for the above-mentioned species. Removal of habitat from the site is not likely to result in a significant impact to the above-mentioned species.
(d) Area of Outstanding Biodiversity Value	No Areas of Outstanding Biodiversity Value have been identified in or in the vicinity of the study area.
(e) Key Threatening Processes	The proposed will not constitute the action of any Key Threatening Processes impacting the above-mentioned species.

Table 14: Summary of assessment of significance for mammals.

Significant Impact Criteria	Mammals - ***Cercartetus nanus*** **(Eastern Pygmy-possum)** - ***Chalinolobus dwyeri*** **(Large-eared Pied Bat)** - ***Dasyurus maculatus*** **(Spotted-tailed Quoll)** - ***Falsistrellus tasmaniensis*** **(Eastern False Pipistrelle)** - ***Micronomus norfolkensis*** **(Eastern Coastal Free-tailed Bat)** - ***Miniopterus australis*** **(Little Bent-winged Bat)** - ***Miniopterus orianae oceanensis*** **(Large Bent-winged Bat)** - ***Petaurus australis*** **(Yellow-bellied Glider)** - **Phascolarctos cinereus (Koala)** - ***Pteropus poliocephalus*** **(Grey-headed Flying-fox)** - ***Saccolaimus flaviventris*** **(Yellow-bellied Sheathtail-bat)** - ***Scoteanax rueppellii*** **(Greater Broad-nosed Bat)**
(a) Life Cycle	Not likely to be affected.
(b) Ecological Community	No ecological communities will be directly impacted by the proposal.
(c) Habitat	Habitat is well represented within the wider study area. The vegetation within the site affords low-quality foraging habitat for the above-mentioned species. Removal of habitat from the site is not likely to result in a significant impact to the above-mentioned species.
(d) Area of Outstanding Biodiversity Value	No Areas of Outstanding Biodiversity Value have been identified in or in the vicinity of the study area.
(e) Key Threatening Processes	The proposed will not constitute the action of any Key Threatening Processes impacting the above-mentioned species.

Table 15: Summary of assessment of significance for Gastropoda.

Significant Impact Criteria	Gastropoda - ***Pommerhelix duralensis*** **(Dural Land Snail)** - ***Meridolum corneovirens*** **(Cumberland Plain Land Snail)**
(a) Life Cycle	Not likely to be affected.
(b) Ecological Community	No ecological communities will be directly impacted by the proposal.
(c) Habitat	Habitat is well represented within the wider study area. The vegetation within the site affords low-quality foraging habitat for the above-mentioned species. Removal of habitat from the site is not likely to result in a significant impact to the above-mentioned species.
(d) Area of Outstanding Biodiversity Value	No Areas of Outstanding Biodiversity Value have been identified in or in the vicinity of the study area.
(e) Key Threatening Processes	The proposed will not constitute the action of any Key Threatening Processes impacting the above-mentioned species.

11.Conclusion

This report assesses whether any threatened flora and fauna species, endangered populations and endangered ecological communities, are likely to be impacted upon by the proposed subdivision proposal. It addresses the *Threatened Species Conservation Act* 1995 and the *Environmental Protection and Biodiversity Conservation Act 1999*.

The four sites were assessed with regards to potential impacts on threatened biodiversity, including threatened ecological communities, threatened populations and species. No threatened biodiversity was recorded within the four sites except for koala feeding trees and Shale Sandstone Transition Forest. Koalas are unlikely to be found within the sites, but the presence of feeding trees result in the sites classifying as potential koala habitat. The native vegetation, Shale Sandstone Transition Forest, is listed as a Critically Endangered Ecological Community under the NSW *Threatened Species Conservation Act 1995*, the current NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environmental Planning and Biodiversity Conservation Act 1999*. Shale Sandstone Transition Forest occurs in poor to moderate condition at the sites and it was found that the proposed lot subdivision is likely to require canopy tree reduction (i.e. clearing and tree trimming) to give way to required Asset Protection Zones. Riparian corridors and vegetation therein will be retained for connectivity.

No other threatened species, endangered populations or endangered ecological communities listed on the schedules of the *Threatened Species Conservation Act* 1995, or the *Environment Protection and Biodiversity Conservation Act* 1999 were recorded in the study area.

An assessment of significance was undertaken in accordance with requirements of Section 5A of the *Environmental Planning and Assessment Act* 1979, the *Threatened Species Conservation Act 1995* and relevant assessment guidelines. It is concluded that the proposal is unlikely to have a significant effect on threatened species, endangered populations, ecological communities, or their habitats. The report concludes that the planning proposal can proceed as proposed with no significant impacts to occur. A Species Impact Statement is not required for the planning proposal.

Following consideration of the administrative guidelines for determining significance under the *Environment Protection and Biodiversity Conservation Act 1999*, it is concluded that the proposal is unlikely to have a significant impact on Matters of National Environmental Significance or Commonwealth land, and a referral to the Commonwealth Environment Minister is not necessary.

A number of impact mitigation and amelioration strategies have been recommended for the proposal. These strategies mitigate the effects of the proposal on threatened species, endangered populations, ecological communities, or their habitats and minimise the impacts of the proposal on the flora and fauna values of the study area in general.

12.Recommendations

The following recommendations are suggested in order to mitigate and ameliorate the impacts of future development proposals on threatened flora and fauna species and threatened ecological communities:

Vegetation Removal:

- Selective retention of larger canopy trees in order to maintain connectivity within the landscape and among habitat patches; and selective retention of hollow bearing trees at the expense of younger trees lacking hollows.
- Clearing for the proposal should be undertaken such that areas of native vegetation to be retained are not impacted upon during construction works.
- Native plants from the species list in Appendix 2 of this report should be considered in any landscaping for the proposal.
- Known weed or invasive species should not be planted for landscaping purposes.
- Any invasive weeds and escaped garden plants should be removed from the site.

Offsetting the Impacts:

- If any fauna is injured during construction works WIRES should be called immediately.
- Appropriate sediment control measures should be established before the commencement of work on the proposal and retained in place until all bare areas have been revegetated, and to avoid polluting the watercourse, which traverses the site.
- Vehicles and earthmoving machinery should only be parked in restricted areas in order to protect the riparian vegetation on site.
- It is recommended to install Bat nest boxes within the riparian complex – a total of 16 boxes.
- In regard to the waterway habitat, all littoral vegetation should remain undisturbed and uncleared by means of a buffer zone. This protection area should extend from the creek line out to approximately 20m and would retain the remnant the Shale Sandstone Transition Forest vegetation.
- A Vegetation Management Plan (VMP) be prepared and implemented to remove and manage weeds and ensure that the area for retention of Shale Sandstone Transition Forest is managed with planting and maintenance over a minimum five-year period.

13.References

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Legislation

Threatened Species Conservation Act 1995

Biosecurity Act 2015

Environmental Planning and Assessment Act 1979

Environment Protection and Biodiversity Conservation Act 1999

State Environmental Planning Policy No 44 – Koala Habitat Protection

Appendix 1 – PMST Report

The attached report provides a list of identified Matters of National Environmental Significance (MNES) listed under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) within the 10km locality surrounding the site.

Appendix 2 - Species Recorded Onsite

Table A: Flora Species List

Plant Family	Scientific Name	Common Name	Priority Weed
Apiaceae	*Hydrocotyle bonariensis**	Pennywort	
Apocynaceae	*Vinca major**	Blue periwinkle	
Asclepiadaceae	*Araujia hortorum**	Moth Vine	
Asparagaceae	*Asparagus asparagoides**	Bridal Creeper	✓
Asteraceae	*Ageratina riparia**	Mist Flower	
Asteraceae	*Cirsium vulgare**	Thistle	
Asteraceae	*Bidens pilosa**	Farmers Friend	
Asteraceae	*Conyza boniarensis**	Fleabane	
Asteraceae	*Onopordum acanthium**	Thistle	
Asteraceae	*Ozothamnus diosmifolius*	Rice Flower	
Asteraceae	*Senecio madagascariensis**	Fireweed	✓
Asteraceae	*Sonchus oleraceus**	Common Sowthistle	
Asteraceae	*Xerochrysum bracteatum*	Strawflower	
Campanulaceae	*Wahlenbergia gracilis*	Native Bluebell	
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	
Clusiaceae	*Hypericum gramineum*	Small St. John's Wort	
Commelinaceae	*Commelina cyanea*	Scurvy Weed	
Convolvulaceae	*Dichondra repens*	Kidney Weed	
Cyperaceae	*Carex appressa*	Tall Sedge	
Cyperaceae	*Cyperus aggregatus**	Flat Sedge	
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge	
Cyperaceae	*Gahnia aspera*	Rough Saw Sedge	
Cyperaceae	*Lepidosperma laterale*	Variable Swordsedge	
Cyperaceae	*Schoenus imberbis*	Beardless Bog Rush	
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	
Euphorbiaceae	*Ricinus communis**	Castor Oil Plant	
Euphorbiaceae	*Croton insularis*	Silver Croton	
Fabaceae	*Acacia decurrens*	Black Wattle	
Fabaceae	*Acacia floribunda*	White Sally Wattle	
Fabaceae	*Acacia implexa*	Hickory Wattle	
Fabaceae	*Acacia ulicifolia*	Prickly Moses	
Fabaceae	*Glycine clandestine*		
Fabaceae	*Glycine microphylla*		
Fabaceae	*Hardenbergia violacea*	False Sarsparilla	
Fabaceae	*Senna pendula**	Easter Cassia	
Geraniaceae	*Geranium homeamum*	Native Geranium	
Geraniaceae	*Geranium solanderi*	Native Geranium	
Haloragaceae	*Gonocarpus teucroides*	Germander Raspwort	

Plant Family	Scientific Name	Common Name	Priority Weed
Juncaceae	*Juncus usitatus*	Common Rush	
Laminaceae	*Chloanthes glandulosa*		
Lilliaceae	*Myrsiphyllum asparagoides**		
Lomandraceae	*Lomandra longifolia*	Spiny-headed Matt-rush	
Loranthaceae	*Amyema congener*	Mistletoe	
Malvaceae	*Sida rhombifolia**	Arrowleaf Sida	
Malvaceae	*Modiola caroliniana**	Red Flower Mallow	
Myrsinaceae	*Anagallis arvensis**	Scarlet Pimpernel	
Myrsinaceae	*Rapanea variabilis*	Mutton Wood	
Myrtaceae	*Backhousia myrtifolia*	Grey Myrtle	
Myrtaceae	*Eucalyptus creba*	Thin leaved ironbark	
Myrtaceae	*Eucalyptus fibrosa*	Large leaved Ironbark	
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark	
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	
Myrtaceae	*Leptospermum polygalifolium*	Tantoon	
Myrtaceae	*Melaleuca styphelioides*	Prickly Leaved Tea Tree	
Oleaceae	*Ligustrum sinense**	Small leaved privet	
Oleaceae	*Ligustrum lucidum*	Large Leaved Privet	
Oxalidaceae	*Oxalis corniculata**	Yellow Wood Sorrel	
Oxalidaceae	*Oxalis bowiei**	Bowie Wood Sorrel	
Oxalidaceae	*Oxalis articulate**	Shamrock Oxalis	
Oxalidaceae	*Oxalis debilis**	Pink Shamrock	
Phytolaccaceae	*Phytolacca octandra**	Inkweed	
Pittosporaceae	*Bursaria spinosa*	Blackthorn	
Plantaginaceae	*Plantago lanceolata**	Lambs Tongue	
Plantaginaceae	*Plantago major**	Greater Plantain	
Poaceae	*Andropogon virginicus**	Whisky Grass	
Poaceae	*Aristida vagans*	Three-awn Speargrass	
Poaceae	*Bothriochloa macra*	Red Grass	
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	
Poaceae	*Cynodon dactylon*	Couch	
Poaceae	*Echinopogon caespitosus*	Hedgehog Grass	
Poaceae	*Imperata cylindrical*	Blady Grass	
Poaceae	*Setaria pumila**	Pale Pidgeon Grass	
Poaceae	*Paspalum dilitatum**	Paspalum	
Poaceae	*Pennisetum clandestinum**	Kikuyu	
Poaceae	*Poa labilliardieri*	Tussock Grass	
Poaceae	*Themeda australis*	Kangaroo Grass	
Poaceae	*Eragrostis sp.*	-	
Primulaceae	*Anagallis arvensis**	Pimpernel	
Proteaceae	*Grevillea robusta*	Silky Oak	

Plant Family	Scientific Name	Common Name	Priority Weed
Pteridaceae	*Adiantum aethiopicum*	Common Maidenhair	
Pteridaceae	*Pellaea falcata*	Sickle Fern	
Pteridaceae	*Cheilanthes sieberi* subsp. *Sieberi*	Poison Rock Fern	
Rhamnaceae	*Alphitonia excels*	Red Ash	
Rosaceae	*Rubus fruticosus**	Blackberry	✓
Rosaceae	*Rubus parviflorus*	Native Raspberry	
Rubiaceae	*Pomax umbellata*	-	
Salicaceae	*Salix alba**	Willow	✓
Santalaceae	*Exocarpos compressiformis*	Cherry Ballart	
Solanaceae	*Physalis peruviana**	Cape Gooseberry	
Solanaceae	*Solanum mauritianum**	Wild Tobacco	
Solanaceae	*Solanum nigrum**	Blackberry Nightshade	
Solanaceae	*Solanum prinophyllum*	Forest Nightshade	
Solanaceae	*Solanum sisymbriifolium**	Sticky Nightshade	
Verbenaceae	*Lantana camara**	Lantana	✓
Verbenaceae	*Phyla nodiflora**	Carpet Weed	
Verbenaceae	*Verbena bonariensis**	Purple Top	

**denotes exotic species*

Table B: Fauna Species List

SCIENTIFIC NAME	COMMON NAME
Amphibians	
Litoria latopalmata	Broad-palmed Frog
Crinia signifera	Common Eastern Froglet
Aves	
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo
Manorina melanophrys	Bell miner
Acanthiza chrysorrhoa	Yellow Rumped Thornbill
Acathanza lineata	Striated Thornbill
Acanthorhynchus tenuirostris	Eastern Spinebill
Rhipidura albiscapa	Grey Fantail
Rhipidura leucophrys	Willy Wagtail
Platycercus eximius	Eastern Rosella
Smicrornis brevirostris	Weebill
Chenonetta jubata	Wood Duck
Manorina melanocephala	Noisy Miner
Gymnorhina tibicen	Magpie
Grallina cyanoleuca	Magpie Lark
*Acridotheres tristis**	Mynah Bird*
Hirundo neoxena	Welcome Swallow
Phaps chalcoptera	Common Bronzewing
Corvus coronoides	Raven
Eopsaltria australis	Eastern Yellow Robin
Dacelo novaeguineae	Kookaburra
Ocyphaps lophotes	Crested Pidgeon
Trichoglossus moluccanus	Rainbow Lorikeet
Coracina novaehollandiae	Black-faced Cuckoo Shrike
Malurus cyaneus	Superb Blue Wren
Sericornis frontalis	White-browed Scrubwren
Zosterops lateralis	Silvereye
Anthochaera chrysoptera	Brush Wattlebird
Mammals	
*Lepus europaeus**	European Hare
Trichosurus vulpecular	Brush-tailed Possum (scat)
Wallabia bicolor	Swamp wallaby (skull)
Reptiles	
Eulamprus quoyii	Eastern Water Skink
Intellagama lesueurii	Eastern Water Dragon

Appendix 3 - Threatened Biodiversity

The following Likelihood of Occurrence table was compiled with threatened biodiversity identified as likely to occur within the sites based in the result of searches in the BioNet Atlas and the PMST. The searches were undertaken within the 10km locality surrounding the sites.

In the likelihood of occurrence table, the determination of a species category of likelihood of occurrence was determined based in the following:

- habitat quality within and adjacent to the Site as determined through review of regional vegetation mapping and the results of the site surveys;
- breeding habitat/resources present – assists with identification of the importance of habitat to the species;
- dispersal ability - based on known ecology - whether the species have an ability to disperse to new areas of habitat following disturbance; and
- local records in similar habitat/distance/connectivity to the Site.

This allows for assessment of cryptic or seasonal species that are unlikely to be readily identified during brief site inspections and/or due to seasonal constraints. The likelihood of each species occurring was categorised as known, potential or unlikely to occur based on the definitions provided in Table C.

Table C: *Definitions of Likelihood of Occurrence*

Category	Description
Known	• the ecological community/species/matter has been recorded in the Subject Land during field surveys; or • database records demonstrate that the ecological community/species has been known to occur in the Subject Land within the last 10 year period.
Potential	• the ecological community/species' known distribution includes the Subject Land, and suitable habitat is present within it, or, • database records demonstrate that the ecological community/species has been known to occur in the Subject Land, however has not been recorded within the last 10 years, or • the species is a wide ranging flying species which may 'fly-over' the Subject Land, regardless of the habitat types present and has been recorded within the 10 km locality surrounding the Subject Land.
Unlikely	• the ecological community/species has not been recorded within 10 km locality of the Subject Land and suitable habitat does not occur within the Subject Land, or • the Subject Land is not within the TEC/species' known distribution, or

Category	Description
	• sufficient field surveys have been conducted to conclude that the species is likely to be absent.

The following considerations were made in assessing habitat suitability and distribution:

- *Habitat quality within and adjacent to the Subject Land.*
- *Breeding habitat/resources present – assists with identification of the importance of habitat to the species.*
- *The species' ability to disperse to new areas of habitat following disturbance.*
- *Local records in similar habitat/distance/connectivity to the Subject Land.*

Table D: *Likelihood of Occurrence*

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[3][4]	Likelihood
Amphibia				
Heleioporus australiacus Giant Burrowing Frog	Vulnerable	Vulnerable	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Burrows below the soil surface or in the leaf litter. Breeds in soaks or pools within first or second order streams.	**Possible**
Litoria aurea Green and Golden Bell Frog	Endangered	Vulnerable	Inhabits marshes, dams and stream-sides, particularly those containing *Typha* spp. or *Eleocharis* spp. Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as *Gambusia holbrooki,* have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	**Possible**
Litoria littlejohni Littlejohn's Tree Frog	Vulnerable	Vulnerable	Found in perched swamps, upper reaches of permanent streams, dams, ditches, isolated pools, flooded hollows, creeks, streams and lagoons. Breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath-based forests and woodlands where it shelters under leaf litter and low vegetation.	**Possible**
Mixophyes balbus Stuttering Frog	Endangered	Vulnerable	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Breeding occurs in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.	**Unlikely** Habitat is not represented within the study area

[3] NSW Office of Environment & Heritage, Threatened Species, <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>
[4] Australian Government Department of the Environment, Species Profile and Threats Database, <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Aves				
Anthochaera phrygia Regent Honeyeater	Critically Endangered	Critically Endangered	Inhabits dry open forests and woodlands that have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Generalist forager, though it feeds mainly on the nectar from a small number of Eucalypts that produce high volumes. Usually makes open, cup shaped nests in horizontal branches or forks in mature Eucalypts, sheoaks and mistletoe *haustoria*.	**Possible**
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	-	Found in woodlands and dry open sclerophyll forests, usually dominated by Eucalypts including mallee associations. Also recorded in shrublands and heathlands and various modified habitats including regenerating forests; very occasionally in moist forests or rainforests. Prefers understorey typically open with sparse Eucalypt saplings, Acacias and other shrubs, including heath. Ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber.	**Possible**
Botaurus poiciloptilus Australasian Bittern	Endangered	Endangered	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes. Hides during the day and feeds, mainly at night. Feeding platforms may be constructed over deeper water from reeds and are often littered with prey remains. Breeding occurs in summer from October to January and the nest is a platform of reeds.	**Unlikely** Habitat is not represented within the study area
Calidris ferruginea Curlew Sandpiper	Endangered	Critically Endangered	Generally found in intertidal mudflats or sheltered coasts. Can also occur in non-tidal lakes, lagoons and swamps, sometimes at inland locations. Forages in shallow water, and sometimes on exposed algae mats or water weed. Roosts on beaches and wetlands, and sometimes on rocky shores and salt marshes.	**Unlikely** Habitat is not represented within the study area

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Callocephalon fimbriatum Gang-gang Cockatoo	Vulnerable	-	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	**Possible**
Calyptorhynchus lathami Glossy Black-Cockatoo	Vulnerable	-	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. *Allocasuarina littoralis* and *A. torulosa* are important foods. Inland populations feed on a wide range of sheoaks, including *Allocasuaraina diminuta* and *A. gymnathera* belah is also utilised and may be a critical food source for some populations. Dependent on large hollow-bearing eucalypts for nest sites.	**Possible**
Chthonicola sagittata Speckled Warbler	Vulnerable	-	Lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Large, relatively undisturbed remnants are required for the species to persist in an area. Pairs are sedentary and occupy a territory of about 10 ha, slightly larger when not breeding. The rounded, domed, roughly built nest is located in a slight hollow in the ground or the base of a low dense plant, between August and January.	**Possible**
Cuculus optatus Oriental Cuckoo	-	Migratory	Winters in coastal parts of northern and eastern Australia. Found in forest canopy, open wooded areas and orchards.	**Possible**
Daphoenositta chrysoptera Varied Sittella	Vulnerable	-	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. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Dasyornis brachypterus Eastern Bristlebird	Endangered	Endangered	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. Shy and cryptic and rarely flies, although can be seen scampering over the ground; when approached, may move to a lookout perch 1 m or more above the ground, then retreat into dense vegetation. Nests are elliptical domes constructed on or near the ground amongst dense vegetation.	**Unlikely** Habitat is not represented within the study area
Epthianura albifrons White-fronted Chat	Vulnerable	-	Found mostly in temperate to arid climates and very rarely sub-tropical areas. Occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Nests in the Sydney region have also been seen in low isolated mangroves.	**Unlikely** Habitat is not represented within the study area
Glossopsitta pusilla Little Lorikeet	Vulnerable	-	Forages primarily in the canopy of open Eucalyptus forest and woodland but also finds food in *Angophora*, *Melaleuca* and other tree species, riparian habitats particularly are used. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain populations. Feeds mostly on nectar and pollen, also on native fruits and only rarely in orchards. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	**Possible**
Grantiella picta Painted Honeyeater	Vulnerable	Vulnerable	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping Eucalypts, she-oak, paperbark or mistletoe branches.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Hieraaetus morphnoides Little Eagle	Vulnerable	-	Occupies open eucalypt forest, woodland or open woodland, Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	**Possible**
Hirundapus caudacutus White-throated Needletail	-	Vulnerable	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. Recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows.	**Possible**
Lathamus discolor Swift Parrot	Endangered	Critically Endangered	Migrates to the Australian south-east mainland between March and October, where they occur in areas where Eucalypts are flowering profusely or where there are abundant lerp infestations. They return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by *Eucalyptus globulus*.	**Possible**
Limosa lapponica baueri Bar-tailed Godwit (baueri)	-	Vulnerable	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks. Roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh.	**Unlikely** Habitat is not represented within the study area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit	-	Critically Endangered	Occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Also recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats.	**Unlikely** Habitat is not represented within the study area

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Lophoictinia isura Square-tailed Kite	Vulnerable	-	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	**Possible**
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	Vulnerable	-	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially *Eucalyptus sideroxylon, E. albens, E. microcarpa, E. melliodora, E. blakelyi* and *E. tereticornis*. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. The compact, suspended, cup-shaped nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage.	**Possible**
Monarcha melanopsis Black-faced Monarch	-	Migratory	Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical rainforest, subtropical rainforest, mesophyll thicket/shrubland, warm temperate rainforest, dry rainforest and occasionally in cool temperate rainforest. Also sometimes found in nearby open eucalypt forests (mainly wet sclerophyll forests), especially in gullies with a dense, shrubby understorey as well as in dry sclerophyll forests and woodlands, often with a patchy understorey.	**Unlikely** Habitat is not represented within the study area
Monarcha trivirgatus Spectacled Monarch	-	Migratory	Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	**Unlikely** Habitat is not represented within the study area

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Myiagra cyanoleuca Satin Flycatcher	-	Migratory	Inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as *Eucalypt fastigata, E. dalrympleana* or occasionally *Mountain Ash, E. regnans*. Sometimes also occurs in dry sclerophyll forests and woodlands, usually dominated by eucalypts such as *E. blakelyi, E. sideroxylon, E. albens, E. macrorhyncha* and Broad-leaved Stringybark, usually with open understorey.	**Unlikely** Habitat is not represented within the study area
Ninox connivens Barking Owl	Vulnerable	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats due to the higher density of prey on these fertile soils. Nesting occurs during mid-winter and spring but is variable between pairs and across years.	**Possible**
Ninox strenua Powerful Owl	Vulnerable	-	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. Roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera, Allocasuarina littoralis, Acacia melanoxylon, Angophora floribunda, Exocarpus cupressiformis* and a number of Eucalypt species. Nests in large tree hollows (at least 0.5 m deep), in large Eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	**Possible**
Numenius madagascariensis Eastern Curlew	-	Critically Endangered	Generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. Roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. May also roost on wooden oyster leases or other similar structures.	**Unlikely** Habitat is not represented within the study area

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Onychoprion fuscata Sooty Tern	Vulnerable	-	Breeds on flat, open, sparsely or heavily vegetated, oceanic or barrier islands of sand, coral or rock in productive tropical and subtropical offshore waters rich in plankton, fish and squid. Absent from cold current areas and generally avoids islands with terrestrial predators.	**Unlikely** Habitat is not represented within the study area
Pachycephala olivacea Olive Whistler	Vulnerable	-	Inhabits wet forests above about 500 m. May move to lower altitudes during cold weather. Forages in trees, shrubs and on the ground.	**Possible**
Petroica boodang Scarlet Robin	Vulnerable	-	Found in forests and woodlands. Habitat usually contains abundant logs and fallen timber. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. Nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	**Possible**
Petroica phoenicea Flame Robin	Vulnerable	-	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. Breeds in spring to late summer. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. Builds an open cup nest made of plant materials and spider webs.	**Possible**
Rhipidura rufifrons Rufous Fantail	-	Migratory	Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as *Eucalyptus microcorys, E. cypellocarpa, E. delegatensis, E. pilularis or E. resinifera*; usually with a dense shrubby understorey often including ferns. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including *Eucalyptus maculata, E. melliodora*, ironbarks or stringybarks, often with a shrubby or heath understorey.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Rostratula australis Australian Painted-snipe	Endangered	Endangered	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	**Possible**
Threatened Ecological Communities				
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	-	Endangered	Occurs on flat or gently undulating terrain on sandy soil (i.e. sand and sandy gravel), on deposits of Tertiary alluvium which are sometimes overlayed with aeolian deposits (i.e. parts of the Agnes Banks occurrences). The vegetation structure is typically woodland less than 20 m tall with a prominent shrub layer and a variable ground layer. The canopy contains, and is often dominated by, one or more of the following species: *Angophora bakeri, Eucalyptus racemosa* and *E. parramattensis* subsp. *parramattensis*. Melaleuca species including *M. decora* and *Eucalyptus fibrosa* may also be prominent in the canopy (and/or mid layer).	**Not Observed**
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	-	Endangered	Occurs in coastal catchments at elevations up to 50 m ASL, typically less than 20 m ASL, on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. There are also minor occurrences on coastal dune swales or flats, particularly deflated dunes and dune soaks. Occurs on soils derived from unconsolidated sediments (including alluvium), typically hydrosols and sometimes organosols. It may occur in transitional soils where shallow unconsolidated sediments border lithic substrates. Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover of at least 10 per cent. Has a canopy of trees dominated by *Casuarina glauca*. Typically occurs where groundwater is saline or brackish.	**Not Observed**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	-	Critically Endangered	Primarily occurs in elevations below 100 m above sea level. Occurs in the Cumberland Subregion with clay soils derived from predominantly Tertiary *alluvium* and on Wianamatta Shale derived soils found next to Tertiary alluvium (in eastern areas of the ecological community's distribution, a sandstone influence is evident). A dry sclerophyll open-forest to low woodland typically dominated by an overstorey of *Eucalyptus fibrosa* and *Melaleuca decora*, with *Eucalyptus longifolia* also often present. Usually includes a moderate to dense mid/shrub stratum, commonly including *Melaleuca nodosa* and *Lissanthe strigosa*, and to a lesser extent *Melaleuca decora*. The ground layer is variable and generally sparse with a mix of grasses and other graminoids, forbs, and low shrubs.	**Not Observed**
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	-	Critically Endangered	The canopy of mature trees may exceed 30 m height and is typically dominated by *Eucalyptus moluccana* and *E. tereticornis*. The lower tree stratum is often sparse when it is present. Non-eucalypt species typically present in this layer include *Acacia implexa, A. parramattensis, A. decurrens, Exocarpos cupressiformis* and *Melaleuca decora*. Where the shrub layer is well developed it is often associated with a reduced abundance of grasses, other graminoids and forbs in the ground layer. The shrub layer is often dominated by *Bursaria spinosa*. The ground layer is typically dominated by native grasses, other graminoids and forbs.	**Not Observed**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[34]**	**Likelihood**
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	-	Critically Endangered	Occurs at the transition between shales and sandstones of the Wianamatta and Hawkesbury Groups, including the transitional Mittagong Formation. Occurs as forest or woodland and may have a primarily shrubby or primarily grassy understorey or be a mixture. Canopy is a mix of species typically including two or more of the following: *Eucalyptus punctata, E. crebra, E. fibrosa* subsp. *fibrosa, E. tereticornis* subsp. *tereticornis, E. resinifera* subsp. *resinifera, E. eugenioides* (or *E. globoidea* depending on local species present and degree of sandstone influence) and *Angophora bakeri*. Where present the mid layer of the understorey varies in structure and floristics. Where present, the small tree layer is likely to be dominated by Eucalypt species and *Allocasuarina littoralis*. Where shrubs are present, the mid layer is likely to be dominated by *Bursaria spinosa* in areas with low sandstone influence, with other common species including *Leucopogon juniperinus, Kunzea ambigua, Persoonia linearis, Ozothamnus diosmifolius* and *Hibbertia aspera*. Where present, the ground layer of the understorey is typically diverse and dominated by grasses and herbs including: *Aristida vagans, Austrostipa pubescens, Cheilanthes sieberi* subsp. *sieberi*, *Dichondra repens, Echinopogon ovatus, Entolasia marginate, Entolasia stricta, Lepidosperma laterale, Lomandra multiflora, Microlaena stipoides* var. *stipoides, Oxalis perennans, Pimelea linifolia* subsp. *linifolia, Pomax umbellata, Phyllanthus hirtellus, Pratia purpurascens, Solanum prinophyllum* and *Themeda australis*. The ground layer may also contain small shrubs, including *Hibbertia aspera.*	**Mapped/Observed**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	-	Critically Endangered	A tall open forest that is typically dominated, or co-dominated, by *Syncarpia glomulifera*. Occurs at elevations from 2-308m, with annual precipitation of 825-1155mm. Grows on clay soils derived from Wianamatta Shale, but parent geology may also be Holocene Alluvium or the Mittagong Formation, or Hawkesbury Sandstone at margin areas. The canopy (which may attain heights of over 30m) also commonly includes various Ironbark species, depending on location, including *Eucalyptus paniculata, E. crebra* and/or *E. fibrosa*. Small trees may also occur, including *Acacia parramattensis, Pittosporum undulatum* and *Trema aspera*. If present, a shrub layer may include *Breynia oblongifolia, Echinopogon ovatus, Leucopogon juniperinus, Maytenus silvestris, Ozothamnus diosmifolius* and *Pittosporum revolutum.*	**Not Observed**
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	-	Endangered	Generally tall open eucalypt forests found on igneous rock in, or adjacent to, the Sydney Basin Bioregion. Occurs in areas of high rainfall, generally ranging from 950 to 1600 mm/year and typically occurs at elevations between 650 and 1050 m above sea level. In the Blue Mountains, the ecological community occurs as small, disjunct patches scattered across the upper mountains on caps of post-Triassic basalt, or on basalt-like volcanics. The ecological community typically occurs as an open to tall open forest with a sparse to dense layer of shrubs and vines, and a diverse understorey of native grasses, forbs, twiners and ferns. However, the structure of the ecological community may vary from tall open forest with trees up to and above 30 m tall with a projected foliage cover of 30–70% to woodland with trees 10–30 m tall, with a projected foliage cover of 10–30% depending on aspect, slope, soil conditions, soil depth, and previous clearing and disturbance. Rainforest elements are also present in less coastal remnants with sheltered aspects and topography, and along watercourses.	**Not Observed**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Western Sydney Dry Rainforest and Moist Woodland on Shale	-	Critically Endangered	Occurs typically on clay soils derived from Wianamatta Group shale geology, generally occurs in areas with a mean annual rainfall of 800 to 920 mm/year at higher elevations of the Cumberland Plain, up to 300 m above sea level (asl). It generally occurs in rugged terrain and other patches may occur on undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically occupying upper sections of the slope or where partial clearance or fire has disturbed the rainforest vegetation. A tree canopy layer is present forming a simple, low closed forest (often with emergents) to a more open woodland, with a small tree layer forming a sub-canopy. A shrub layer is usually present, though variable in density, and has good representation of mesic species. The ground layer is variable and generally sparse with a diverse mix of forbs, ferns and shade-tolerant grasses (the latter more typical of the moist woodland form). Vines and scramblers are typically present across the ecological community.	**Not Observed**
Flora				
Acacia bynoeana Bynoe's Wattle	Endangered	Vulnerable	Occurs on sandy soils, in heath or dry sclerophyll forest. Appears to have preference for open sites, sometimes disturbed, such as recently burnt areas, and roadside spoil mounds and trail margins. Grows with overstorey species including Scribbly Gum, Red Bloodwood, Narrow-leaved Apple, Saw Banksia and Parramatta Red Gum.	**Possible**
Acacia gordonii	Endangered	Endangered	Found in healthlands, woodland and dry sclerophyll forest, within or amongst rock platforms on sandstone outcropping. Grows on Hawkesbury Sandstone substrate, with some laterite and residual clay influence, which is nutrient poor and well drained. Overstorey species include *Eucalyptus eximia, E. gummifera, E. squamea* and *E. piperita.*	**Possible**
Acacia pubescens Downy Wattle	Vulnerable	Vulnerable	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Found in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Flowers from August to October. The pods mature in October to December.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[34]**	**Likelihood**
Acrophyllum australe	Vulnerable	Vulnerable	Grows in sheltered gullies beneath waterfalls and drip zones of rock overhangs of Hawkesbury or Narrabeen sandstone and cliff faces, in shale interbeds, crevices on the sandstone rock face, talus slopes and in thick moss. Flowers November – December.	**Unlikely** Habitat is not represented within the study area
Allocasuarina glareicola	Endangered	Endangered	Grows in Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora*. Common associated understorey species include *Melaleuca nodosa, Hakea dactyloides, Hakea sericea, Dillwynia tenuifolia, Micromyrtus minutiflora, Acacia elongata, Acacia brownei, Themeda australis* and *Xanthorrhoea minor*.	**Possible**
Asterolasia elegans	Endangered	Endangered	Occurs on Hawkesbury sandstone. Found in sheltered forests on mid to lower slopes and valleys. The canopy at known sites includes *Syncarpia glomulifera* subsp. *glomulifera, Angophora costata, Eucalyptus piperita, Allocasuarina torulosa* and *Ceratopetalum gummiferum*.	**Possible**
Cryptostylis hunteriana Leafless Tongue-orchid	Vulnerable	Vulnerable	Found in a range of habitats including woodland, sedgelands, forest, wetlands and swamp heath. Large populations occur in woodland dominated by *Eucalyptus sclerophylla, E. sieberi, Corymbia gummifera* and *Allocasuarina littoralis*. Occurs on moist and sandy, dry and peaty soils.	**Unlikely** Habitat is not represented within the study area
Cynanchum elegans White-flowered Wax Plant	Endangered	Endangered	Occurs at the edge of dry rainforest vegetation. May also be associated with littoral rainforest, *Leptospermum laevigatum – Banksia integrifolia* subsp. *integrifolia* coastal scrub; *Corymbia maculata* aligned open forest and woodland; *Melaleuca armillaris* scrub to open scrub; and *Eucalyptus tereticornis* aligned open forest and woodland.	**Possible**
Dillwynia tenuifolia	Vulnerable	-	Found in scrubby/dry heath habitat. In western Sydney may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. Flowering occurs sporadically through the year with a peak from August to March depending on environmental conditions.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat**[34]	**Likelihood**
Epacris sparsa	Vulnerable	Vulnerable	Grows in Riparian Sandstone Scrub, where it is found on the base of cliffs or rock faces, on rock ledges or among rocks in the riparian flood zone. Often in small pockets of damp clay soil, chiefly on south-west facing slopes. Can occur in rocky sites the scrub vegetation is dominated by *Tristaniopsis laurina, Leptospermum trinervium, Allocasuarina littoralis, Acacia longifolia, Grevillea sericea* and *Lomandra fluviatilis*.	**Possible**
Eucalyptus aggregata Black Gum	Vulnerable	Vulnerable	Grows in the lowest parts of the landscape. Grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Often grows with other cold-adapted eucalypts, such as *Eucalyptus pauciflora, E. viminalis, E. rubida, E. stellulata* and *E. ovata*. Black Gum usually occurs in an open woodland formation with a grassy groundlayer dominated either by *Poa labillardierei* or *Themeda australis*, but with few shrubs. Also occurs as isolated paddock trees in modified native or exotic pastures.	**Possible**
Eucalyptus sp. *Cattai*	Critically Endangered	Critically Endangered	Occurs as a rare emergent tree in scrub, heath and low woodland on sandy soils, usually as isolated individuals or occasionally in small clustered groups. The sites at which it occurs are generally flat and on ridge tops. Associated soils are laterised clays overlying sandstone.	**Unlikely** Habitat is not represented within the study area
Genoplesium baueri Yellow Gnat-orchid	Endangered	Endangered	Found in open, shrubby and heathy forest, heathland to shrubby woodland. Also, grows in moss gardens on sandstone. Associated soils are sands or sandy loams.	**Unlikely** Habitat is not represented within the study area

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Grevillea juniperina subsp. *juniperina* Juniper-leaved Grevillea	Vulnerable	-	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest. Associated canopy species within Cumberland Plain Woodland and Shale/Gravel Transition Forest include *Eucalyptus tereticornis, E. moluccana, E. crebra, E. fibrosa* and *E. eugenioides*. Understorey species include *Bursaria spinosa, Dillwynia sieberi, Ozothamnus diosmifolius, Daviesia ulicifolia, Acacia falcata, Acacia parramattensis, Themeda australis, Aristida ramosa, Cymbopogon refractus, Eragrostis brownii, Cheilanthes sieberi, Dianella revoluta* and *Goodenia hederacea*. In Castlereagh Woodland on more sandy soils the dominant canopy species are *Eucalyptus fibrosa, E. sclerophylla, Angophora bakeri* and *Melaleuca decora*. Understorey species include *Melaleuca nodosa, Hakea sericea, Cryptandra spinescens, Acacia elongata, Gonocarpus teucrioides, Lomandra longifolia* and the threatened species *Dillwynia tenuifolia, Pultenaea parviflora, Micromyrtus minutiflora* and *Allocasuarina glareicola*. Flowering may occur sporadically throughout the year, but particularly between July and October.	**Possible**
Haloragis exalata subsp. *exalata* Wingless Raspwort	Vulnerable	Vulnerable	Appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	**Possible**
Haloragodendron lucasii Hal	Endangered	Endangered	Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels. Flowering occurs from August to November with fruits appearing from October to December.	**Possible**
Homoranthus darwinioides	Vulnerable	Vulnerable	Grows in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand. Forms small shrubs or shrublets, often in tangled masses. Flowers in spring or from March to December.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Leucopogon exolasius Woronora Beard-heath	Vulnerable	Vulnerable	Inhabits woodland on sandstone and sandy alluvium and prefers rocky hillsides along creek banks. Occupies areas with low nutrient soils, up to an altitude of 100 m above sea.	**Possible**
Leucopogon fletcheri subsp. *fletcheri*	Endangered	-	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Flowers August to September. Fruit produced October.	**Possible**
Melaleuca deanei Deane's Melaleuca	Vulnerable	Vulnerable	Occurs in sandy soils, woodlands and wet heath on sandstone. Found in mostly ridgetop woodland, with fewer sites in heath on sandstone.	**Possible**
Micromyrtus minutiflora	Endangered	Vulnerable	Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments. Sporadic flowering, June to March.	**Possible**
Olearia cordata	Vulnerable	Vulnerable	Found on sandstone ridges in dry open sclerophyll forest and open shrubland.	**Possible**
Persicaria elatior Knotweed	Vulnerable	Vulnerable	Normally grows in damp places, including coastal with swampy areas, along watercourses, streams and lakes, swamp forest and disturbed areas.	**Possible**
Persoonia hirsuta Hairy Geebung	Endangered	Endangered	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations.	**Possible**
Persoonia nutans Nodding Geebung	Endangered	Endangered	Found on aeolian and alluvial sediments in northern populations, in a range of sclerophyll forest and woodland habitats, including Agnes Banks Woodland, Castlereagh Scribbly Gum and Cooks River /Castlereagh Ironbark Forest. Also, grows on tertiary alluvium in southern populations, which may also extent into shale sandstone transitional communities.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Pimelea curviflora var. *curviflora*	Vulnerable	Vulnerable	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots.	**Possible**
Pimelea spicata Spiked Rice-flower	Endangered	Endangered	Found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. The co-occurring species in the Cumberland Plain sites are *Eucalyptus moluccana, E. tereticornis* and *E. crebra. Bursaria spinosa* is often present at sites and *Themeda australis* is usually present in the groundcover. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites. The IIllawarra populations usually occur in one of two communities - a woodland or a coastal grassland. Woodland sites are dominated by *E. tereticornis E. eugenioides,* with a groundcover dominated by *Themeda australis* and *Lomandra longifolia*. The grassland sites are dominated by *Themeda australis* and *Lomandra longifolia*, with *Imperata cylindrica*. A shrubby layer, where present, is dominated by *Acacia sophorae* and *Westringia fruticosa* with *Banksia integrifolia*.	**Possible**
Pomaderris brunnea Rufous Pomaderris	Endangered	Vulnerable	Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Flowers appear in September and October. The species has been found in association with *Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa* and *Kunzea ambigua.*	**Possible**
Pterostylis gibbosa Illawarra Greenhood	Endangered	Endangered	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. A deciduous orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat**[34]	**Likelihood**
Pterostylis saxicola Sydney Plains Greenhood	Endangered	Endangered	Occurs in shallow soil depressions above cliff lines on sandstone rock shelves. Associated with sclerophyll forest or woodland and in heathy forest, supported by shale or shale/sandstone transitional soils (including sandy soils). Also found in sandstone boulder crevices, often near streams. Grows at altitudes between 10 and 60 m, in small groups, loose colonies or as scattered individuals.	**Possible**
Pultenaea glabra Smooth Bush-pea	Vulnerable	Vulnerable	Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Flowers September to November, fruit matures October to December.	**Possible**
Pultenaea parviflora	Endangered	Vulnerable	Common in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays, as well as transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. *Eucalyptus fibrosa* is usually the dominant canopy species. Flowering peaks in September.	**Possible**
Rhizanthella slateri Eastern Underground Orchid	Vulnerable	Endangered	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Flowers September to November.	**Possible**
Rhodamnia rubescens Scrub Turpentine	Endangered	Critically Endangered	Populations of are mainly coastal and occasionally extend inland onto escarpments up to 600 m ASL in areas with rainfall of 1,000–1,600 mm. Known to occur from coastal districts north from Batemans Bay, approximately 280 km south of Sydney, to the Queensland border. commonly occurs in all rainforest subforms except cool temperate rainforest. A characteristic species in the Endangered Ecological Communities; Littoral Rainforest, Lowland Rainforest.	**Unlikely** Habitat is not represented within the study area
Syzygium paniculatum Magenta Lilly Pilly	Endangered	Vulnerable	Found in Littoral Rainforest on grey soils over sandstone in the south coast. Also, found in Riverside Galley Rainforest and Littoral Rainforest communities on gravels, sands, silts and clays in the central coast.	**Unlikely** Habitat is not represented within the study area

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat**[34]	**Likelihood**
Tetratheca glandulosa	Vulnerable	-	Found in Littoral Rainforest on grey soils over sandstone in the south coast. Also, found in Riverside Galley Rainforest and Littoral Rainforest communities on gravels, sands, silts and clays in the central coast.	**Unlikely** Habitat is not represented within the study area
Thelymitra kangaloonica Kangaloon Sun Orchid	Critically Endangered	Critically Endangered	Found in heath, scrub, woodlands/open woodlands and open forest habitat. Occurs in areas where shale capping is found on sandstone in shale-sandstone transitional areas including Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes. Grows on ridgetops, upper slopes, and less commonly on mid-slope sandstone benches. Common soils include shallow yellow, clayey/sandy loam, often with stony lateritic fragments on ridgetops. Associated with *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. racemosa,* and/or *E. sparsifolia*.	**Possible**
Thesium australe Austral Toadflax	Vulnerable	Vulnerable	Found in grassland on coastal headlands and grassy woodland, shrubland or grassland at inland locations. Commonly found with *Themeda australis*. Occurs on soils derived from sedimentary, igneous and metamorphic geology, including peaty loams and black clay loams to yellow podzolics. Commonly present at damp sites.	**Possible**
Wollemia nobilis Wollemi Pine	Critically Endangered	Critically Endangered	Grows 670–780 m above sea level in deeply shaded sandstone gorges. Occurs in the warm temperate rainforest and rainforest margins in a Eucalyptus spp. forest/woodland complex within the Sydney Sandstone Biome of the eastern coast of NSW. Associated species of these communities include *Ceratopetalum apetalum, Doryphora sassafras, Acmena smithii, Backhousea myrtifolia, Quintinia sieberi, Angophora floribunda, Dicksonia antarctica, Cyathea australis, Eupomatia laurina, Lepidosperma urophorum, Sticherus flabellatus, Todea barbara, Cissus hypoglauca, Clematis aristata, Pandorea pandorana* and *Parsonsia straminea.*	**Unlikely** Habitat is not represented within the study area
Zieria involucrata	Endangered	Vulnerable	Found on Hawkesbury Sandstone, and Quaternary alluvium and Narrabeen Group sandstone. Mostly found lower on lower to mid slopes and valleys in sheltered forests but may also be found in drier vegetation. The canopy typically includes *Syncarpia glomulifera* subsp*. glomulifera, Angophora costata, Eucalyptus agglomerata* and *Allocasuarina torulosa*.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Gastropoda				
Pommerhelix duralensis Dural Land Snail	Endangered	Endangered	Has a strong affinity for communities in the interface region between shale and sandstone-derived soils, with forested habitats that have good native cover and woody debris. Favours sheltering under rocks or inside curled-up bark. Also observed resting in exposed areas such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	**Possible**
Meridolum corneovirens Cumberland Plain Land Snail	Endangered	-	Primarily inhabits the critically endangered ecological community Cumberland Plain Woodland and grassy open woodland with occasional dense patches of shrubs. Also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. Lives under litter, bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. Generally active at night.	**Possible**
Insecta				
Synemon plana Golden Sun Moth	Endangered	Critically Endangered	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the ground layer is dominated by wallaby grasses. Occurs in landscapes which are typically low and open with the bare ground between tussocks thought to be an important microhabitat feature. Adults are short-lived (one to four days) and do not feed, the larvae are thought to feed exclusively on the roots of wallaby grasses. Breeding in the ACT is Nov to Dec but may differ in other areas.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Mammalia				
Cercartetus nanus Eastern Pygmy-possum	Vulnerable	-	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation. Tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.	**Possible**
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	Vulnerable	Roosts in cave entrances, crevices in cliffs, old mine workings and the disused, bottle-shaped mud nests of the Fairy Martin. Frequents low to mid-elevation dry open forest and woodland close to these features. Females raise young in maternity roosts from November to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.	**Possible**
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	Endangered	Found in a variety of areas including open forest, rainforest, woodland, coastal heath and inland riparian forest. Uses tree hollows, logs, rock outcrops, small caves and rocky cliff faces as dens. Uses flat rocks amongst boulder sites, rocky stream beds or banks and rocky cliff faces as latrine sites.	**Possible**
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in Eucalypt hollows but has also been found under loose bark on trees or in buildings. Breeding occurs in late spring to early summer. Hibernates in winter.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[34]**	**Likelihood**
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Vulnerable	-	Found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	**Possible**
Miniopterus australis Little Bent-winged Bat	Vulnerable	-	Found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forages for small insects beneath the canopy of densely vegetated habitats.	**Possible**
Miniopterus orianae oceanensis Large Bent-winged Bat	Vulnerable	-	Caves are the primary roosting habitat. Also uses derelict mines, storm-water tunnels, buildings and other man-made structures. Forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves. Hunts in forested areas, catching moths and other flying insects above the tree tops.	**Possible**
Myotis macropus Southern Myotis	Vulnerable	-	Generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish by raking their feet across the water surface.	**Unlikely** Habitat is not represented within the study area
Petauroides volans Greater Glider	-	Vulnerable	Feeds exclusively on Eucalypt leaves, buds, flowers and mistletoe. Shelters during the day in tree hollows and will use up to 18 hollows in their home range.	**Possible**
Petaurus australis Yellow-bellied Glider	Vulnerable	-	Occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Extracts sap by incising the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Dens are created (often in family groups) in hollows of large trees.	**Possible**

Scientific Name Common Name	NSW Status	Commonwealth Status	Habitat[34]	Likelihood
Petaurus norfolcensis Squirrel Glider	Vulnerable	-	Occurs on the coast in a range of habitats including low scrubby eucalypt woodlands and banksia thickets to tall, wet eucalypt forests bordering on rainforest. Important food sources are likely to be the winter flowering *Banksia integrifolia* and *Corymbia maculata* and the summer flowering *B. serrata* and *Eucalyptus paniculata*. Tree hollows are an important habitat feature providing den sites for raising young. Hollows can be found in trees of the genera *Eucalyptus, Corymbia* and *Angophora*.	**Unlikely** Habitat is not represented within the study area
Petrogale penicillata Brush-tailed Rock-wallaby	Endangered	Vulnerable	Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browses on vegetation in and adjacent to rocky areas, eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelters or basks during the day in rock crevices, caves and overhangs. Mostly active at night.	**Unlikely** Habitat is not represented within the study area
Phascolarctos cinereus Koala	Vulnerable	Vulnerable	Inhabits Eucalypt woodlands and forests. Feeds on the foliage of more than 70 Eucalypt species and 30 non-Eucalypt species, but in any one area will select preferred browse species.	**Possible**
Pseudomys novaehollandiae New Holland Mouse	-	Vulnerable	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Social animal, living predominantly in burrows shared with other individuals.	**Unlikely** Habitat is not represented within the study area
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Vulnerable	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies close to water in vegetation with a dense canopy. Feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. Also forages in cultivated gardens and fruit crops.	**Possible**

Scientific Name **Common Name**	**NSW Status**	**Commonwealth Status**	**Habitat[34]**	**Likelihood**
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Vulnerable	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	**Possible**
Scoteanax rueppellii Greater Broad-nosed Bat	Vulnerable	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m.	**Possible**
Reptilia				
Hoplocephalus bungaroides Broad-headed Snake	Endangered	Vulnerable	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from sandstone rocks to shelters in crevices or hollows in large trees within 500 m of escarpments in summer.	**Unlikely** Habitat is not represented within the study area

Appendix 4 - Assessment of Significance

To comply with State legislative requirements, an Assessment of Significance under the *Environmental Planning and Assessment Act* 1979 and the *Threatened Species Conservation Act* 1995 has been undertaken for the following species:

Amphibia

- *Heleioporus australiacus* (Giant Burrowing Frog)
- *Litoria aurea* (Green and Golden Bell Frog)
- *Litoria littlejohni* (Littlejohn's Tree Frog)

Aves

- *Anthochaera phrygia* (Regent Honeyeater)
- *Artamus cyanopterus cyanopterus* (Dusky Woodswallow)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Calyptorhynchus lathami* (Glossy Black-Cockatoo)
- *Chthonicola sagittata* (Speckled Warbler)
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Grantiella picta* (Painted Honeyeater)
- *Hieraaetus morphnoides* (Little Eagle)
- *Lathamus discolour* (Swift Parrot)
- *Lophoictinia isura* (Square-tailed Kite)
- *Melithreptus gularis gularis* (Black-chinned Honeyeater)
- *Ninox connivens* (Barking Owl)
- *Ninox strenua* (Powerful Owl)
- *Pachycephala olivacea* (Olive Whistler)
- *Petroica boodang* (Scarlet Robin)
- *Petroica phoenicea* (Flame Robin)
- *Rostratula australis* (Australian Painted-snipe)

Flora

- *Acacia bynoeana* (Bynoe's Wattle)
- *Acacia gordonii*
- *Acacia pubescens* (Downy Wattle)
- *Allocasuarina glareicola*
- *Asterolasia elegans*
- *Cynanchum elegans* (White-flowered Wax Plant)
- *Dillwynia tenuifolia*
- *Epacris sparsa*
- *Eucalyptus aggregata* (Black Gum)
- *Grevillea juniperina subsp. juniperina*
- *Haloragis exalata subsp. exalata* (Wingless Raspwort)
- *Haloragodendron lucasii*
- *Homoranthus darwinioides*
- Leucopogon exolasius (Woronora Beard-heath)
- *Leucopogon fletcheri subsp. fletcheri*
- *Melaleuca deanei* (Deane's Melaleuca)
- *Micromyrtus minutiflora*
- *Olearia cordata*
- Persicaria elatior (Knotweed)
- *Persoonia hirsuta* (Hairy Geebung)
- *Persoonia nutans* (Nodding Geebung)
- Pimelea curviflora var. curviflora
- *Pimelea spicata* (Spiked Rice-flower)
- *Pomaderris brunnea* (Rufous Pomaderris)
- *Pterostylis gibbosa* (Illawarra Greenhood)
- *Pterostylis saxicola* (Sydney Plains Greenhood)
- *Pultenaea glabra* (Smooth Bush-pea)
- *Pultenaea parviflora*
- *Rhizanthella slateri* (Eastern Underground Orchid)

- *Thelymitra kangaloonica* (Kangaloon Sun Orchid)
- *Thesium australe* (Austral Toadflax)
- *Zieria involucrate*

Insecta

- *Synemon plana* (Golden Sun Moth)

Mammalia

- *Cercartetus nanus* (Eastern Pygmy-possum)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Dasyurus maculatus* (Spotted-tailed Quoll)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
- *Petaurus australis* (Yellow-bellied Glider)
- *Phascolarctos cinereus* (Koala)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

Gastropoda

- *Pommerhelix duralensis* (Dural Land Snail)
- *Meridolum corneovirens* (Cumberland Plain Land Snail)

Endangered Ecological Communities (Separate test applied)

- Shale Sandstone Transition Forest of the Sydney Basin Bioregion

Threatened Ecological Communities

An assessment of the effects of the proposal on threatened species, populations and ecological communities likely to occur in habitats similar to those available in the study area, may be carried out by applying the seven factors from Section 5A of the amended *Environmental Planning and Assessment Act* 1979 in accordance with gazetted assessment guidelines to each identified threatened species, population and ecological community.

This assessment of significance is presented below for the following threatened ecological communities:

Shale Sandstone Transition Forest (Critically Endangered)

Part 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.

Not applicable. This test is for an endangered ecological community

Part b): In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

Not applicable. This test is for an endangered ecological community.

Part c): In the case of an 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 of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

i). The proposed action is unlikely to place the local occurrence of Shale Sandstone Transition Forest (SSTF) at risk of extinction as the riparian vegetation which is mapped as SSTF will be retained.

ii). The composition of the ecological community onsite will not be substantially or adversely modified to place the local occurrence of the critically endangered ecological community at risk of extinction. No vegetation from this community will be removed for the proposal.

Part d): In relation to the habitat of a threatened species, population 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.

i). The extent to which the habitat for this ecological community is to be removed is unknown, the area along the watercourse will be retained and is connected to the areas to the North and South.

ii). The area that is mapped on site is joined to the area to the North and South, and will be retained along the watercourse and thus will not fragment or isolate this area from other areas to a greater extent.

iii). The habitat to be removed is not of great importance to the long term survival of the endangered ecological community as an area of this vegetation community will be retained along the watercourse.

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

The action proposed will not adversely affect critical habitat.

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

The Office of Environment and Heritage (OEH) is developing a targeted strategy for Shale Sandstone Transition Forest under the Saving Our Species program; which aims to maximise the extent and condition of Ecological Communities in the state. In the interim, 26 management actions have been identified for this community.

These management actions have been reviewed and it is considered that the action proposed is consistent with the objectives and associated actions of the 26 management actions. That is the retaining of this Ecological Community.

Part 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 action proposed may marginally increase the impact of the key threatening process Clearing of native vegetation as some grasses will be removed, and could potentially result in the Invasion of native vegetation by exotic perennial grasses, and the Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

The disturbances within the subject site may result in adjacent areas of retained native vegetation becoming susceptible to invasion by exotic perennial grasses. However, if sterile cover crops are sown to stabilise exposed surfaces if necessary, and native grasses or non-invasive exotic grasses sown to provide the final vegetative cover in these areas, rather than invasive exotic perennial grass species (such as those listed in the Final Determination of the NSW Scientific Committee for this key threatening process) then the action proposed is not expected to substantially increase the impact of this key threatening process.

No hollow bearing trees will be removed for the proposal, and as such there will not be an increase in the impact of the key threatening process Loss of Hollow-bearing Trees.

Fauna

An assessment of the effects of the proposal on threatened species, populations and ecological communities likely to occur in habitats similar to those available in the study area, may be carried out by applying the seven factors from Section 5A of the amended *Environmental Planning And Assessment Act* 1979 in accordance with gazetted assessment guidelines to each identified threatened species, population and ecological community.

This assessment of significance is presented below for the following threatened species:

- Eastern Freetail Bat - *Mormopterus norfolkensis*
- Eastern False Pipistrelle - *Falsistrellus tasmaniensis*
- Eastern Bentwing-bat - *Miniopterus schreibersii oceanensis*
- Southern Myotis - *Myotis macropus*
- Greater Broad-nosed Bat *Scoteanax rueppellii*

Part 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.

For the purposes of this assessment, these microbats are assessed collectively as their broad habitat requirements are similar. Each of these species forages for insects within or around forested environments and each are dependent on tree hollows or other similar cavities (such as caves) for roosting and breeding. The study area provides an area of suitable foraging habitat for these species and the hollow-bearing trees could offer potential roosting habitat

for individuals. No caves were found in the study area, the trees with hollows were up to 15 metres in height.

No evidence of roosting activity was found via the nocturnal survey.

These species are expected to utilise a very large home range, as they are highly mobile. An area of suitable foraging resources occurs on site and within the surrounding landscape.

The retaining of any hollow bearing trees, and the placement of bat boxes will ensure these resources remain available to dependent species, and any species utilising hollows in the study area for shelter or breeding are likely to continue to do so. Under these circumstances, the action proposed is unlikely to affect the life cycle of these species such that a viable local population of these species is likely to be placed at risk of extinction.

Part b): In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

None of the species considered in this assessment of significance are species which constitute an endangered population.

Part c): In the case of an 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 of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable - This test is not for an Endangered Ecological Community.

Part d): In relation to the habitat of a threatened species, population 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.

(i). Effects on Extent of Habitat

Threatened Species

The riparian complex vegetation to be conserved contains many fauna habitat resources (Hollows, Shelter and Foraging) within this area; and will be connected to a similar area to the North and South (see figure 1).

Endangered Populations

No endangered populations occur in the study area.

Endangered Ecological Communities

This test is for threatened species.

(ii). Effects on Habitat Connectivity

Threatened Species

The action proposed will not fragment or isolate any areas of habitat for sedentary or wide-ranging species. The proposal will not restrict access to any resources or areas of habitat for these species. The vegetation in the study area will remain well connected to other areas of similar habitat to the North and South of the site.

Endangered Populations

No endangered populations occur in the study area.

Endangered Ecological Communities

This test is for threatened species.

(iii). Importance of Habitat to be affected

Threatened Species

The action proposed is unlikely to affect the long-term survival of these species in the locality, as a vast majority of the subject site Ecological Community is to be conserved along the watercourse.

Endangered Populations

No endangered populations occur in the study area.

Endangered Ecological Communities

This test is for a threatened species.

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

The action proposed will not adversely affect critical habitat.

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

Eastern Free-tail Bat

The Office of Environment and Heritage has developed a recovery strategy for this species under the Saving Our Species program; it has been assigned to the Data Deficient species management stream. This stream has assigned 18 state-wide management actions; and one research action, which can inform effective management of this species.

Eastern False Pipistrelle

The Office of Environment and Heritage has developed a recovery strategy for this species under the Saving Our Species program; it has been assigned to the Landscape species management stream. This stream has assigned 4 management actions; to ensure that the species is secure in the wild in NSW and that its NSW geographic range is extended or maintained.

Eastern Bent-wing Bat

The Office of Environment and Heritage has developed a recovery strategy for this species under the Saving Our Species program; it has been assigned to the Landscape species

management stream. This stream has assigned 25 management actions; to ensure that the species is secure in the wild in NSW and that its NSW geographic range is extended or maintained.

Southern Myotis

The Office of Environment and Heritage has developed a recovery strategy for this species under the Saving Our Species program; it has been assigned to the Landscape species management stream. This stream has assigned 13 management actions; to ensure that the species is secure in the wild in NSW and that its NSW geographic range is extended or maintained.

Greater Broad-nosed Bat

The Office of Environment and Heritage has developed a recovery strategy for this species under the Saving Our Species program; it has been assigned to the Landscape species management stream. This stream has assigned 10 management actions; to ensure that the species is secure in the wild in NSW and that its NSW geographic range is extended or maintained.

These management actions have been reviewed and it is considered that the action proposed is consistent with the objectives and associated actions of the management actions, and recovery plan.

Part 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 action proposed may marginally increase the impact of the key threatening process Clearing of native vegetation, and could potentially result in the Invasion of native vegetation by exotic perennial grasses, and the loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
While the proposal involves the clearing of some native vegetation, the amount of disturbance involved is relatively minor and will not substantially contribute to this key threatening process, considering that the Riparian complex will be retained.

The disturbances to the native vegetation within the subject site may result in adjacent areas of retained native vegetation becoming susceptible to invasion by exotic perennial grasses. However, if sterile cover crops are sown to stabilise exposed surfaces if necessary, and native grasses or non-invasive exotic grasses sown to provide the final vegetative cover in these areas, rather than invasive exotic perennial grass species (such as those listed in the Final Determination of the NSW Scientific Committee for this key threatening process) then the action proposed is not expected to substantially increase the impact of this key threatening process.

While no hollows will be removed for the proposal, it is a recommendation to install bat boxes at the site along the Riparian complex, and as such there will not be an increase in the impact of the key threatening process Loss of Hollow-bearing Trees.

Appendix 5 - Federal Legislative Considerations for Threatened Species

The *Significant Impact Guidelines 1.1* provide guidelines on determining whether a proposed action is likely to have a significant impact on a matter of national significance. The following assessment has been undertaken considering the impacts of the proposed development on the following species, listed on Section 178 of the *Environment Protection and Biodiversity Conservation Act* 1999:

Species Listed as Vulnerable under the *EPBC Act* 1999:

Amphibia

- *Heleioporus australiacus* (Giant Burrowing Frog)
- *Litoria aurea* (Green and Golden Bell Frog)
- *Litoria littlejohni* (Littlejohn's Tree Frog)

Aves

- *Grantiella picta* (Painted Honeyeater)
- *Hirundapus caudacutus* (White-throated Needletail)

Flora

- *Acacia bynoeana* (Bynoe's Wattle)
- *Acacia pubescens* (Downy Wattle)
- *Epacris sparsa*
- *Eucalyptus aggregata* (Black Gum)
- *Haloragis exalata subsp. exalata* (Wingless Raspwort)
- *Homoranthus darwinioides*
- *Leucopogon exolasius* (Woronora Beard-heath)
- *Melaleuca deanei* (Deane's Melaleuca)
- *Micromyrtus minutiflora*
- *Olearia cordata*
- *Persicaria elatior* (Knotweed)
- *Pimelea curviflora var. curviflora*
- *Pomaderris brunnea* (Rufous Pomaderris)
- *Pultenaea glabra* (Smooth Bush-pea)
- *Pultenaea parviflora*
- *Thesium australe* (Austral Toadflax)
- *Zieria involucrata*

Mammalia

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

- *Petauroides volans* (Greater Glider)
- *Phascolarctos cinereus* (Koala)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

...lead to a long-term decrease in the size of an important population of a species;

The proposed action is not likely to have a significant impact on any vulnerable species that would lead to a long-term decrease in the size of the important population of species. No important populations have been observed or recorded within or immediately adjacent to the site.

...reduce the area of occupancy of an important population;

The proposed action is not likely to have a significant impact on any vulnerable species that would lead to a reduction in area of occupation of an important population of species. No important populations have been observed or recorded within or immediately adjacent to the site.

...fragment an existing important population into two or more populations;

The proposed action is not likely to have a significant impact on any vulnerable species as the proposal will not fragment an existing important population into two or more populations. Vegetation and habitat adjacent to the site would not be impacted by the proposed activity. No important populations have been observed or recorded within or immediately adjacent to the site.

...adversely affect habitat critical to the survival of a species;

No critical habitat would be adversely affected by the proposed activity.

...disrupt the breeding cycle of an important population;

The site does not constitute significant breeding habitat. The proposed action is unlikely to significantly disrupt the breeding cycle of an important population of any species.

...modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The removal of a relatively small amount of habitat resulting from the proposed action is unlikely to result in a decline of any species. Vegetation and habitat adjacent to the site would not be impacted by the proposed activity.

...result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed action is not likely to have a significant impact on any vulnerable species as it is not likely to result in invasive species that are harmful to vulnerable species becoming established in the vulnerable species habitat. No vulnerable species have been observed or recorded on or immediately adjacent to the site.

...introduce disease that may cause the species to decline, or;

The proposed action would be conducted in such a way as to minimise the introduction or spread of disease that may cause the decline of any listed species.

...interfere substantially with the recovery of the species.

The proposed action would be limited to the site and would not interfere substantially with the recovery of any listed species.

Species Listed as Critically Endangered or Endangered under the *EPBC Act* 1999:

Aves

- *Anthochaera phrygia* (Regent Honeyeater)
- *Lathamus discolour* (Swift Parrot)
- *Rostratula australis* (Australian Painted-snipe)

Flora

- *Acacia gordonii*
- *Allocasuarina glareicola*
- *Asterolasia elegans*
- *Cynanchum elegans* (White-flowered Wax Plant)
- *Haloragodendron lucasii*
- *Persoonia hirsuta* (Hairy Geebung)
- *Persoonia nutans* (Nodding Geebung)
- *Pimelea spicata* (Spiked Rice-flower)
- *Pterostylis gibbosa* (Illawarra Greenhood)
- *Pterostylis saxicola* (Sydney Plains Greenhood)
- *Rhizanthella slateri* (Eastern Underground Orchid)
- *Thelymitra kangaloonica* (Kangaloon Sun Orchid)

Insecta

- *Synemon plana* (Golden Sun Moth)

Mammalia

- *Dasyurus maculatus* (Spotted-tailed Quoll)

Gastropoda

- *Pommerhelix duralensis* (Dural Land Snail)

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

… lead to a long-term decrease in the size of a population;

The proposed action is not likely to have a significant impact on any critically endangered or endangered species that would lead to a long-term decrease in the size of a population of species. No populations of critically endangered or endangered species have been observed or recorded within or immediately adjacent to the site.

… reduce the area of occupancy of the species;

The proposed action is not likely to have a significant impact on any critically endangered or endangered species that would lead to a reduction in area of occupation of the species. No critically endangered or endangered species have been observed or recorded within or immediately adjacent to the site.

… fragment an existing population into two or more populations;

The proposed action is not likely to have a significant impact on any critically endangered or endangered species as the proposal will not fragment an existing population into two or more populations. Vegetation and habitat adjacent to the site would not be impacted by the proposed activity. No populations of critically endangered or endangered species have been observed or recorded within or immediately adjacent to the site.

… adversely affect habitat critical to the survival of a species;

No critical habitat would be adversely affected by the proposed activity.

… disrupt the breeding cycle of a population;

The site does not constitute significant breeding habitat. The proposed action is unlikely to significantly disrupt the breeding cycle of any critically endangered or endangered populations.

… modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The removal of a relatively small amount of habitat resulting from the proposed action is unlikely to result in a decline of any species. Vegetation and habitat adjacent to the site would not be impacted by the proposed activity.

… result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

The proposed action is not likely to have a significant impact on any critically endangered or endangered species as it is not likely to result in invasive species that are harmful to critically endangered or endangered species becoming established in the critically endangered or endangered species habitat. No critically endangered or endangered species have been observed or recorded on or immediately adjacent to the site.

… introduce disease that may cause the species to decline, or;

The proposed action would be conducted in such a way as to minimise the introduction or spread of disease that may cause the decline of any listed species.

… interfere with the recovery of the species.

The proposed action would be limited to the site and would not interfere with the recovery of any listed species.

Species Listed as Migratory under the *EPBC Act* 1999:

Aves

- *Cuculus optatus* (Oriental Cuckoo)
- *Motacilla flava* (Yellow Wagtail)
- *Rhipidura rufifrons* (Rufous Fantail)

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

… Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The proposal will not substantially modify, destroy or isolate an area of important habitat for any migratory species listed on the schedules of the *EPBC Act* 1999. The proposed action is not likely to have a significant impact on any migratory species as the proposal will not fragment areas of habitat or alter fire regimes, nutrient or hydrological cycles associated with habitat exploited occasionally or periodically by listed migratory species. Vegetation and habitat adjacent to the site would not be impacted by the proposed activity. No migratory species have been observed or recorded within or immediately adjacent to the site.

… Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or;

The proposed action is not likely to have a significant impact on any migratory species as it is not likely to result in invasive species that are harmful to migratory species becoming established in the migratory species habitat. No migratory species have been observed or recorded on or immediately adjacent to the site.

… Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposed action is not likely to seriously disrupt the lifecycle, including breeding, feeding, migration or resting behaviours of any ecologically significant proportion of a migratory species. No migratory species or ecologically significant proportions of migratory populations have been observed or recorded on or immediately adjacent to the site.

Appendix 6 - State Environmental Planning Policy 44 Koala Habitat Protection (SEPP 44)

Background Details:

State Environmental Planning Policy 44 (SEPP 44) aims to encourage the proper conservation of areas of natural vegetation that provide habitat for koalas, to ensure a permanent free-living population over their present range and reverse the current trend of koala habitat decline. The objectives of SEPP 44 are achieved by:

- Requiring the preparation of management plans before development consent can be granted in relation to areas of core koala habitat;
- Encouraging the identification of areas of core koala habitat; and
- Encouraging the inclusion of areas of core koala habitat in environment protection zones.

Core koala habitat means an 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.

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

Koala Assessment:

The local government area of the Hawkesbury City Council is listed in Schedule 1 of the Local Government Areas to which SEPP 44 applies and is recognised as containing potential koala habitat.

The site contains one species of known food trees, a primary feed species *Eucalyptus tereticornis*. This species comprises approximately 15% of the total number of trees in the upper or lower strata of the tree component of the site.

During targeted koala surveys (examining trees for scratch marks/koalas and searching under trees for scats within the immediate area and surrounds), no koalas and no evidence for the koala were recorded.

There have been 6 recorded Koala sightings within 10km of the site at Kurmond (See Figure A), these include:-

1. SW – 1 km – 1956 – accuracy 1000
2. W – 1.5 km – 1934 – accuracy 100
3. WSW – 2 km – 2014 – accuracy 1000
4. W – 4 km – 2013 – accuracy 500
5. N – 4km – 2006 – accuracy 25

6. NNE – 5 km – 2002 – accuracy 20

The closest recent sighting (record 3) is 2km away to the West South West of the site in 2014, records 4, 5 and 6 are within 4 to 5 km away and were recorded between 3 to 14 years ago. Records 1 and 2, while being closer (1 to 1.5 km away), they were recorded 60 and 82 years ago.

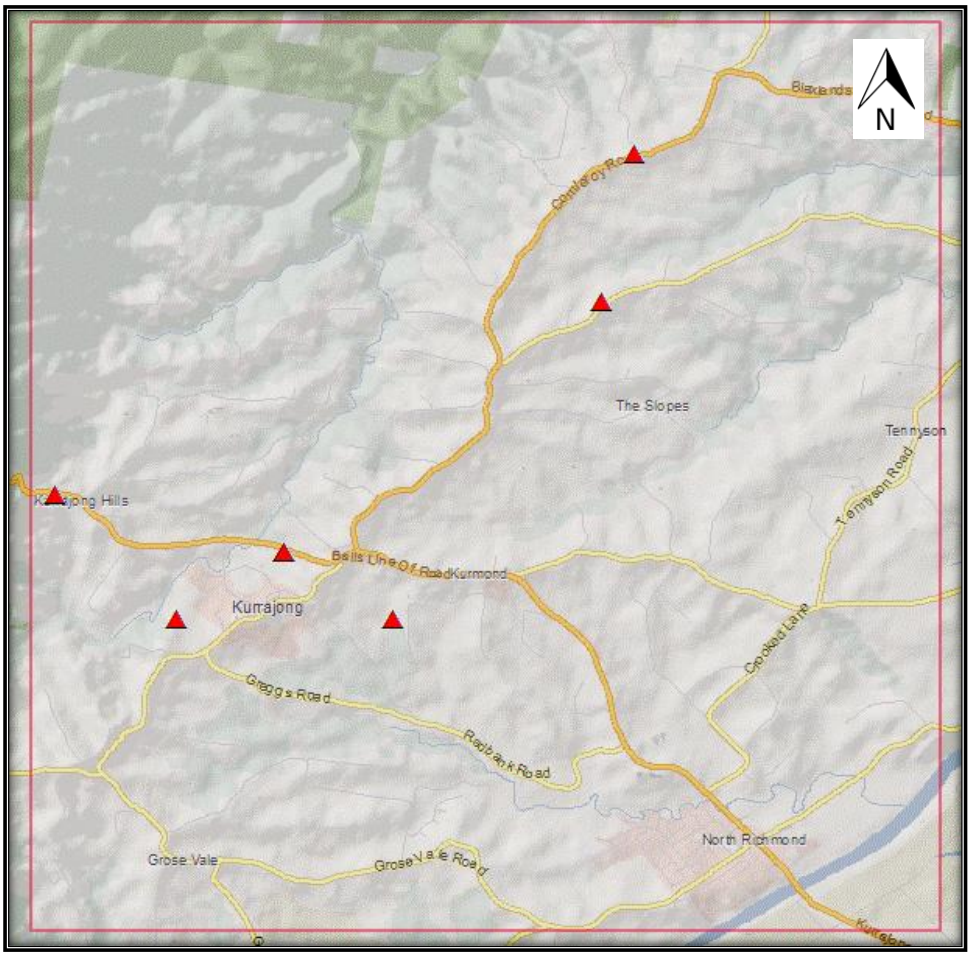

Figure A: Koala records within 10 km of 79, 95 and 100 Bells Lane and 457 Bells Line of Road, Kurmond.

Conclusion

The site contains approximately 15 % of preferred feed tree species, it does not have a breeding population, recent and historic records are within 1 to 2 km away and there was no evidence of use of the site by koalas from surveys. The site is considered to be Potential koala habitat and not core koala habitat, thus a koala plan of management is not required.

Appendix 7 - Terrestrial Biodiversity (Hawkesbury LEP 2012)

Figure 8: Land identified by Hawkesbury LEP (2012) as containing high terrestrial biodiversity value shown in blue. Property boundaries marked in red.