

FLORA AND FAUNA ASSESSMENT REPORT

2 INVERARY DRIVE

KURMOND

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Shane Maloney (Ecologist) B.Env.Sc (Hons), Grad. Dip.Ed, M.Sc.Res		
		

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Executive Summary

This report describes the biological environment of 2 Inverary Drive, Kurmond and assesses the potential effects on threatened and migratory species, endangered populations and ecological communities of a planning proposal to allow development of the land for a large-lot residential estate.

A desktop search for threatened species within a 10 km radius of the site was generated, and a flora (12.5 hours) and fauna (14.5 hours) assessment was undertaken to ascertain if any threatened species were on site or might use the site. The endangered ecological community Shale Sandstone Transition Forest was mapped as being on site, a large area will be retained along the Riparian habitat, and some areas of this community were assessed as being in a degraded structure. A SEPP 44 assessment concluded the site should be classed as potential koala habitat.

No other threatened species, endangered populations or endangered ecological communities listed on the schedules of the *NSW Threatened Species Conservation Act 1995*, or the *Commonwealth 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 *NSW Environmental Planning and Assessment Act 1979*, as required by the *NSW 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.

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.

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1. Introduction

This report determines the presence of threatened species, habitats, populations (and their associated habitats) as well as ecological communities within the subject property. 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).

1.1 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);
- To assess the impact of the development on matters of conservation significance;
- Assess the potential for threatened flora and fauna species and Endangered Ecological Communities (EECs) 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 *Threatened Species Conservation Act*, (1995) and the *Environmental Conservation and Biodiversity Act*, (1999).

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 TSC Act and the EPBC Act that are known or are likely to occur in the study area;
- Undertake an Assessment of Significance in accordance with the TSC Act and significant impact criteria assessments under the EPBC Act for threatened species, communities and populations that can 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

1.2 Project Context

Table 1: Name and address of client

Client Name	101 Group
Address	2 Inverary Drive Kurmond
Local government area	Hawkesbury City Council

1.3 Description of Study Area

Table 2: Description of study area

Size of Property	10 ha
Proposed land use	Planning proposal to allow development of the land for a large-lot residential estate
Map of study site	Refer to Figure 1.

1.4 Proposed Development

Table 3: Description of proposed development

Proposed Development	Planning proposal to allow development of the land for a large-lot residential estate
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1.5 Site details



Figure 1: Aerial Map of 2 Inverary Drive, Kurmond (Six Maps vegetation viewer)



Figure 2: Vegetation map for 2 Inverary Drive, Kurmond (Six Maps Vegetation Viewer)







-    = Shale Sandstone Transition Forest (LT10pc_E_2222 and GT10pc_E_2221)
-  = Shale Hills Woodland (Cumberland Plain GT10pc_E_2221)



Figure 3: Vegetation map 2 Inverary Drive Kurmond (Six maps Vegetation Viewer)

  = Shale Sandstone Transition Forest (Hawkesbury LGA_2007_E_3958)

2. Legislative Requirements and International Agreements

Threatened Species Conservation Act, 1995 (New South Wales)

The central aim of the *Threatened Species Conservation 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.

Environmental Planning and Assessment Act 1979 (NSW)

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; Commonwealth legislation)

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.

3. Methodology

3.1 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 or migratory species should be targeted during field surveys. Table 4 provides an overview of the desktop review.

Table 4: Overview of Desktop Search

Search Tool	Description	Search Parameters
The NSW Bionet <i>Atlas of New South Wales Wildlife</i>	Used to generate a list of species listed under the TSC Act.	Parameters set to a 10km radius of the study site (Flora, Fauna and Vegetation Communities).
Commonwealth <i>Protected Matters Search Tool</i>	Used to generate a list of species protected under the EPBC Act.	Parameters set to a 10km radius of the study site (Flora, Fauna and Vegetation Communities).
<i>Vegetation Information System</i>	Used to generate a map of the vegetation community onsite.	Six Map Vegetation Viewer (Figure 2 and 3)

3.2 Terrestrial Flora Survey

Envirotech ecologists have undertaken flora surveys on this property on the 29th July 2014 for a period of 4.5 hours; on the 11th January 2015 for 5 hours (3 quadrats), and 28th February 2016 for 3 hours. Flora surveys have also been undertaken on the adjoining property 396 Bells Line of Road, on the 13th, 18th and 20th November 2014 for 2, 2.5 and 3 hours respectively. Six 400-m² quadrats were also undertaken on this adjoining property.

The methodology employed was designed in accordance with the *Working Draft Threatened Biodiversity Assessment Guidelines for Developments and activities (2004)*. Table 5 refers to specific techniques employed.

Table 5: Survey techniques employed to target threatened flora

Date	Survey Type	Description	Effort	Is this in accordance with Guidelines?
29 th July 2014	Random Meander	The site was traversed and the flora species observed were recorded.	4.5 Hours	Yes
11 th January 2015	Quadrat	Three quadrats of 400m ² were undertaken on site. (see figure 4)	5 Hours	Yes
28 th February 2016	Random Meander	The site was traversed and the flora species observed were recorded.	3 Hours	Yes
Total			12.5 Hours	
Total on Adjoining property	Random Meander	The adjoining property was traversed and the flora species observed were recorded. Plus 6 400m ² quadrats (no time recorded)	7.5 Hours	
Total flora survey in the study area			20 Hours (Plus 6 400m ² quadrats)	

3.2.1 Habitat 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 area in general terms, were *good*, *moderate*, *poor* and *cleared/disturbed*. These are detailed in table 6.

Table 6: 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.



Figure 4. The position of the 3-quadrat areas sampled on the subject site (yellow Q1, Q2 and Q3).

3.2.2 Detailed Vegetation Description

The site at 2 Inverary Drive, Kurmond is 11 hectares in area (with only 10 being part of the proposal). The site has native vegetation along the watercourse, and canopy trees with no understorey towards the East and South West from the watercourse (see Figures 1, 2 and 3); the vegetation maps for the site are presented in Figure 2 (Six maps vegetation viewer Cumberland Plain) and Figure 3 (Six maps vegetation viewer Hawkesbury LGA). These resources have indicated that the vegetation communities:-

1. Shale Sandstone Transition Forest (Figure 2 and 3); and
2. Shale Hills Woodland (Figure 2)

are present on the site; The area overall has been highly modified with only canopy species present for the most.

Both of the vegetation-mapping resources have indicated the presence of the critically endangered ecological community Shale Sandstone Transition Forest (See Figures 2 and 3). This community on site is in a degraded form with only canopy species present, excepting for the area along the waterway through the site, which has 3 levels of strata in situ. For this report this area is referred to as Riparian Complex.

The dominant canopy species of the Riparian Complex are *Angophora floribunda* and *Alphitonia excelsa*, with *Backhousia myrtifolia* and *Melaleuca styphilooides* in the mid storey/upper shrub layer. The lower shrub layer and the groundcover contained *Rapanea variabilis*, and introduced and native grasses and shrubs.

The areas to the East and South West of the Riparian complex were degraded, displaying past grazing practices, being majority cleared, except for canopy species. The area to the North East from the Riparian Complex contained *Eucalyptus tereticornis* and 3 individual *Eucalyptus punctata*; while the area South East from the Riparian complex contained *Eucalyptus creba*, *Alphitonia excelsa* and *Exocarpus compressiformis*. The area to the South West contained *Angophora floribunda* and *Eucalyptus creba*.

Using the criteria listed in Table 6, the vegetation in the area described as Riparian Complex, would be classified as moderate to good; and the areas to the East and West would be classified as cleared and disturbed to poor.

Quadrat description (see Appendix 2 for details and Figure 4 for siting).

Three 400m² quadrats were undertaken on site (Figure 4), to ascertain if these areas were equivalent to the characteristic species composition of the Endangered Ecological Communities mapped on site (Figure 2 and 3). The results for the quadrats are presented in Appendix 2 and the following are descriptions for the quadrats.

1. Within the number 1-quadrat eighteen species were recorded with numbers ranging from 1 to 140 individuals. Ten native and eight introduced, only four of the native species were equivalent to characteristic species of the Cumberland Plain Woodland (EEC), indicating that this area is not equivalent to Cumberland Plain Woodland; and six of the species recorded were characteristic of Shale Sandstone Transition Forest (EEC).
2. Within the number 2 – quadrat twenty-six species were recorded with numbers ranging from 1 to numerous. Twenty-one were native and 5 introduced; eight of the native species recorded were characteristic of Shale Sandstone Transition Forest (EEC).
3. Within the number 3 – quadrat twenty-four species were recorded ranging from 1 to 36 individuals. Sixteen were native and 8 introduced; ten of the native species recorded were characteristic of Shale Sandstone Transition Forest (EEC).

While there are some individual species recorded within the three quadrats that are characteristic with Shale Sandstone Transition Forest, the boundaries of this vegetation community are indistinct with little connectivity, excepting for the vegetation along the watercourse. This vegetation along the watercourse (Riparian Complex) has been assessed as moderate to good, as it has good connectivity and three levels of strata in situ. It is recommended that this area be conserved see Figure 6.

3.3 Terrestrial Fauna Survey

Envirotech have undertaken fauna surveys for the site on the 29th July 2014, the 18th and 20th November 2014, and on Wednesday 28th February 2016. Weather conditions experienced ranged from cool and sunny to hot and sunny, approximately 22°C to 27 °C. Envirotech also undertook fauna surveys on the adjoining property 396 Bells Line of Road, on the 13th, 18th and 20th November 2014 for 2, 2.5 and 3 hours respectively.

Table 7: Dates, effort and type of Fauna survey undertaken at the site.

Date	Survey Type	Description	Effort	Is this in accordance with Guidelines?
29 th July 2014	Fauna	See Table 8 below for the techniques undertaken to survey for threatened Fauna.	4.5 Hours	Yes, however the survey was limited in effort and time (See section 3.5)
18 th Nov 2014	Koala Habitat Assessment	Call playback, spotlighting and examination of trees for markings and scats	3 hours	Yes, however the survey was limited in effort and time (See section 3.5)
20 th Nov 2014	Koala Habitat Assessment	Call playback, spotlighting and examination of trees for markings and scats	3 hours	Yes,
28 th February 2016	Fauna	See Table 8 below for the techniques undertaken to survey for threatened Fauna.	3 Hours	Yes,
Total Effort			14.5 Hours	
13 th , 18 th and 20 th November 2014	Fauna	Undertaken on the adjoining property 396 Bells Line of Road	7.5 Hours	
Total Fauna survey in the study area			22 Hours	

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 8):

Table 8: 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,
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.

3.3.1 Habitat Assessment

A number of habitat values were recorded during the site inspection (Table 8).

The potential for the site to provide habitat for threatened fauna species was based upon habitat values provided in Table 8, and the specific habitat requirements of threatened species. Criteria used to evaluate the overall quality of the habitat, were *good*, *moderate*, and *poor*. This criteria is detailed in Table 9.

Table 8: Description of fauna habitat values

Habitat Value	Description
Hollow Bearing Trees	The hollows on the site were small to medium (Figure 5)
Stags	Six stags were recorded 3 along the watercourse, 3 to the East (Figure 5)
Connectivity	There was connectivity on the North and South of the site along the watercourse (see Figure 3).
Water	There was a watercourse running North to South through the site
Rocky Outcrops	The rocky outcrops at the site were along the watercourse
Leaf Litter	The study area had a covering of leaf litter and grasses within the riparian zone; the remainder of the area was covered in grasses and trees.

Table 9: Criteria used to assess habitat quality for the site

Score	Criteria
Good	The presence of the ground flora consists of a diverse range of native species, the assemblages of species of the vegetation, leaf litter, significant number of refuge, feeding and breeding sites and the presence of a diverse range of native fauna species
Moderate	The ground flora contains a relatively high number of native species, the assemblages of species is relatively undisturbed, leaf litter, the presence of some refuge, feeding and breeding sites and diverse presence of native fauna
Poor	There was a low diversity of ground flora and very little presence of native flora, the assemblages of species of vegetation is low, poor presence of leaf litter, little or no refuge, feeding and breeding sites and a low diversity of fauna species.

3.3.2 Detailed Fauna habitat description

The study area indicates significant disturbances in the past, such as clearing and grazing. At present there are paddocks on site, with scattered trees and a covering of introduced grasses, with good habitat along the watercourse. The site is found adjacent to and surrounded by other large areas of predominantly cleared grazing land.

The fauna habitat ranges from a tall canopy (up to 25m), to a well developed mid storey and shrub layer down to a lower strata along the watercourse; the majority of the site contains open paddocks with canopy trees down to a grassy groundcover. The study area generally contains the following fauna habitats:

- Nectar, pollen and insect foraging resources for mammals and birds from canopy and sub-canopy trees; along the watercourse and surrounds;
- A watercourse with rocky outcrops, leaf litter and ground shelter for small mammals, reptiles and amphibians;
- Some hollows and stags for arboreal mammals and birds.

The rocky outcrops along the watercourse and grassy groundcover over the site would provide some shelter and foraging for terrestrial fauna. The small number of hollows on site ranged from small to medium and would make available resources for hollow dependent fauna (see Figure 5). Habitat connectivity to other areas of native vegetation occurs at the Eastern end of the study area (see Figure 3).

Overall the site was assessed to have a moderate to good habitat quality assessment (see Table 9 above) for the Riparian area, the exception being in the area to the East and South West of the Riparian area. Which has been assessed as having a poor to moderate habitat quality assessment. This is due to the amount of introduced species (flora and fauna in rabbit burrows) and previous clearing that has happened on site; and the paucity of hollows and ground shelter for fauna species.

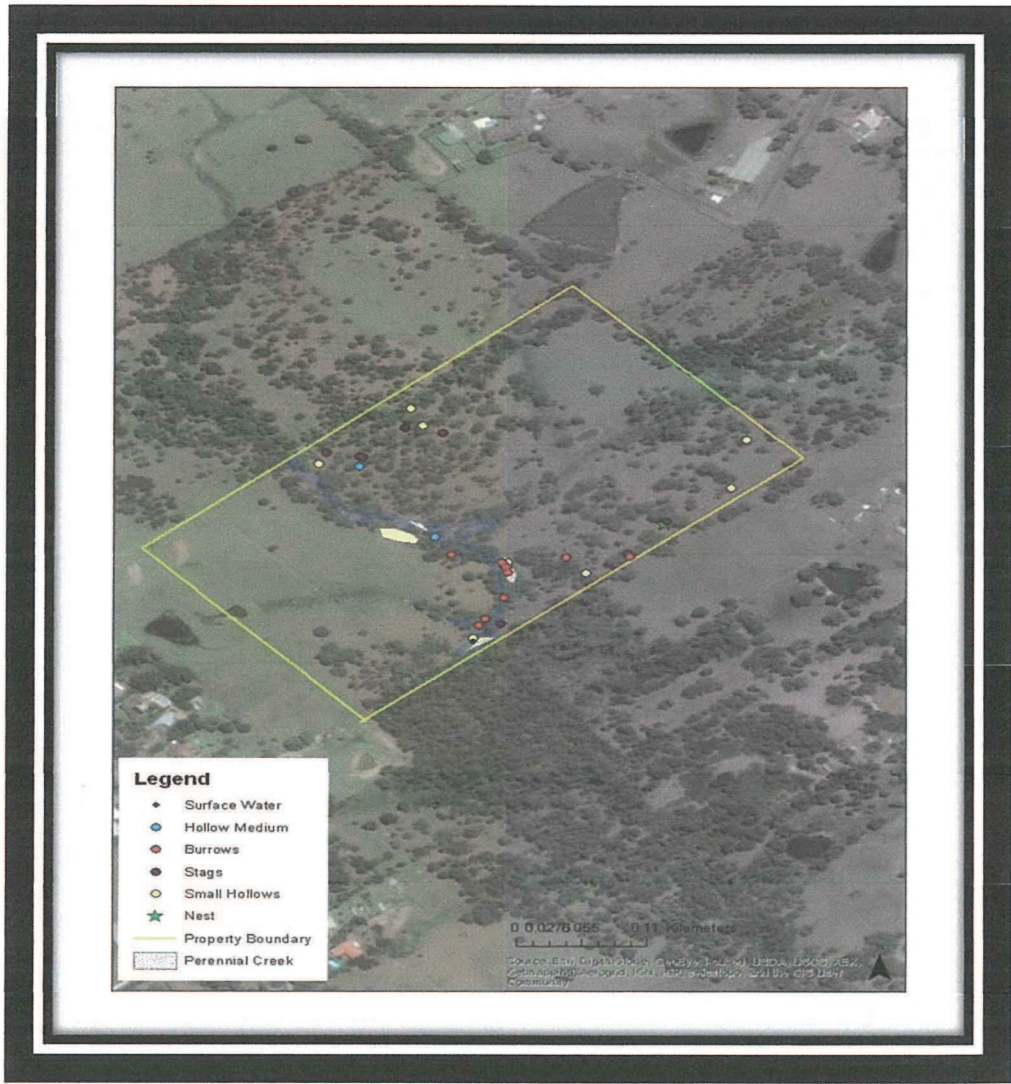


Figure 5: Fauna habitat features for 2 Inverary Drive, Kurmond

3.4 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, considered and listed in Table 10 below.

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

Table 10: 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	No
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	TSC/EPBC	Yes	No
Competition and Grazing by the feral European Rabbit, <i>Oryctolagus cuniculus</i> (L)	TSC/EPBC	Yes	No

3.5 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 publically available data sources and is bound by the limitations of the collection, processing and management of those databases used (Table 4).

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.

4. Results

4.1 Vegetation Communities

Results of the desktop research are provided in Table 11, with a vegetation community map of the study site provided in Figure 2 and 3.

Table 11. Results of Bionet and Protected Matters Search tool, identifying endangered ecological communities recorded within 10 km of the site.

Community name	NSW Status	Commonwealth status	Occurrence
Agnes Banks Woodland in the Sydney Basin Bioregion	Endangered	Critically Endangered	Not detected
Blue Gum High Forest in the Sydney Basin Bioregion	Critically Endangered	Critically Endangered	Not detected
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	Endangered	Critically Endangered	Not detected
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	Vulnerable	Not listed	Not detected
Castlereagh Swamp Woodland Community	Endangered	Not listed	Not detected
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Vulnerable	Not detected

Community name	NSW Status	Commonwealth status	Occurrence
Coastal Upland Swamp in the Sydney Basin Bioregion	Endangered	Endangered	Not Detected
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Endangered	Not Listed	Not Detected
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered	Critically Endangered	Not Detected
Elderslie Banksia Scrub Forest in the Sydney Basin Bioregion	Endangered	Not Listed	Not Detected
Freshwater wetland on coastal floodplains of the New South Wales North Coast, Sydney Basin and South East corner bioregions	Endangered	Not listed	Not Detected
Montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South Easter Corner, South Eastern Highlands and Australian Alps Bioregions	Endangered	Endangered	Not Detected
River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales, North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Not listed	Not Detected
Shale Gravel Transition Forest in the Sydney Basin Bioregion	Endangered	Critically Endangered	Not Detected

Community name	NSW Status	Commonwealth status	Occurrence
Shale/Sandstone Transition Forest in the Sydney Basin Bioregion	Critically Endangered	Critically Endangered	Detected (Mapped)
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	Endangered	Not listed	Not Detected
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Not listed	Not Detected
Sydney turpentine Ironbark Forest	Endangered	Critically Endangered	Not Detected
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	Endangered	Critically Endangered	Not Detected

Note: the Endangered Ecological Communities that were mapped on site (refer to figures 2 and 3); Shale Sandstone Transition Forest only has canopy tree species remaining in the East and South West; and has many introduced species and some clearing within these areas that is mapped for this EEC. The area along the watercourse that is mapped as SSTF will be conserved. The area that is mapped with one resource as Shale Hills Woodland is assessed as degraded SSTF.

4.2 Flora

4.2.1 Desktop Research

Results of the desktop research are provided in Table 13. A total of 5 threatened flora species have been recorded within a 10km radius of the study site. This includes:

- 5 species listed under the TSC Act
- 3 species listed under the EPBC Act

4.2.2 Site Habitat Features

Flora surveys revealed the following habitat features for the study area (Table 12): A total of 91 species were recorded during the survey 50 (55%) were native and 41 (45%) were exotic (Appendix 2). The results from the three 400m² quadrats undertaken on site are presented in Appendix 2. No threatened flora species were recorded within the site and the adjacent site over the 20 hours of survey effort undertaken.

Table 12: Habitat features present onsite for threatened flora

Feature	Quantity	Description
Species diversity	Moderate	During the vegetation survey 50 native species and 41 exotic species were recorded.
Structural integrity	Low – Moderate	The area within the riparian complex, has a moderate level of structural integrity with 3 levels of strata intact. The areas with canopy trees east and southwest of the watercourse have grass cover and no shrubs or mid storey.
Habitat quality	Low – Moderate	The site represents good habitat quality within the boundaries of the riparian complex. While the remaining area has been significantly modified.
Disturbances	Moderate – High	The riparian complex has the least disturbance compared to the significantly modified area contained within the rest of the site.

4.2.3 Assessment of Occurrence (Flora)

Table 13 below provides a summary of the results from desktop and field surveys, findings indicate there is:

- A low likelihood of the occurrence of 4 species to be present onsite
- A moderate likelihood of occurrence of 1 species to be present onsite

Species with a moderate likelihood of occurrence are:

- *Cynanchum elegans*

For this species, a 7 Part Test of Significance was deemed **not** to be required, as no habitat that is required by this flora species, will be removed by the proposal. As the Riparian complex vegetation of which this species may be found will be retained along the watercourse.

Where required, species nationally protected have had an impact assessment undertaken with respect to the EPBC Act presented in Appendix 4.

Details of the assessment of available habitat resources onsite, specific to threatened flora species is provided in Table 13.

Table 13: An analysis of threatened flora species likely to occur onsite (Using species habitat requirements and site habitat features (Table 12) and surveys).

Species	Common name	NSW status	Commonwealth status	Habitat	Likelihood of occurrence on the study site
<i>Cynanchum elegans</i>	White flowered wax plant	Endangered	Endangered	Usually occurs on the edge of dry rainforest or littoral rainforest. Also occur in <i>Leptospermum laevigatum</i> – <i>Banksia integrifolia</i> coastal scrub, <i>Eucalyptus tereticornis</i> aligned open forest and woodland, <i>Corymbia maculata</i> aligned open forest and woodland, and <i>Melaleuca armillaris</i> scrub to open scrub.	Moderate
<i>Leucopogon fletcheri</i> subsp. <i>Fletcheri</i>		Endangered	Not Listed	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs.	Low
<i>Pimelea spicata</i>		Endangered	Endangered	In both the Cumberland Plain and Illawarra environments this species is 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.	Low
<i>Tetratheca glandulosa</i>	Glandular pink bell	Vulnerable	Not Listed	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone. Often occurs on ridgetops and shallow clayey/sandy loam. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop	low

Species	Common name	NSW status	Commonwealth status	Habitat	Likelihood of occurrence on the study site
				Woodland (Map Unit 10ar). Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae.	
<i>Zieria involucreta</i>		Endangered	Vulnerable	Occurs primarily on Hawkesbury sandstone. Also occurs on Narrabeen Group sandstone and on Quaternary alluvium. Found primarily in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest, although some populations extend upslope into drier vegetation.	Low

4.3 Terrestrial Fauna

4.3.1 Desktop Research

Results of the desktop research are provided in Table 15. A total of 26 threatened fauna species have been recorded within a 10 km radius of the study site. This includes:

- 25 species listed under the TSC Act
- 8 species listed under the EPBC Act (1 migratory see Table 16)

4.3.2 Fauna Surveys

A list of the species recorded onsite during the survey period is presented in Appendix 2. In total, 41 species were recorded on site, 25 birds, 5 mammals, 6 reptiles and 5 amphibians.

Of the 41 species recorded, the introduced Indian Mynah was recorded and three of the mammal species recorded were the introduced European Rabbit, hare and fox.

No threatened fauna species were recorded in the study area over the 22 man hours of survey effort.

4.3.3 Habitat Assessment

An overview of the habitat assessment is provided in the Table 14 below.

Table 14: Habitat features onsite for threatened fauna

Habitat Value	Quantity	Description
Hollow Bearing Trees	Low -Moderate	The hollows observed ranged in size from small (6) to medium (2) Figure 5
Stags	Low - Moderate	6 small stags were observed,
Connectivity	Moderate	The site is connected on the North and South boundaries by the watercourse.
Water	Moderate	A watercourse runs through the site from North to South
Rocky Outcrops	Low	There were rocky outcrops along the watercourse.
Leaf Litter	Low	The lack of leaf litter and grassy groundcover would provide a low level of shelter and foraging for terrestrial fauna

4.3.4 Assessment of Occurrence:

Table 15 below provides the results from desktop and field surveys, it has been determined that there is:

- A low likelihood for the occurrence of 19 threatened species to be present on the study site;
- A moderate likelihood for the occurrence of 6 threatened species to be present on the study site.

Species with a moderate likelihood of occurrence are:

- Powerful owl – *Ninox strenua*
- 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*

For the Powerful Owl a 7 Part Test of Significance were deemed **not** to be required, as the proposed action will not remove any habitat of which these species might require or utilise for breeding or foraging, and no large hollows or stags were recorded.

For the five micro bat (microchiropterans) species listed above, 7 Part Tests of Significance were deemed to be required and are presented in Appendix 3 (Table 18).

Where required, species nationally protected have had an impact assessment undertaken, with respect to the EPBC Act presented in Appendix 4. No nationally protected species were recorded on site, any species recorded within 10km of the site (Tables 15 and 16) are not considered likely to be impacted by the proposed development as, the proposed action will not remove any habitat of which these species might require or utilise.

Table 15: An analysis of threatened fauna species likely to occur onsite (Using species habitat requirements and habitat features of the site (Table 13) and surveys).

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
Herpetofauna					
<i>Heleioporus australiacus</i>	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. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.	Low
Aves					
<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable	Not Listed	Occupies open eucalypt forest, woodland or open woodland. She-oak 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.	Low
<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	Not Listed	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Low
<i>Onychoprion fuscata</i>	Sooty Tern	Vulnerable	Not Listed	Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters. Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.	Low

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Not Listed	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate rainforests. Move to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting.	Low
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Endangered	Found where eucalypts are flowering profusely or where lerp infestations are evident. Will return to feed areas where there is foraging resources. Favoured species include Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> in the winter. Commonly used lerp infested trees include Inland Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> .	Low

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not Listed	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black Sheoak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. Powerful Owls nest 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.	Moderate
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Endangered	The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Low

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
<i>Epthiamura albifrons</i>	White-fronted Chat	Vulnerable	Not Listed	Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Nests in the Sydney region have also been seen in low isolated mangroves.	Low
<i>Grantiella picta</i>	Painted Honeyeater	Vulnerable	Not Listed	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 <i>Amyema</i> . Insects and nectar from mistletoe or eucalypts are occasionally eaten.	Low
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	Vulnerable	Not Listed	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	Low
<i>Daphoenositta chrysoptera</i>	Varied sitella	Vulnerable	Not listed	This species occurs in Eucalypt forests particularly where rough barked species are found.	Low
<i>Pachycephala olivacea</i>	Olive Whistler	Vulnerable	Not Listed	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects. Make nests of twigs and grass in low forks of shrubs. Lay two or three eggs between September and January	Low

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
<i>Petroica boodang</i>	Scarlet Robin	Vulnerable	Not Listed	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	Low
Mammalia					
<i>Dasyurus maculatus</i>	Spotted tailed quoll	Vulnerable	Endangered	This species occurs in a range of habitat types which encompass woodland, rainforest, open forest and heath. This species requires fallen logs, caves, rock crevices and rocky cliff faces for refuge.	Low
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Vulnerable	This species occurs in Eucalypt woodlands and forests. Require a home range of 2 hectares up to several hundred hectares.	Low
<i>Petaurus australis</i>	Yellow bellied glider	Vulnerable	Not listed	This species occurs in mature or old growth Ironbark Woodlands as well as River Red Gum Forest. It occurs in places where an <i>Acacia</i> midstory is present. They require abundant tree hollows for nesting and refuge	Low
<i>Petaurus norfolkensis</i>	Squirrel Glider	Vulnerable	Not Listed	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or <i>Acacia</i> midstorey. Live in family groups of a single adult male one or more adult females	Low

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
				and offspring. Require abundant tree hollows for refuge and nest sites.	
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	Vulnerable	Vulnerable	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Low
<i>Mormopterus norfolkensis</i>	Eastern Freetail Bat	Vulnerable	Not Listed	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.	Moderate
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	Not listed	Found in moist habitats where there is an abundance of trees taller than 20 metres	Moderate
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	Not Listed	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Moderate
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not listed	Generally roost 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. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Moderate

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Likelihood of occurrence on study site
<i>Scoteanax rueppelli</i>	Greater broad nosed bat	Vulnerable	Not listed	This species occurs in a wide range of habitats. It is mostly found in tall wet forest. Forages along creek and river edges.	Moderate

4.4 Migratory Species

4.4.1 Desktop Research

Results of the desktop research are provided in Table 16. A total of 1 migratory species has been recorded within a 10km radius of the study site.

4.4.2 Fauna Surveys

No migratory species were recorded onsite during the fauna surveys.

4.4.3 Assessment of Occurrence

In collating results from desktop and field surveys, it has been determined that there is a low likelihood of the occurrence of the 1 migratory species potentially occurring on the study site.

Table 16. Results of the Desktop research, showing the occurrence of migratory species within a 10km radius of the site (C=CAMBA; J=JAMBA, K=ROKAMBA)

Species	Common Name	NSW Status	Commonwealth Status	Habitat	Occurrence on Study Site
<i>Ardea ibis</i>	Cattle Egret	Not Listed	C,J	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. The Cattle Egret often forages away from water on low lying grasslands, improved pastures and croplands. It is commonly found in cattle fields and other farm areas that contain livestock.	Low

Note: This species is very mobile and would be able to move very efficiently through the area.

5. Impacts of the Proposed Development

5.1 Potential Impacts on Endangered Ecological Communities (EECs)

The endangered ecological communities Shale Sandstone Transition Forest and Cumberland Plain Woodland are mapped as being present on the site (see figure 2 and 3). Notwithstanding, this assessment has concluded that the Cumberland Plain Woodland mapped is not on site. While the mapped Shale Sandstone Transition Forest is on site, the boundaries of this vegetation community are indistinct with little connectivity, excepting for the vegetation along the watercourse. This Riparian complex was assessed as being in a moderate to good condition, and is to be conserved, as it connects to similar vegetation that has been retained on the adjoining development to the North (Figure 6). The Shale Sandstone Transition Forest area to the East and South West of the Riparian complex has a scattered canopy with no mid or understorey and little connectivity.

Therefore the proposed action will have minimal effect on the mapped Shale Sandstone Transition Forest on site. The Riparian vegetation along the watercourse and a buffer area will be retained as it is in a moderate to good condition and will provide connectivity to other areas (see Figure 6), this will also help to align the lots for this parcel.

5.2 Potential Impacts on Threatened Flora Species

The proposal is **unlikely** to cause the following impacts on threatened flora species:

- Removal of habitat
- Individual death or injury
- A disturbance to reproduction
- Functional and structural changes within flora populations

Table 17 provides a justification for the conduct of a Seven Part Test, in relation to individual flora species.

This assessment has determined that the development will **NOT** have a significant impact upon the one threatened flora species with suitable habitat represented onsite (Table 17), as there will not be a significant amount of suitable habitat removed.

An assessment of considerations under the *Environmental Protection and Biodiversity Conservation Act* (1999) has also determined that it is **unlikely** that this development will lead to the local extinction of the two threatened flora species listed (Table 13, 17).

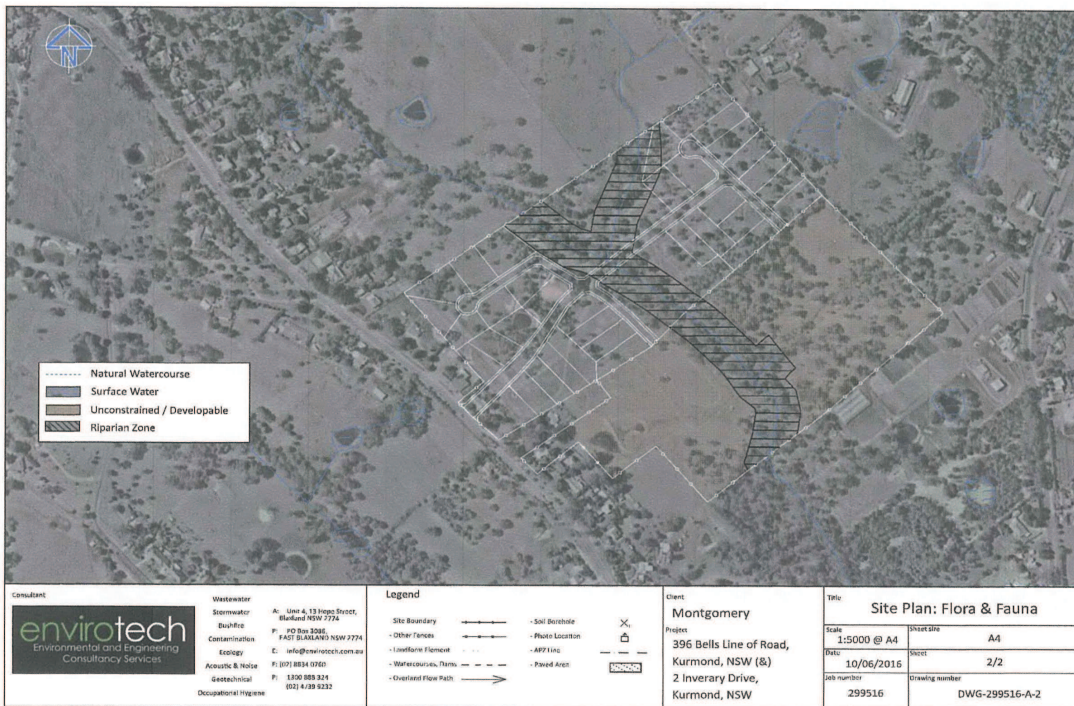


Figure 6: The Riparian Complex on site to be conserved and connection to the area to the North.

Table 17: The potential impact on threatened flora species that have habitat represented on site, and whether a Seven Part Test is required (TSC Act has been applied)

Scientific Name	TSC Act	EPBC Act	Individual death or injury	Disturbance to reproduction	Impact assessment applied?
<i>Dillwynia tenuifolia</i>	Vulnerable	Not Listed	Unlikely	Unlikely	No
<i>Grevillea parviflora</i> subsp. <i>Supplicans</i>	Endangered	Not Listed	Unlikely	Unlikely	No
<i>Pimelea spicata</i>	Endangered	Endangered	Unlikely	Unlikely	No
<i>Tetratheca glandulosa</i>	Vulnerable	Not Listed	Unlikely	Unlikely	No
<i>Zieria involucrata</i>	Endangered	Vulnerable	Unlikely	Unlikely	No

5.3 Potential Impacts on Threatened Fauna Species

The potential impacts of the proposal on threatened fauna species, can be assessed by utilising the information from Table 15 (regarding the potential habitat available), and whether a threatened species was recorded on site; this information is used to determine if the proposal is likely to cause any of the following impacts on threatened fauna species:

- Death of individuals
- Injury of individuals
- Reduction and loss of breeding resources
- Reduction and loss of foraging resources
- Disturbance to a larger habitat area
- Loss of connectivity within and between habitats

Table 18 outlines the potential impacts that the proposal may have on threatened species and determines whether a Seven Part Test (TSC Act) is to be applied. The species that were assessed in Table 15, as having a moderate chance of being found on site were the:

- Powerful owl – *Ninox strenua*
- 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*

As the proposed action will not remove any habitat that the Powerful Owl will utilise, it has been determined that it is **unlikely** that the proposed action will cause:-

- any death or injury to any of this species,
- a reduction and loss of breeding resources and foraging resources for this species,
- a disturbance to a larger habitat area for this species
- a loss of connectivity within and between habitats for this species

It has been determined that this species **does not** require that a seven part test is to be applied as part of this assessment (See Table 18).

A seven-part test of significance is presented in Appendix 3 for the five micro bats listed above, as there may be removal of trees on site.

Table 18: The potential impact on threatened fauna species, and whether a Seven Part Test is required (TSC Act has been applied).

Common name	Scientific name	TSC Act	EPBC Act	Individual death or injury	Loss or disturbance to limiting of foraging resources	Loss or disturbance of breeding resources	Impact assessment applied?
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	Vulnerable	Vulnerable	Unlikely	Unlikely	Unlikely	No
Cattle Egret	<i>Ardea ibis</i>	Not Listed	C, J	Unlikely	Unlikely	Unlikely	No
Little Eagle	<i>Hieraaetus morphnoides</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Square-tailed Kite	<i>Laphoictinia isura</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Not likely	No
Sooty Tern	<i>Onychoprion fuscata</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Not likely	No
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Swift Parrot	<i>Lathamus discolor</i>	Endangered	Endangered	Unlikely	Unlikely	Unlikely	No
Powerful Owl	<i>Ninox strenua</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Regent Honeyeater	<i>Anthochaera phrygia</i>	Critically Endangered	Endangered	Unlikely	Unlikely	Unlikely	No

White-fronted Chat	<i>Ephiamura bibifrons</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Painted Honeyeater	<i>Grantiella picta</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Black-chinned Honeyeater	<i>Melithreptus gularis gularis</i>	Vulnerable	Not listed	Unlikely	Unlikely	Not likely	No
Varied sittella	<i>Daphoenositta chrysoptera</i>	Vulnerable	Not listed	Unlikely	Unlikely	Unlikely	No
Olive Whistler	<i>Polycephala olivacea</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Scarlet Robin	<i>Petroica boodang</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Vulnerable	Endangered	Unlikely	Unlikely	Unlikely	No
Koala	<i>Phascolarctus cinereus</i>	Vulnerable	Vulnerable	Unlikely	Unlikely	Unlikely	No
Yellow-bellied Glider	<i>Petaurus australis</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Squirrel Glider	<i>Petaurus norfolkensis</i>	Vulnerable	Not Listed	Unlikely	Unlikely	Unlikely	No
Grey-headed flying fox	<i>Pteropus poliocephalus</i>	Vulnerable	Vulnerable	Unlikely	Unlikely	Unlikely	No

Eastern Freetail Bat	<i>Mormopterus nofolkensis</i>	Vulnerable	Not Listed	Possible	Unlikely	Unlikely	Yes
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	Vulnerable	Not Listed	Possible	Unlikely	Unlikely	Yes
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	Vulnerable	Not Listed	Possible	Unlikely	Unlikely	Yes
Southern Myotis	<i>Myotis macropus</i>	Vulnerable	Not listed	Possible	Unlikely	Unlikely	Yes
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	Vulnerable	Not Listed	Possible	Unlikely	Unlikely	Yes

6. 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 residential development. It addresses the *Threatened Species Conservation Act* (1995) and the *Environmental Protection and Biodiversity Conservation Act* (1999).

The site was assessed as potential koala habitat, and the endangered ecological community Shale Sandstone Transition Forest while mapped as being on site was assessed as being in a degraded structure to a moderate structure. The area along the watercourse is to be retained for connectivity.

No other threatened species, endangered populations or endangered ecological communities listed on the schedules of the *NSW Threatened Species Conservation Act 1995*, or the *Commonwealth 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 *NSW Environmental Planning and Assessment Act 1979*, as required by the *NSW 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.

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.

7. Recommendations

The following recommendations are suggested in order to mitigate and ameliorate the impacts of the proposal on threatened flora and fauna species and endangered 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 within the identified Riparian corridor are not impacted upon during construction works.
- Invasive exotic perennial grass species listed in the Final Determination of the NSW Scientific Committee for this key threatening process (Appendix B) should not be sown within 10m of vegetation to be retained intact. Sterile cover crops should be sown if necessary to stabilise exposed surfaces, and native grasses or non-invasive exotic grasses should be sown to provide the final vegetative cover in these areas if required.
- 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.

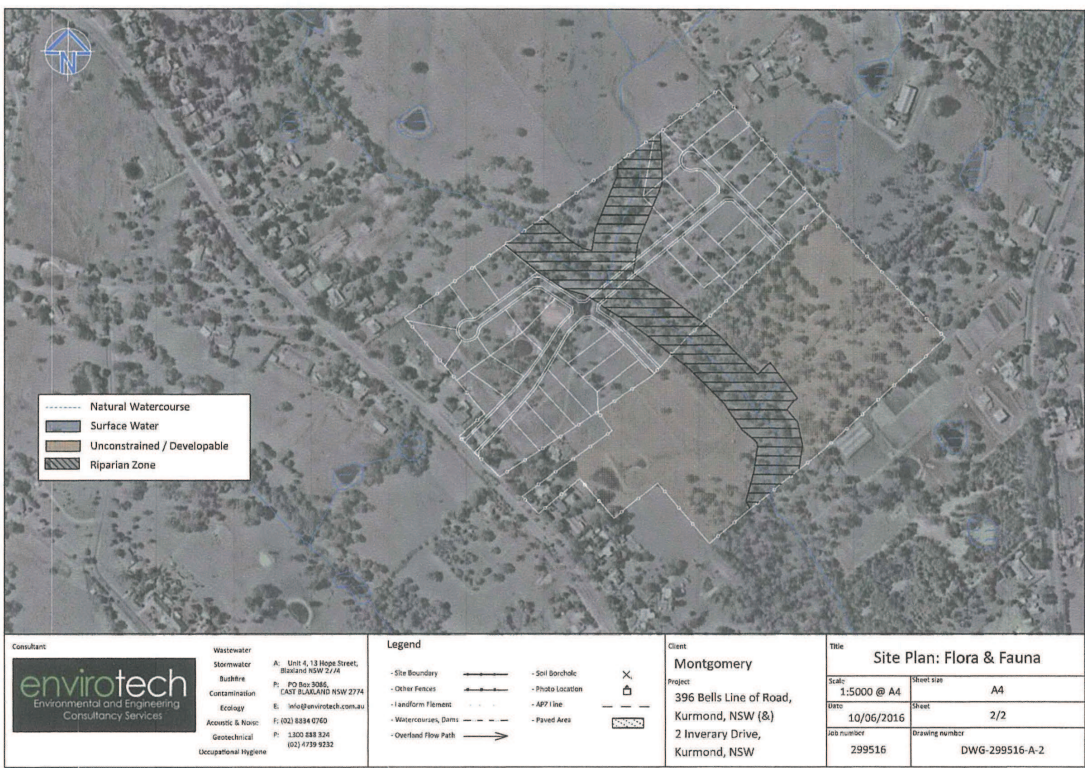
Offsetting the Impacts:

- 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.
- If hollow bearing trees are to be removed, they must be assessed for any fauna, and replaced with artificial nest boxes in Riparian habitat BEFORE clearing is underway. These are to be replaced with the artificial hollows being of a similar size to those removed. (Numbers to install 6 small <5cm, 6 medium <10cm, 2 large <30cm and 6 micro bat boxes)
- In regards 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 will retain the majority of the Shale Sandstone Transition Forest vegetation.
- The proposal to protect this area is to apply a minimum lot size of 1ha within the identified riparian complex and to create restrictions on the titles of those lots to protect and enhance the vegetation, as has occurred on the adjoining land to the north. These are considered appropriate protection mechanisms.

8. References

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Appendix 1: Developable Land



envirotech Environmental and Engineering Consultancy Services	Wastewater Stormwater BulkMire Contamination Ecology Acoustic & Noise Geotechnical Occupational Hygiene	A: Unit 4, 13 Hogg Street, Blackland NSW 2174 P: 700 800 9066 EAST BLACKLAND NSW 2174 E: info@envirotech.com.au F: (02) 8384 6760 P: 1300 888 324 (02) 4729 9332	Legend - Site Boundary - Other Fences - Landform Features - Watercourses, Dams - Overhead Flow Path - Soil Borehole - Photo Location - AP7 Line - Paved Area	Client Montgomery Project 396 Bells Line of Road, Kurmond, NSW (& 2 Inverary Drive, Kurmond, NSW	Title Site Plan: Flora & Fauna
	Scale: 1:5000 @ A4	Sheet size: A4			
	Date: 10/06/2016	Sheet: 2/2			
	Job number: 299516	Drawing number: DWG-299516-A-2			

Appendix 2: Species Recorded Onsite

Flora

* Denotes exotic species

Plant Family	Scientific Name	Common Name	Conservation/Weed Status
Apiaceae	<i>Hydrocotyle bonariensis</i> *	Pennywort	
Apocynaceae	<i>Vinca major</i> *	Blue periwinkle	
Asclepiadaceae	<i>Araujia hortorum</i> *	Moth Vine	
Asparagaceae	<i>Asparagus asparagoides</i> *	Bridal Creeper	Declared Noxious Weed
Asteraceae	<i>Ageratina riparia</i> *	Mist Flower	
Asteraceae	<i>Cirsium vulgare</i> *	Thistle	
Asteraceae	<i>Bidens pilosa</i> *	Farmers Friend	
Asteraceae	<i>Conyza bonariensis</i> *	Fleabane	Weed of National Significance
Asteraceae	<i>Onopordum acanthium</i> *	Thistle	
Asteraceae	<i>Ozothamnus diosmifolius</i>	Rice Flower	
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed	Class 4 Noxious Weed
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sowthistle	
Campanulaceae	<i>Wahlenbergia gracilis</i>	Native Bluebell	
Clusiaceae	<i>Hypericum gramineum</i>	Small St. John's Wort	
Commelinaceae	<i>Commelina cyanea</i>	Scurvy Weed	
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	
Cyperaceae	<i>Carex appressa</i>	Tall Sedge	
Cyperaceae	<i>Cyperus aggregatus</i> *	Flat Sedge	
Cyperaceae	<i>Cyperus eragrostis</i> *	Umbrella Sedge	
Cyperaceae	<i>Gahnia aspera</i>	Rough Saw Sedge	
Cyperaceae	<i>Lepidosperma laterale</i>	Variable Swordsedge	
Cyperaceae	<i>Schoenus imberbis</i>	Beardless Bog Rush	
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken	
Euphorbiaceae	<i>Ricinus communis</i> *	Castor Oil Plant	
Fabaceae	<i>Acacia decurrens</i>	Black Wattle	
Fabaceae	<i>Acacia implexa</i>	Hickory Wattle	
Fabaceae	<i>Acacia ulicifolia</i>	Prickly Moses	
Fabaceae	<i>Glycine clandestine</i>		
Fabaceae	<i>Glycine microphylla</i>		
Fabaceae	<i>Hardenbergia violacea</i>	False Sarsparilla	
Fabaceae	<i>Senna pendula</i> *	Easter Cassia	
Geraniaceae	<i>Geranium homeamum</i>	Native Geranium	
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium	
Haloragaceae	<i>Gonocarpus teuroides</i>	Germander Raspwort	
Juncaceae	<i>Juncus usitatus</i>	Common Rush	

Laminaceae	<i>Chloanthes glandulosa</i>		
Lilliaceae	<i>Myrsiphyllum asparagoides*</i>		
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Matt-rush	
Loranthaceae	<i>Amyema congener</i>	Mistletoe	
Malvaceae	<i>Sida rhombifolia*</i>	Arrowleaf Sida	
Malvaceae	<i>Modiola caroliniana*</i>	Red Flower Mallow	
Myrsinaceae	<i>Anagallis arvensis*</i>	Scarlet Pimpernel	
Myrsinaceae	<i>Rapanea variabilis</i>	Mutton Wood	
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	
Myrtaceae	<i>Backhousia myrtifolia</i>	Grey Myrtle	
Myrtaceae	<i>Eucalyptus creba</i>	Thin leaved ironbark	
Myrtaceae	<i>Eucalyptus eugenoides</i>	Thin-leaved Stringybark	
Myrtaceae	<i>Eucalyptus fibrosa</i>	Large leaved Ironbark	
Myrtaceae	<i>Eucalyptus paniculata</i>	Grey Ironbark	
Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum	
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum	
Myrtaceae	<i>Leptospermum polygalifolium</i>	Tantoon	
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly Leaved Tea Tree	
Oleaceae	<i>Ligustrum sinense*</i>	Small leaved privet	
Oxalidaceae	<i>Oxalis corniculata*</i>	Yellow Wood Sorrel	
Oxalidaceae	<i>Oxalis bowiei*</i>	Bowie Wood Sorrel	
Oxalidaceae	<i>Oxalis articulate*</i>	Shamrock Oxalis	
Oxalidaceae	<i>Oxalis debilis*</i>	Pink Shamrock	
Phytolaccaceae	<i>Phytolacca octandra*</i>	Inkweed	
Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn	
Plantaginaceae	<i>Plantago lanceolata*</i>	Lambs Tongue	
Plantaginaceae	<i>Plantago major*</i>	Greater Plantain	
Poaceae	<i>Andropogon virginicus*</i>	Whisky Grass	
Poaceae	<i>Aristida vagans</i>	Three-awn Speargrass	
Poaceae	<i>Bothriochloa macra</i>	Red Grass	
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass	
Poaceae	<i>Cynodon dactylon*</i>	Couch	
Poaceae	<i>Echinopogon caespitosus</i>	Hedgehog Grass	
Poaceae	<i>Imperata cylindrical</i>	Blady Grass	
Poaceae	<i>Setaria pumila*</i>	Pale Pidgeon Grass	
Poaceae	<i>Paspalum dilitatum*</i>	Paspalum	
Poaceae	<i>Pennisetum clandestinum*</i>	Kikuyu	
Poaceae	<i>Poa labillardieri</i>	Tussock Grass	
Poaceae	<i>Themeda australis</i>	Kangaroo Grass	
Primulaceae	<i>Anagallis arvensis*</i>	Pimpernel	
Proteaceae	<i>Grevillea robusta</i>	Silky Oak	Planted
Pteridaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair	
Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>Sieberi</i>	Poison Rock Fern	

Rhamnaceae	<i>Alphitonia excels</i>	Red Ash	
Rosaceae	<i>Rubus fruticosus</i> *	Blackberry	Weed of national Significance
Rosaceae	<i>Rubus parviflorus</i>	Native Raspberry	
Rubiaceae	<i>Pomax umbellata</i>	-	
Salicaceae	<i>Salix alba</i> *	Willow	
Santalaceae	<i>Exocarpos compressiformis</i>	Cherry Ballart	
Solanaceae	<i>Physalis peruviana</i> *	Cape Gooseberry	
Solanaceae	<i>Solanum mauritianum</i> *	Wild Tobacco	
Solanaceae	<i>Solanum nigrum</i> *	Blackberry Nightshade	
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade	
Solanaceae	<i>Solanum sisymbriifolium</i> *	Sticky Nightshade	
Verbenaceae	<i>Lantana camara</i> *	Lantana	Class 4 Noxious Weed
Verbenaceae	<i>Phyla nodiflora</i> *	Carpet Weed	
Verbenaceae	<i>Verbena bonariensis</i> *	Purple Top	

Quadrat Data (400m²)- *Denotes introduced species, #Denotes Cumberland Plain Woodland, ^ Denotes Shale Sandstone Transition Forest.

Quadrat 1 – species composition (total numbers)		
<i>Eragrostis curvula</i> * - 140	<i>Dichondra repens</i> # – 115	<i>Lomandra obliqua</i> - 63
<i>Axonopus fissifolius</i> * - 57	<i>Sonchus olearaceus</i> * - 42	<i>Pratia purpurescens</i> # ^ – 20
<i>Anagallis arvensis</i> * - 29	<i>Oxalis corniculata</i> * - 16	<i>Glycine microphylla</i> – 15
<i>Cyperus eragrostis</i> * – 8	<i>Tradescantia flumenensis</i> * - 7	<i>Entolasia stricta</i> ^ – 5
<i>Eucalyptus creba</i> # ^ – 5	<i>Ozothamus diosmifolius</i> ^ - 2	<i>Desmodium varians</i> - 2
<i>Wahlenbergia gracilis</i> # ^ – 2	<i>Acacia sp. (Juv)</i> ^ – 1	<i>Cynodon dactylon</i> * - 1
Quadrat 2 – species composition (total numbers)		
<i>Centella asiatica</i> (numerous)	<i>Cheilanthes sieberi</i> ^ – 29	<i>Dichondra repens</i> - 27
<i>Adiantum aethiopicum</i> – 14	<i>Bursaria spinosa</i> ^ – 12	<i>Commelina cyanea</i> - 10
<i>Backhousia myrtifolia</i> – 10	<i>Juncus usitatus</i> – 10	<i>Eragrostis curvula</i> * - 8
<i>Conyza bonariensis</i> * - 6	<i>Solanum prinophyllum</i> ^ - 5	<i>Eustrephus latifolius</i> - 5
<i>Leucopogon juniperinus</i> ^ – 4	<i>Alphitona excelsa</i> – 3	<i>Rapanea variabilis</i> – 3
<i>Pratia purperascens</i> ^ – 3	<i>Angophora floribunda</i> ^ - 2	<i>Cyperus eragrostis</i> - 2
<i>Lantana camara</i> * – 2	<i>Viola hederacae</i> – 2	<i>Sonchus olearaceus</i> * - 2
<i>Glycine microphylla</i> – 2	<i>Cymbopogon refractus</i> ^ - 1	<i>Cirsium vulgare</i> * - 1
<i>Ozothamnus diosmifolium</i> ^ – 1	<i>Gahnia aspera</i> – 1	
Quadrat 3 – species composition (total numbers)		
<i>Paspalum dilatatum</i> * – 36	<i>Dichondra repens</i> – 35	<i>Sonchus olearaceus</i> * - 27
<i>Cheilanthes sieberi</i> ^ – 26	<i>Cyperus aggregatus</i> * - 24	<i>Conyza bonariensis</i> * - 20
<i>Bursaria spinosa</i> ^ – 19	<i>Eragrostis curvula</i> * - 16	<i>Oxalis corniculata</i> * - 14
<i>Leucopogon juniperinus</i> ^ - 12	<i>Sida rhombifolia</i> * - 10	<i>Pratia purparescens</i> ^ - 9
<i>Glycine microphylla</i> – 9	<i>Commelina cyanea</i> - 9	<i>Solanum prinophyllum</i> ^ - 8
<i>Eustrephus latifolius</i> – 5	<i>Lomandra obliqua</i> – 5	<i>Angophora floribunda</i> ^ – 3
<i>Eucalyptus paniculata</i> ^ – 3	<i>Eucalyptus creba</i> ^ – 2	<i>Cymbopogon refractus</i> ^ – 2
<i>Acacia sp. (Juv)</i> ^ – 2	<i>Lantana camara</i> * - 2	<i>Gahnia aspera</i> – 1

Fauna *Denotes introduced species - # Denotes Threatened species

SCIENTIFIC NAME	COMMON NAME
Amphibians	
<i>Litoria latopalmata</i>	Broad-palmed Frog
<i>Crinia signifera</i>	Common Eastern Froglet
<i>Limnodynastes dumerili</i>	Eastern Banjo Frog
<i>Litoria fallax</i>	Eastern Dwarf Tree frog
<i>Litoria peronei</i>	Perons' Tree Frog
Aves	
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black Cockatoo
<i>Manorina melanophrys</i>	Bell miner
<i>Acanthiza chrysorrhoa</i>	Yellow Rumped Thornbill
<i>Acathanza lineata</i>	Striated Thornbill
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill
<i>Rhipidura albiscapa</i>	Grey Fantail
<i>Rhipidura leucophrys</i>	Willy Wagtail
<i>Platycercus eximius</i>	Eastern Rosella
<i>Smicrornis brevirostris</i>	Weebill
<i>Chenonetta jubata</i>	Wood Duck
<i>Manorina melanocephala</i>	Noisy Miner
<i>Gymnorhina tibicen</i>	Magpie
<i>Grallina cyanoleuca</i>	Magpie Lark
<i>Acridotheres tristis</i> *	Mynah Bird*
<i>Hirundo neoxena</i>	Welcome Swallow
<i>Phaps chalcoptera</i>	Common Bronzewing
<i>Corvus coronoides</i>	Raven
<i>Eopsaltria australis</i>	Eastern Yellow Robin
<i>Dacelo novaeguineae</i>	Kookaburra
<i>Ocyphaps lophotes</i>	Crested Pidgeon
<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet

<i>Coracina novaehollandiae</i>	Black-faced Cuckoo Shrike
<i>Malurus cyaneus</i>	Superb Blue Wren
<i>Sericornis frontalis</i>	White-browed Scrubwren
<i>Zosterops lateralis</i>	Silvereye
<i>Anthochaera chrysoptera</i>	Brush Wattlebird
Mammals	
<i>Lepus europaeus</i> *	European Hare
<i>Trichosurus vulpecular</i>	Brush-tailed Possum (scat)
<i>Wallabia bicolor</i>	Swamp wallaby (skull)
<i>Oryctolagus cuniculus</i> *	European Rabbit (scat)*
<i>Vulpes vulpes</i> *	European Fox (scat)*
Reptiles	
<i>Pseudonaja textilis</i>	Eastern Brown Snake
<i>Cryptoblepharus virgatus</i>	Wall Lizard
<i>Eulamprus quoyii</i>	Eastern Water Skink
<i>Intellagama lesueurii</i>	Eastern Water Dragon
<i>Lampropholis delicata</i>	Delicate Garden Skink
<i>Lampropholis guichenoti</i>	Common Garden skink

Appendix 3 - Effects on Threatened Biota (Assessment of Significance)

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 *NSW 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 a 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, extending the area from the adjoining area to the North (396 Bells Line of Road).
- ii). The composition of the ecological community onsite will only be modified in that some trees to the East of the retained Riparian vegetation that will be retained may be removed. It is unlikely that this modification will place the local occurrence of the critically endangered ecological community at risk of extinction.

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 area that has been retained to the North (396 Bells Line of Road).
- ii). The area that is mapped on site is joined to the area to the North (396 Bells Line of Road) 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.

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 trees 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 - Appendix B) then the action proposed is not expected to substantially increase the impact of this key threatening process.

Some hollow bearing trees (3) may be removed for the proposal, and as such there will be an increase in the impact of the key threatening process Loss of Hollow-bearing Trees. The installation of double the number of hollows along the retained watercourse will aid in alleviating this KTP.

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 *NSW 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. Three within the Riparian complex and three to the East of this area (Figure 5)

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 effect 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, Foraging) within this area; and will be connected to a similar area to the North (see figure).

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 - Appendix B) then the action proposed is not expected to substantially increase the impact of this key threatening process.

Three hollow bearing trees may 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.

Seven-part Test Conclusion

The proposal is unlikely to have a significant effect on threatened species, populations or ecological communities or their habitats pursuant to Section 5A of the NSW Environmental Planning and Assessment Act.

A Species Impact Statement is not required for the proposal.

Appendix 4: EPBC Act Considerations

An assessment of the impact of the proposed development upon threatened species, populations, ecological communities, World Heritage values, and migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* are listed below.

Impacts on threatened species and ecological communities

An action has, will have, or is likely to have a significant impact on a threatened species if it does, will, or is likely to:

- Lead to a long-term decrease in the size of a population
- Reduce the area of occupancy of the species
- Fragment an existing population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of a population
- Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat; or
- Interfere with the recovery of the species

Critically endangered and endangered species

No critically endangered or endangered species were observed on the subject site, however potential habitat exists for the endangered species *Pimelea spicata*. This species was not detected in the study area however may potentially occur in the soil seedbank.

It is considered that the proposed development will not disrupt the lifecycle of this species such that any potentially viable local population would be placed at increased risk of extinction. The potential impacts of the proposed development is not likely to lead to significant exacerbation of those points listed above.

Vulnerable Species

No vulnerable species were recorded at the study site, however potential habitat exists for the vulnerable flora species *Zieria involucrata*. This species was not detected in the study area however may potentially occur in the soil seedbank.

It is considered that the proposed development will not disrupt the lifecycle of this species such that any potentially viable local population would be placed at increased risk of extinction. The

potential impacts of the proposed development is not likely to lead to significant exacerbation of those points listed above.

Critically endangered and endangered ecological communities

An important population is one that is necessary for a species long-term survival and recovery. This may include populations that are:

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

The Critically Endangered Ecological Shale Sandstone Transition Forest was mapped on the site, and was in a degraded structure. It is unlikely that the proposed action will have a detrimental effect on the ecological community in the area due to the fact that the development will conserve an area of this community, which runs along the waterway through the site, and connects, with the area to the north.

Impacts on migratory species

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species;
- Result in invasive species that are harmful to the migratory species, and prevent the species becoming established in an area of important habitat;
- Seriously disrupt the lifecycle (breeding, feeding, migration or nesting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant portion of the population of the species
- Habitat utilised by a migratory species which is at the limit of the species range; or
- Habitat within an area where the species is declining.

One (1) migratory species (Cattle egret), has been recorded within a 10km radius of the site (Table 16). The proposed development will not significantly decrease habitat available for this species, or disrupt the lifecycle of this species such that viable populations are likely to be placed at risk of extinction. The proposed development is therefore not likely to have a significant impact on these species and is not likely to result in any points listed above under the migratory species provisions of the EPBC Act.

EPBC Act Assessment

- The proposed action will not significantly impact on any of the 2 flora and 6 fauna species listed under the EPBC Act and recorded within a 10 km radius of the site (Tables 13 and 15).
- The proposed action will not significantly impact on the Critically Endangered Community Shale Sandstone Transition Forest, which was mapped on site.
- The proposed action will not significantly impact on the 1 migratory species that is listed under the EPBC Act and recorded within a 10km radius of the site (Table 16).

Referral Recommendation

The proposed development will **not** require referral to the Commonwealth Minister for the Environment for consideration under the EPBC Act.

Appendix 5:
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 three species of known food trees, including one primary feed species (*Eucalyptus tereticornis*) and two secondary/supplementary food species (*Eucalyptus punctata* and *Eucalyptus eugenioides*). These species together comprise approximately 15% of the total number of trees in the upper or lower strata of the tree component.

During targeted koala surveys (which included call playback sessions, spotlighting, 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 Kurmond (See Figure 7), 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.

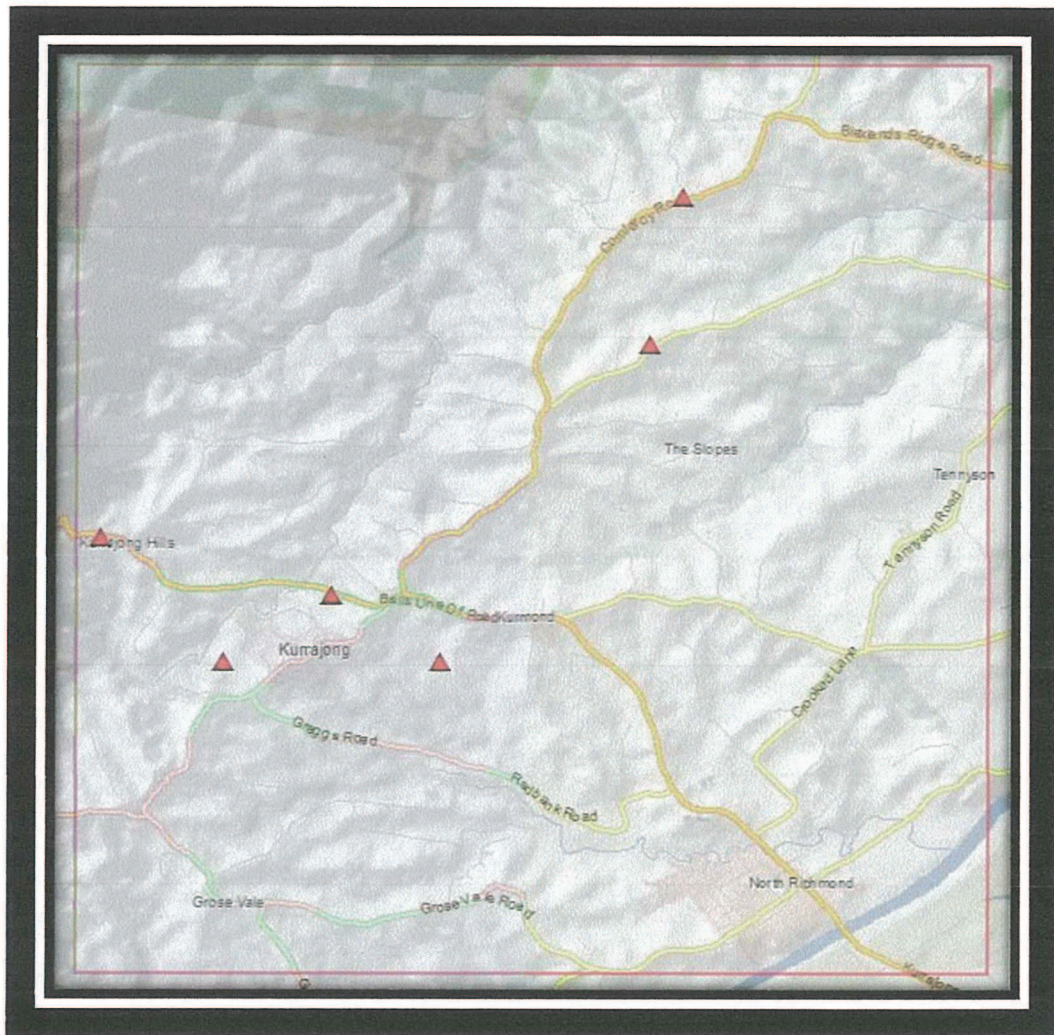


Figure 7: Koala records within 10 km of 2 Inverary Drive, Kurmond

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.