STATEMENT OF EFFECT

ON THREATENED FLORA AND FAUNA

for a proposed rezoning and
subdivision

at

Lot 42 DP 846326
Wilton Drive & Mt Vincent Road

EAST MAITLAND
NSW

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EXECUTIVE SUMMARY

Flora, fauna and habitat studies have been undertaken within Lot 42 DP 846326 Wilton Drive and Mt Vincent Road East Maitland NSW for a proposed rezoning and subsequent subdivision.

Investigations in accordance with the requirements of the Environmental Planning and Assessment Act 1979 (EPA Act) and the Threatened Species Conservation Act 1995 (TSC Act) have led to this Flora and Fauna Impact Assessment, which incorporates an assessment of the site under the provisions of State Environmental Planning Policy (SEPP) 44 - 'Koala Habitat Protection' and the Environmental Protection and Biodiversity Conservation Act 1999. These studies have been undertaken to ascertain whether or not the proposal would have a significant effect upon any populations, ecological communities, or habitats of threatened flora and fauna species.

The Proposal

It is proposed that the site be rezoned, subdivided and developed for residential purposes. The development footprint (20.33ha) will be situated over the majority of Lot 42 DP 846326 occurring above the 1:100 year flood line. A narrow vegetated buffer will be left *in-situ* along Mt Vincent Road.

Description of the site

The 26.73 ha site (Lot 42 DP 846326) was located on the southern outskirts of East Maitland along on the corner of Mount Vincent Road and Wilton Drive. Topography within the site was undulating with the high area of land present in the far north-east. The lowest ground in the far south-west fell below the 1:100 year flood level. A drainage line which formed part of the Wallis Creek Catchment was also present within this area. The site has been subject to past vegetation clearance, past coal mining operations and ongoing cattle grazing.

Vegetation within the site

Approximately 12.08ha of remnant Dry Sclerophyll Open Forest was present within the far east of the site. Common canopy species within this remnant included *Corymbia maculata* (Spotted Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus fibrosa* subsp. *fibrosa* (Broad-leaved Ironbark). This vegetation assemblage was most consistent with Map Unit 17 Lower Hunter Spotted Gum – Ironbark Forest as described within the 'Vegetation Survey, Classification and Mapping, Lower Hunter and Central Coast Region' (NPWS, 2000). Apart from an area of aquatic vegetation

along the drainage line in the far south-west Pasture/Grassland occupied the remainder of the site. In total four vegetation communities were delineated within the site, being:

- Lower Hunter Spotted Gum Ironbark Forest (12.08ha)
- Pasture/Grassland with scattered and clumped remnant trees (8.25ha)
- Freshwater Drainage Line Vegetation (2.14ha)
- Freshwater Dam Vegetation (0.03ha)

Endangered Ecological Communities (EEC's)

Three Endangered Ecological communities were found to be present within the site, being:

- Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion (12.08ha);
- Hunter Lowlands Redgum Forest in the Sydney Basin Bioregion (0.18ha);
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast (2.14ha).

The area of Dry Sclerophyll Forest in the east of the site was found to be most consistent with that of Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion. Despite disturbances such as past tree removal and ongoing cattle grazing this area of EEC was found to be in relatively good condition, although the western periphery edge of this community and the two outlying smaller fragments tended to be subject to greater edge effects particularly from introduced grasses. *Lantana camara* (Lantana) was also a common invasive species within this community. The ongoing Cattle grazing has had an impact on the current height and density of the ground and shrub layers of this community.

One small isolated clumped area (0.18ha) of remnant *Eucalyptus tereticornis* (Forest Red Gum) had some similarities to the EEC Hunter Lowlands Redgum Forest. However this remnant area had an understorey largely consisting of introduced grasses and lacked any associated flora species.

Approximately 2.14ha of aquatic vegetation occurring along the drainage line in the far west of the site was found to be most consistent with Freshwater Wetlands on Coastal Floodplains of the NSW North Coast. This area was found to occur in brackish water and had been subject to prolonged grazing and trampling by cattle.

Threatened Flora Species

No threatened flora species were found within the site during fieldwork completed for this report or previous studies (Wildthing Environmental Consultants, 2009). The site was considered to contain potential habitat for 3 of the 14 threatened flora species addressed in the report, being; *Grevillea parvifolia* subsp. *parviflora* (Small-flowered Grevillea), *Eucalyptus glaucina* (Slaty Red Gum) and *Rutidosis heterogama* (Heath Wrinklewort). Habitat for these flora species would be confined to the area of Dry Sclerophyll Forest in the east of the site.

Threatened Fauna

A total of four threatened fauna species all species of microchiropteran were positively recorded within the site during fieldwork completed for this report and past surveys (Wildthing Environmental Consultants, 2009), being:

- *Mormopterus norfolkensis* (Eastern Freetail Bat);
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Miniopterus australis* (Little Bentwing-bat);
- *Miniopterus schreibersii oceanensis* (Large Bentwing Bat).

As a result of the similarity of the calls within the Genus Vespadelus, an additional threatened species *Vespadelus troughtoni* (Eastern Cave Bat) was also tentatively considered to utilise the site. Suitable hunting habitat was present over the site for all of these microchiropteran bat species. Only preferred roosting habitat in the form of tree hollows was present for *M. norfolkensis* and *F. tasmaniensis* within the area of Dry Sclerophyll Forest. Preferred roosting habitat in the form of caves and man-made structures such as culverts was absent for *M. australis*, *M. schreibersii oceanensis* and *V. troughtoni*.

Of the remaining threatened fauna species suitable habitat within the site was found to be present for 28 of the 89 addressed species. Taking the habitat and local records into consideration the most likely of these species to utilise the study area would include *Pomatostomus temporalis temporalis* (Grey-crowned Babbler), *Daphoenositta chrysoptera* (Varied Sittella), *Glossopsitta pusilla* (Little Lorikeet), *Pteropus poliocephalus* (Grey-headed Flying-fox) and *Scoteanax rueppellii* (Greater Broad-nosed Bat).

Habitat within the study area

Three habitat types within the study area were:

- Dry Sclerophyll Forest (Lower Hunter Spotted Gum – Ironbark Forest)(12.04ha);
- Pasture/Grassland with scattered remnant trees (8.25ha);
- Freshwater Wetland.

Dry Sclerophyll Forest occurring in the east of the site would likely form a significant fragment of habitat (approximately 12ha) for a number of native species within the local landscape. This habitat would also provide a link to a larger area of similar habitat to the south, east and north of the site.

In general, the habitats within the study area offer a wide range of habitat opportunities for a range of native species. The habitats proposed to be affected by the proposal range from less ecologically significant areas such as pasture/Grassland to relatively intact Dry Sclerophyll Forest that is capable of offering suitable resources to both resident and transitory species.

A total of 97 habitat (hollow-bearing) trees were identified within the study area as a result of a hollow-bearing tree survey. The vast majority of hollow-bearing trees were located within Dry Sclerophyll Forest in the east of the site. Hollows were available for roosting or nesting avifauna species, arboreal mammals, reptiles and tree roosting microchiropteran bats species. A small number of potential roost trees for large owls.

SEPP 44 – 'Koala Habitat Protection'

Assessment of the site under SEPP 44 – 'Koala Habitat Protection' revealed that the site supported two tree species, *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum) recognised under Schedule 2 of SEPP 44 as a Koala feed tree. These tree species were relatively common over the site however was found to be under 15% of the total number of trees within the site. Therefore the site would not constitute 'Potential Koala Habitat' and accordingly no further provisions of this policy apply to the site. No direct observations of Koalas or evidence of Koala activity such as scats and scratches on the boles of trees were recorded within the site.

Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999).

Consideration has been given to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999). Lower Hunter Spotted Gum – Ironbark Forest occurring on site was found to be consistent with the critically endangered ecological community Central Hunter Valley Eucalypt Forest. No nationally threatened or migratory species were recorded during the survey.

Impact Assessment

The proposal will result in the in the following direct impacts:

- The loss of approximately 11.33ha of Lower Hunter Spotted Gum – Ironbark Forest an EEC listed under the TSC Act 1995 in the east of the site. This assemblage would also be consistent with Central Hunter Valley Eucalypt Forest and Woodland which is listed as a Critically Endangered under the EPBC Act 1999. A narrow buffer of Lower Hunter Spotted Gum – Ironbark Forest (approximately 0.75ha) will remain *in-situ* along Mt Vincent Road. The removal of the area of Lower Hunter Spotted Gum – Ironbark Forest would be considered to be a significant reduction of this community in the local area. However under the current land practices the long-term integrity of Lower Hunter Spotted Gum – Ironbark Forest on site will continue to decline;
- The loss of a 0.2ha clump of isolated *Eucalyptus tereticornis* (Forest Red Gum) which may be considered to be a highly disturbed EEC – Hunter Lowlands Red Gum Forest;
- Loss of approximately 8.25ha of Pasture/Grassland;

- The loss of 11.33ha of known hunting habitat for four affected species *F. tasmaniensis, M. norfolkensis, M. australis* and *M. schreibersii oceanensis* plus *V. troughtoni* which was tentatively recorded within the site. Preferred roosting habitat in the form of tree hollows will be impacted for *F. tasmaniensis* and *M. norfolkensis.*
- The loss of potential habitat for 23 additional threatened flora and fauna species assessed as having suitable habitat within the site;
- The loss of 82 hollow-bearing trees largely within the area of Lower Hunter Spotted Gum Forest;
- Habitat Fragmentation;
- Injury/Mortality to native fauna during felling of trees.

No areas of Freshwater Wetland an EEC will be directly impacted by the proposal.

Mitigation Measures

A number of mitigation measures have been specified to minimise the impact of the loss of habitat. The measures will include:

- Protection and enhancement of the proposed remaining buffer of Lower Hunter Spotted Gum Ironbark Forest along Mt Vincent Road;
- Protection and enhancement of the area of Freshwater Wetland in the west of the site;
- Protection of native fauna during habitat removal (Fauna ecologist on site during habitat removal);
- Installation of compensatory fauna nest boxes along Mt Vincent Road;
- Reconstruction of Lower Hunter Spotted Gum – Ironbark Forest within an area of Grassland/Pasture (approximately 2ha) on higher ground within the far south-west of the site.
- Provision of compensatory habitat (Offsetting). This will need to be undertaking with the consultation with the Office of Environment and Heritage (OEH), Wildthing Environmental Consultants, Maitland City Council and the proponent.

To help ensure these measures are carried out a vegetation/habitat management plan will need to be developed to address any impacts associated with the proposal to ensure the long-term viability of remaining and rehabilitated habitat.

Conclusion

The proposed residential development will result in a significant loss of the EEC Lower Hunter Spotted Gum – Ironbark Forest within the local area and reduction in habitat for a number of the addressed threatened species. Taking into account the recommendations and given a suitable habitat offset which would be the subject of further discussion between Maitland City Council, OEH,

Wildthing Environmental Consultants and the proponent it is believed that the proposal is less likely to disrupt the life cycle of any addressed threatened species, endangered population or endangered ecological community such that local extinction would occur.

CONTENTS

1.0 INTRODUCTION

Flora, fauna and habitat studies have been undertaken for a proposed rezoning and subdivision of Lot 42 DP 846326 Wilton Drive and Mt Vincent Road East Maitland NSW. This report is intended to indicate the likelihood of the subsequent development having a significant effect on threatened species of flora, fauna, populations and ecological communities and to fulfil other requirements of the Environmental Planning and Assessment Act (EPA Act) 1979 and the Threatened Species Conservation Act (TSC Act) 1995. The results are presented here in the form of a Seven Part Test report, incorporating an assessment of the site under the provisions of State Environmental Planning Policy No. 44 (SEPP 44) - 'Koala Habitat Protection' and the Commonwealth Environment Protection And Biodiversity Conservation Act 1999 (EPBC Act). The report will also incorporate the results of a previous assessment on Threatened Flora and Fauna (Wildthing Environmental Consultants, 2009) which was completed for a proposed rezoning of the site.

1.1 GENERAL DESCRIPTION OF SITE

The 26.73 ha site was located on the southern outskirts of East Maitland along Mount Vincent Road (Figure 1). The site was bounded by Mount Vincent Road in the east and Wilton Drive in the north. Cleared land bordered the site to the west and south-west. Open Forest bordered the site to the south-east. The majority of the site occurs on undulating topography on Permian sediments in the East Maitland Hills (Matthei, 1995). The highest point (approximately 50m asl) was located in the far north-east. The underlying geology consists of the Tomago Coal Measures composed of shale, mudstone, sandstone and coal. Very small areas of exposed sandstone bedrock were observed on site. Low ground in the far west of the site consisted of Quaternary alluvium derived from the Hunter River and associated drainage lines. The site was located in the Wallis Creek catchment. A small number of drainage lines were present on site and were mostly ephemeral in nature. The largest of the drainage lines run through the south-west of the site before entering a larger water body just over the western boundary.

The higher eastern portion of the site had been subject to the least amount of disturbance and contained Spotted Gum – Ironbark Forest composed primarily of the canopy species *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Broad-leaved Ironbark). Although this area of open forest was found to be in generally good condition it had been subject from disturbances from past vegetation clearance, cattle grazing, historical coal mining activity and weed invasion particularly in the form of *Lantana camara* (Lantana). The lower western portion of the site had undergone the most disturbance and was largely composed of grassland/pasture that has been subject to ongoing cattle grazing.

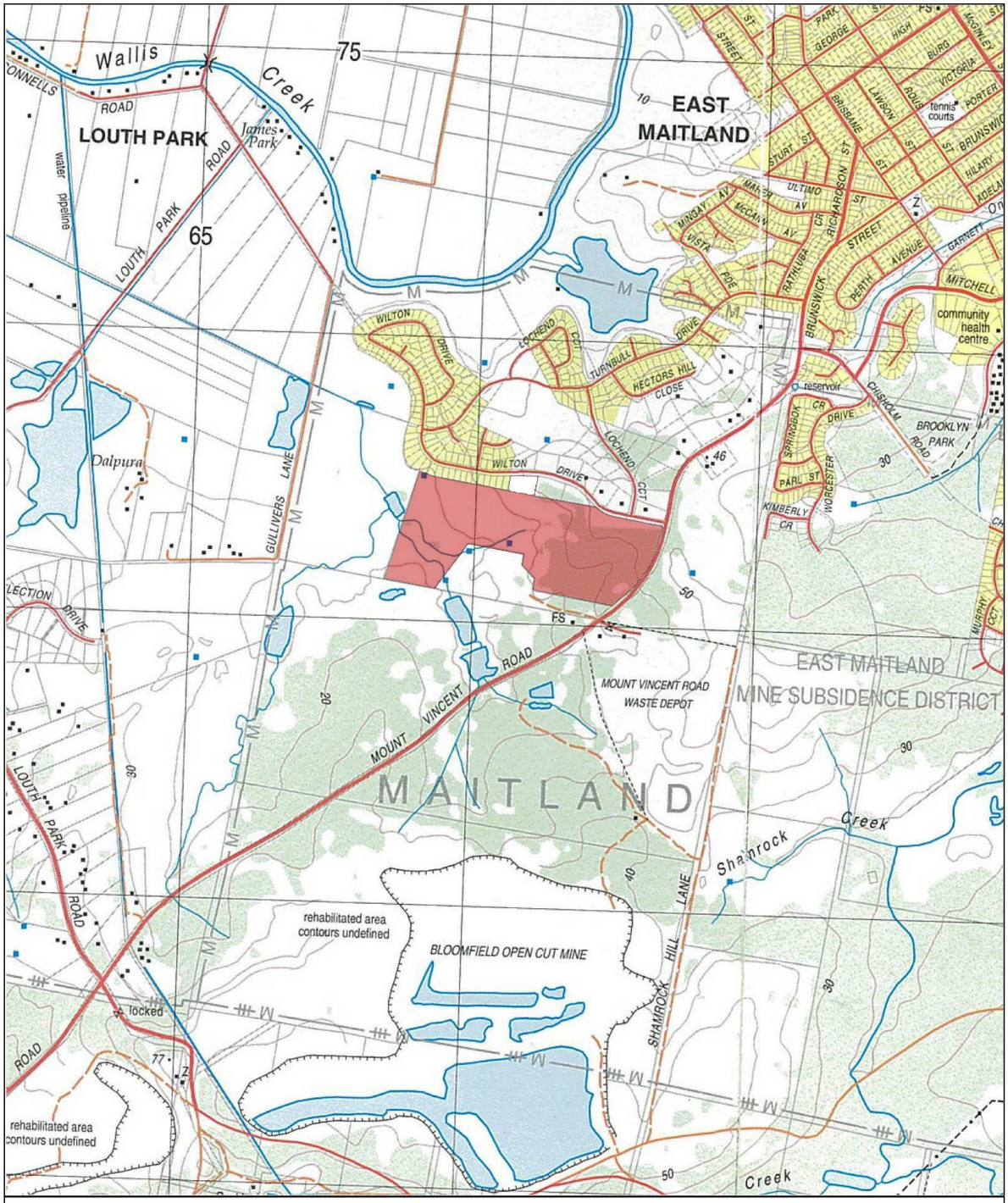

Figure 1: Location of site Lot 42 DP 846326 & Lot 8 DP 855275 Wilton Drive & Mt Vincent Road, East Maitland.

Source: Land & Property Information
1:25000 Topographic Map
Beresfield 9232 - 3N

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Source: nearmap 6 May 2015
Proposed residential Lot Precincts
1% AEP Flood Level - RL 10.1
Vegetation Buffer
Proposed Retained Trees
Sewer Line
Overhead Power Lines
Figure 2: Proposed development within subject site

1.2 DESCRIPTION OF THE PROPOSAL

It is proposed that the site be developed for residential purposes. The development footprint will be situated over the majority of Lot 42 DP 846326 and will require the removal of approximately 11.33ha of Lower Spotted Gum Ironbark Forest a listed Endangered Ecological Community under the NSW Threatened Species Conservation Act 1995 (TSC Act). A vegetated buffer will be left *in-situ* along Mt Vincent Road. Higher ground in the far south-west of the site will be revegetated.

2.0 SCOPE OF THE STUDY

This study was designed to address any likely flora and fauna issues of significance occurring as a result of the proposal. This was achieved by appraisal of the vegetation assemblage and structural formation, and identification of representative plant species of the various structural layers. Potential habitat offered by the vegetation present was also assessed. The possibility of this site being significant for any Schedule 1 and 2 (endangered and vulnerable) flora, fauna and ecological communities was paramount in the assessment process.

2.1 LEGISLATIVE REQUIREMENTS

This report on Threatened Flora and Fauna report has been structured upon the guidelines laid down in Section 5A of the Environmental Planning and Assessment Act (1979), and the Threatened Species Conservation Act (1995), which requires consideration of the impact of the proposed development upon any Schedule 1 and 2 (endangered or vulnerable) species and ecological communities expected or found on the site. Endangered and vulnerable species are collectively referred to as 'threatened' species in this report.

Also considered in this report was the Commonwealth Environment Protection and Biodiversity Conservation Act (1999), State Environmental Planning Policy (SEPP) 44 – 'Koala Habitat Protection' and SEPP 14 – 'Coastal Wetlands'.

Fieldwork undertaken by Wildthing Environmental Consultants was carried out under NPWS Scientific Investigation Licence S10475 and under Animal Care and Ethics Approval: Animal Research Authority Issue by the Director General of NSW Agriculture (File No. 13/251) for Fauna Survey for Biodiversity and Impact Assessment.

3.0 METHODOLOGY

3.1 VEGETATION APPRAISAL METHODOLOGY

The initial determination of the basic vegetation community boundaries was undertaken through the review of an orthophoto covering the site. Following this, a detailed ground survey was conducted. The vegetation survey was undertaken in accordance with the Lower Hunter and Central Coast Region – Flora and Fauna Guidelines (Murray et al, 2002). This involved three 100m vegetation transects and three plots 20×20m in area. During the transect-based surveys all species observed within 2m either side of the centre line were recorded as well as the physical attributes of the surrounding area. Within the survey plots, the height of each primary structural layer and relative cover abundance of the species within was recorded, along with location, elevation, slope, aspect and general soil type.

In addition to the above, flora searches for threatened species were undertaken across the site in the manner described by Cropper (1993) as the 'Random Meander Technique'. This involved walking in a random manner throughout the entire study site, visiting the full range of potential habitats and checking every plant species seen. A list of all flora species identified on site has been provided in Appendix B and the results of transect and plot surveys can be seen in Appendix C.

3.2 HABITAT APPRAISAL METHODOLOGY

Habitat may be defined as the physical and biological environment required for the survival of a specific population of a species. In modern usage habitat has also come to be regarded as an association of landform and plant life, which provides sustenance and shelter for a particular fauna assemblage.

The methodology of the habitat appraisal used the vegetation community data combined, where relevant, with geomorphological features and the occurrence of particular plant species or forms (i.e. tree hollows) to provide a basis for a subjective habitat assessment aimed at placing the ecological status of the site within a local perspective.

3.2.1 GENERAL HABITAT FOR NATIVE SPECIES

From the vegetation appraisal and a general inspection of the site and surrounding areas, a subjective assessment of the general habitat value of this site was made. Considered in this assessment were:

- occurrence of that habitat type in the general vicinity;
- degree of disturbance and degradation;
- area occupied by that habitat on site;
- continuity with similar habitat adjacent to the site, or connection with similar habitat off site by way of corridors; and
- structural and floral diversity.

3.2.1.1 HOLLOW-BEARING TREE SURVEY

Hollow-bearing trees are a habitat resource utilised by a variety of native avifaunal and mammalian species. This resource is usually a limiting factor in the occurrence of hollow-dependent species on a site, due to the time taken for hollows to form in trees. During the fieldwork a survey was undertaken to identify the number of hollow-bearing trees within the study area and to classify the size of the hollow openings.

3.2.2 HABITAT FOR SIGNIFICANT SPECIES

This study area was evaluated as potential habitat for each of the threatened species reported on the Office of Environment and Heritage (OEH) and the Department of Environment (DoE) databases from within 10km of the site. This evaluation was based on home-range, feeding, roosting, breeding, movement patterns and corridor requirements for fauna and hydrology, soil types, aspect and structural formation for flora species.

3.3 FAUNA APPRAISAL METHODOLOGY

The fauna survey was initiated with the production of an Expected Fauna Species List and an assessment of the potential use of the study area by any threatened species identified in the OEH and DoE database searches. Subsequently, the confirmation and supplementation of the Expected Fauna Species List, by way of on-site observation, trapping and recording, was carried out as described below. The survey was carried out using the Lower Hunter and Central Coast Region – Flora and Fauna Guidelines (Murray. et. al, 2002).

3.3.1 SMALL TERRESTRIAL MAMMAL TRAPPING

Terrestrial mammal trapping was undertaken using 40 Elliott Type A traps (8x10x33cm) within the site. The traps were left in place for four consecutive nights giving a total of 160 small terrestrial trap nights. The traps were hidden in thick grass, under shrubs or and around trees and were camouflaged with vegetation where the ground cover was sparse. The baits used for the traps were a mixture of rolled oats, peanut butter and honey, and Good-O's (dry dog food). The traps were checked at first light each morning and, where necessary, reset and rebaited. The location of the small terrestrial traps is shown in Figure 3.

3.3.2 MEDIUM TERRESTRIAL MAMMAL TRAPING

Medium terrestrial mammal trapping was undertaken using 10 cage traps (60×35×40cm) within the site. The traps were left in place for four consecutive nights giving a total of 40 terrestrial trap nights. The traps were hidden in thick grass, under shrubs or near fallen logs and were camouflaged with vegetation where the ground cover was sparse. The bait used for the traps was chicken necks. The

traps were checked early each morning and, where necessary, reset and rebaited. The location of the Medium terrestrial traps is shown in Figure 3.

3.3.3 ARBOREAL TERRESTRIAL MAMMAL TRAPING

Arboreal mammal trapping was undertaken using 20 Elliott Type B traps (15 × 15 × 46cm) within the site area to determine the presence of arboreal mammals. The traps were left in place for four consecutive nights giving a total of 80 arboreal trap nights. The traps were placed around 3 - 4 metres above the ground on platforms mounted on tree trunks. Trees which were targeted contained hollows, were flowering or had scratches present on the boles. The baits used consisted of a rolled oats, peanut butter and honey mixture, and a two pieces of liquorice. The traps were sprayed with honey mixed in water before being placed in the trees to attract fauna and mask the smell of humans. The tree trunks were also sprayed with this mixture each day. In all cases the traps were checked early each morning and, where necessary, reset and rebaited. The position of the arboreal traps within the study area can be seen in Figure 3.

3.3.4 HARP TRAPPING

Two monofilament harp trap were set for two nights within the site. The harp trapping was undertaken in order to sample the use of the site by sub-canopy microchiropteran bat species. The trap was positioned in a potential flyway and was checked early each morning, with any captures being identified directly via the use of dichotomous keys and subsequent comparison with commercially available field guides, where degrees of uncertainty prevailed. The locations of the harp trap are shown in Figure 3.

3.3.5 MICROCHIROPTERAN BAT CALL SURVEY

Bat echo-location calls were taped using an Anabat detector in areas which were considered likely to be used by bats. These positions were selected to sample potential hunting sites for bats, including flyways, clearings and ecotones. Echolocation surveys used a combination of stationary and hand held mobile surveys. Stationary call activated microchiropteran bat detection was undertaken from dawn to dusk over two nights. Mobile surveys were conducted over two evenings. The bat calls recorded by Wildthing Environmental Consultants were analysed in-house by Mungo Worth. The location of the bat call survey is shown in Figure 4.

3.3.6 AMPHIBIAN SURVEY

The amphibian survey included a combination of diurnal and nocturnal census methods. Diurnal searches were undertaken for two half-person hour periods. Systematic searches involved searches within appropriate habitat for basking or sheltering individuals. Any appropriate cover such as logs were turned over for resting individuals. Nocturnal surveys were undertaken for a one person hour period. The surveys were undertaken in suitable habitat and involved listening for the characteristic

call of male frogs. Playback of frog calls was undertaken in an attempt to elicit a response from threatened amphibian species in particular *Litoria aurea* (Green and Golden Bell Frog) which is known to occur within the locality. Other calls broadcasted include those of *Litoria littlejohni* (Littlejohn's Tree Frog) and *Litoria brevipalmata* (Green-thighed Frog). The location of the frog census conducted is shown in Figure 4.

3.3.7 REPTILE SURVEY

Searches for reptiles involved a combination of diurnal and nocturnal searches. Diurnal searches for reptiles involved searching in likely habitat (i.e. leaf litter, dead logs and long grass) during the morning and afternoon survey period. Nocturnal searches were conducted for reptile species active at night such as geckos and some species of snakes and involved searching in likely habitats with the aid of a spotlight. The location of the reptile surveys is shown in Figure 4.

3.3.8 DIURNAL AVIFAUNA SURVEY

The diurnal avifauna census involved point surveys targeting potential habitat in the study area for species such as *Anthochaera phrygia* (Regent Honeyeater). Surveys were conducted at peak activity periods (i.e. dawn and dusk) for four periods of half an hour. A total of 2 hours of targeted diurnal bird surveys were undertaken. Incidental observations and secondary indications (i.e. distinctive feathers and nests) of avifauna were also recorded. The location of the diurnal avifauna surveys is shown in Figure 4.

3.3.9 NOCTURNAL AVIFAUNA AND MAMMAL CALLPLAYBACK SURVEY

During the nocturnal avifauna and mammal survey pre-recorded calls of *Ninox connivens* (Barking Owl), *Ninox strenua* (Powerful Owl), *Tyto novaehollandiae* (Masked Owl), *Tyto tenebricosa* (Sooty Owl), *Petaurus australis* (Yellow-bellied Glider), *Petaurus norfolcensis* (Squirrel Glider) and *Phascolarctos cinerea* (Koala) were broadcast through an amplification system designed to project the sound for at least 1km under still night conditions. An initial listening period of 10 minutes was undertaken, followed by 5 minutes of calls (repeated in four different directions). A period of two minutes of quiet listening was then employed after each 5-minute bracket of calls. At the conclusion of the call playback survey, spotlighting was carried out in the vicinity of the call playback site. The locations of the call playback are shown in Figure 4.

3.3.10 SPOTLIGHTING SURVEY

Spotlighting was undertaken on foot using 100watt hand-held spotlights. The spotlighting undertaken was completed by two persons and involved walking at a slow pace along the particular survey area and stopping every 2 minutes, allowing the observer to hear movements of animals. A total of 7 person hours of spotlighting was conducted during the survey. The spotlight routes are shown in Figure 4.

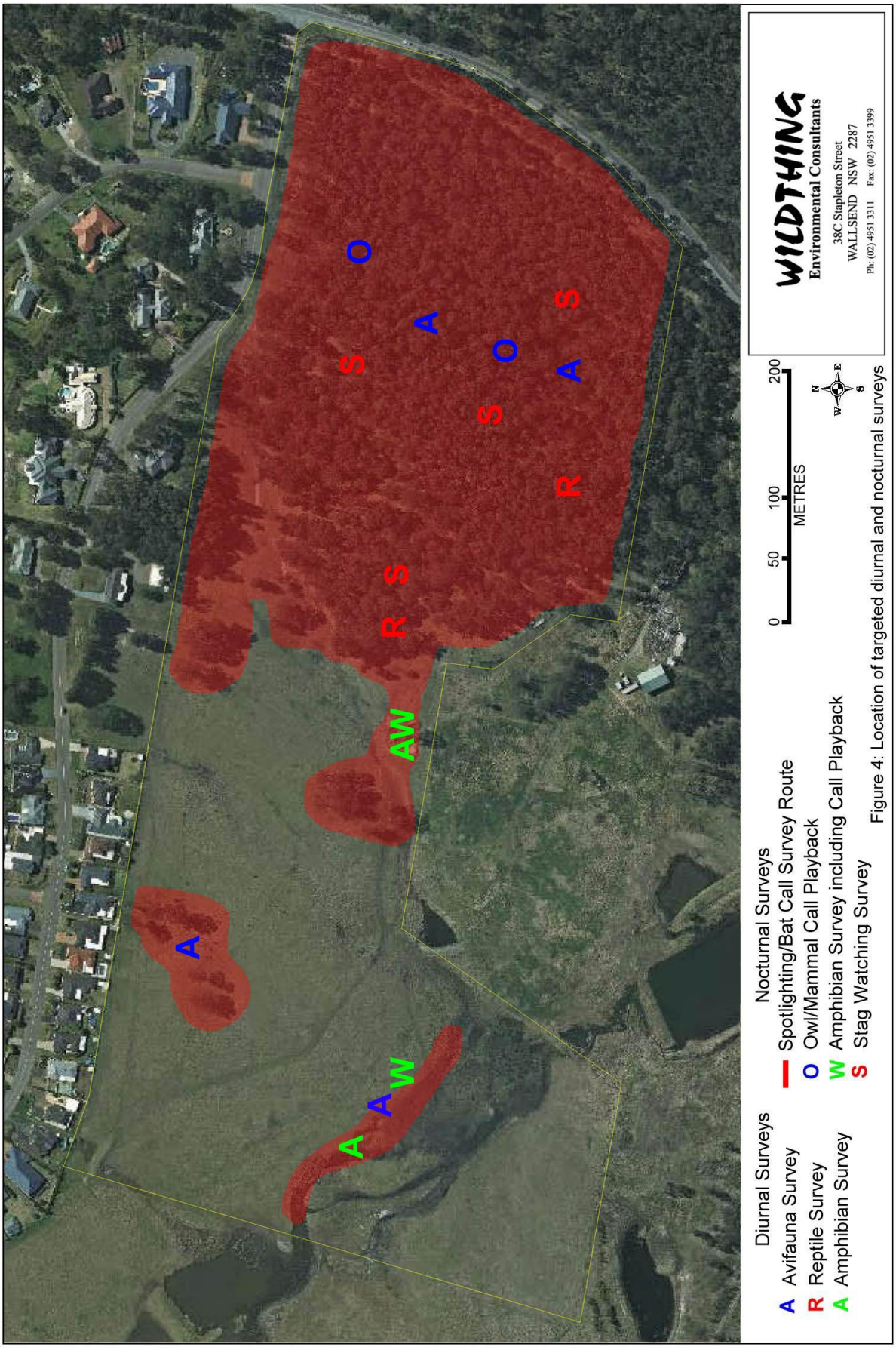

Figure 4: Location of targeted diurnal and nocturnal surveys

4.3.11 STAG WATCHING SURVEY

The Stag watching survey involved watching a selected dead hollow-bearing trees, 15 minutes prior to sunset and continuing until 15 minutes after sunset. The required listening period and stag watching were undertaken concurrently. A total of 2 person hours of stag watching was conducted during the survey. The locations of the stag watching surveys are shown in Figure 4.

3.4 DATE, TIMES, ACTIVITIES & WEATHER CONDITIONS

A summary of the time spent on site during fieldwork and the prevailing weather conditions at the time is contained below in Table 1.

Table 1: Survey effort, dates, times and weather conditions

DATE	TIME (24HR)	SURVEY EFFORT (PERSON HOURS)	ACTIVITY	WEATHER
Thursday 09/07/15	1700 - 0650 1700 - 1800	0.5 (one person)	Bat Call Survey (All Night) Spotlighting Anabat survey	1/8 cloud, Calm, max 15°C.
Friday 10/07/15	0800 - 0815	0.25	Anabat retrieval Incidental observations.	8/8 cloud, NW 2, max 7°C.
Tuesday 14/07/15	1300 – 1600	7.0 1.0 (two persons)	Habitat tree survey Reptile survey Incidental observations Anabat survey	0/8 cloud, NW 28, max 15°C
Wednesday 15/07/15	0745 - 0845	1.0 (one person)	Anabat retrieval Habitat tree survey Incidental observations	0/8 cloud, Calm, max 9°C
Monday 20/07/2015	0900 - 1300	12.0 (three persons)	Site inspection Trap deployment Incidental observations.	1/8 cloud, Calm, 13°C
Tuesday 21/07/15	0630 – 0900	2.5 (one person)	Checking Traps Incidental observations	8/8 Fog, Calm, 7°C
Wednesday 22/07/2015	0630 – 0830	2.0 (one person)	Checking Traps	6/8 cloud, Calm, 7°C

DATE	TIME (24HR)	SURVEY EFFORT (PERSON HOURS)	ACTIVITY	WEATHER
			Incidental observations	
Thursday 23/07/15	0630 – 0830	2.0 (one person)	Checking Traps Incidental observations	8/8 cloud, Calm, 10°C
Friday 24/07/15	0630 – 1100	9.0 (two persons)	Checking Traps Trap retrieval Incidental observations	8/8 cloud, Calm, slight drizzle, 12°C
Thursday 30/07/15	1200 – 1545	7.5 (two persons)	Vegetation Transects Vegetation Quadrat Incidental Observations	0/8 cloud, light wind, 20°C
	1545 – 1615	1.0 (two persons)	Reptile Survey	
	1615 – 1630	0.5 (two persons)	Amphibian Survey	
	1630- 1700	1.0 (two persons)	Avifauna Survey	
	1700 – 1730	1.0 (two persons)	Stag Watching Survey	
	1730 – 2000	5.0 (two persons)	Spotlighting Survey Harp Trapping Survey Anabat Detection Call Playback Survey	7/8 moon, light wind, 15°C

DATE	TIME (24HR)	SURVEY EFFORT (PERSON HOURS)	ACTIVITY	WEATHER
Wednesday 05/08/15	1515 – 1630		Vegetation Quadrats	1/8 cloud, NW 35, 15°C
			Incidental Observations	
			Reptile Survey	
			Amphibian Survey	
	1630-1700	1.0 (two persons)	Avifauna Survey	
	1700-1730	1.0 (two persons)	Stag Watching Survey	
	1730-1830	2.0 (two persons)	Spotlighting Survey	1/8 moon, Calm, 8°C
			Anabat Detection	

3.5 SIGNIFICANT SPECIES

The following significant species have been recorded on the Office of Environment and Heritage (OEH) Database within 10km of the site (Table 2). Species marked with an asterisk (*) have not been recorded within 10km of the site but are considered to have potential habitat available within 10km according to the Department of the Environment (DoE) database.

Table 2: Threatened Species Considered.

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
FLORA			
**Cryptostylis hunteriana*	Leafless Tongue Orchid	V	V
Tetratheca juncea	Black-eyed Susan	V	V
**Acacia bynoeana*	Bynoe's Wattle	E1	V
**Grevillea parviflora* subsp. *parviflora*	Small Flowered Grevillea	V	V
**Eucalyptus glaucina*	Slaty Red Gum	V	V
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum	V	V
**Melaleuca biconvexa*	Biconvex Paperbark	V	V
Syzygium paniculatum	Magenta Lillypilly	E1	V
**Pterostylis gibbosa*	Illawarra Greenhood	E1	E
**Euphrasia arguta*		E4A	CE
**Asterolasia elegans*		E1	E
Rutidosis heterogama	Heath Wrinklewort	V	V
**Streblus pendulinus*	Siah's Backbone		E
**Thesium australe*	Austral Toadflax	V	V
FAUNA			
Amphibians			
Litoria aurea	Green and Golden Bell Frog	E1	V
Litoria littlejohni	Littlejohn's Tree Frog	V	V
**Mixophyes balbus*	Stuttering Frog	E1	V
Birds			
Oxyura australis	Blue-billed Duck	V	
**Botaurus poiciloptilus*	Australasian Bittern	E1	E
Rostratula australis	Australian Painted Snipe	E1	E
Ephippiorhynchus asiaticus	Black-necked Stork	E1	
**Dasyornis brachypterus*	Eastern Bristlebird	E1	E
Callocephalon fimbriatum	Gang Gang Cockatoo	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	
Lathamus discolor	Swift Parrot	E1	E
Neophema pulchella	Turquoise Parrot	V	
Glossopsitta pusilla	Little Lorikeet	V	
**Anthochaera phrygia*	Regent Honeyeater	E4A	E
Daphoenositta chrysoptera	Varied Sittella	V	
Melithreptus gularis gularis	Black-chinned Honeyeater	V	
Pomatostomus temporalis subsp. *temporalis*	Grey-crowned Babbler	V	
Climacteris picumnus victoriae	Brown Treecreeper	V	
Hieraaetus morphnoides	Little Eagle	V	
Ninox connivens	Barking Owl	V	
Ninox strenua	Powerful Owl	V	
Tyto novaehollandiae	Masked Owl	V	
Tyto tenebricosa	Sooty Owl	V	
Migratory Birds			
**Apus pacificus*	Fork-tailed Swift		M
**Ardea alba*	Great Egret		M
**Ardea ibis*	Cattle Egret		M
**Gallinago hardwickii*	Latham's Snipe		M
**Rostratula benghalensis (sensu lato)*	Painted Snipe		M

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
**Haliaeetus leucogaster*	White-bellied Sea-Eagle		M
**Arenaria interpres*	Ruddy Turnstone		M
**Calidris canutus*	Red Knot		M
**Calidris tenuirostris*	Great Knot	V	M
**Limosa lapponica*	Bar-tailed Godwit	V	M
**Limosa limosa*	Black-tailed Godwit	V	M
**Calidris accuminata*	Sharp-tailed Sandpiper		M
**Calidris ferruginea*	Curlew Sandpiper	E1	CE, M
**Calidris melanotos*	Pectoral Sandpiper		M
**Calidris ruficollis*	Red-necked Stint		M
**Limicola falcinellus*	Broad-billed Sandpiper	V	M
**Actitis hypoleucos*	Common Sandpiper		M
**Xenus cinereus*	Terek Sandpiper	V	M
**Numenius madagascariensis*	Eastern Curlew		M
**Numenius phaeopus*	Whimbrel		M
**Tringa stagnatilis*	Marsh Sandpiper		M
**Philomachus pugnax*	Ruff (Reeve)		M
**Charadrius bicinctus*	Double-banded Plover		M
**Charadrius leschenaultii*	Greater Sand Plover	V	M
**Charadrius mongolus*	Lesser Sand Plover	V	M
**Pluvialis fulva*	Pacific Golden Plover		M
**Pluvialis squatarola*	Grey Plover		M
**Heteroscelus brevipes*	Grey-tailed Tattler		M
**Hirundapus caudacutus*	White-throated Needletail		M
**Pandion cristatus*	Eastern Osprey	V	M
**Merops ornatus*	Rainbow Bee-eater		M
**Monarcha melanopsis*	Black-faced Monarch		M
**Monarcha trivirgatus*	Spectacled Monarch		M
**Myiagra cyanoleuca*	Satin Flycatcher		M
**Rhipidura rufifrons*	Rufous Fantail		M
Mammals			
Dasyurus maculatus maculatus	Tiger Quoll	V	E
Phascogale tapoatafa	Brush-tailed Phascogale	V	
Phascolarctos cinereus	Koala	V	V
Petaurus norfolcensis	Squirrel Glider	V	
**Potorous tridactylus tridactylus*	Long-nosed Potoroo	V	V
**Petrogale penicillata*	Brush-tailed Rock-wallaby	E1	V
**Pseudomys novaehollandiae*	New Holland Mouse		V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	
Miniopterus australis	Little Bentwing-bat	V	
Miniopterus schreibersii oceanensis	Large Bentwing-bat	V	
Myotis macropus	Southern Myotis	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	
Vespadelus troughtoni	Eastern Cave Bat	V	
**Chalinolobus dwyeri*	Large-eared Pied Bat	V	V
Endangered Populations (E2)			
Cymbidium canaliculatum population in the Hunter Catchment		E2	
Wetlands of National Importance (RAMSAR)			
Hunter estuary wetlands		Ramsar	Ramsar
Endangered Ecological Communities (EEC)			
Lower Hunter Spotted Gum Ironbark Forest			
Hunter Lowland Redgum Woodland			
^Central Hunter Valley Eucalypt Forest and Woodland			

Scientific Name	Common Name	TSC Act 1995	EPBC Act 1999
*White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland			

E1, E=Endangered Species V=Vulnerable Species E4A, CE=Critically Endangered M=Migratory Species

4.0 RESULTS

4.1 FLORA ASSEMBLAGES

The Pre 1750 vegetation map produced for the for the Lower Hunter Central Coast Regional Environment Management Strategy (2003) shows the 26.73ha site was most likely dominated by Lower Hunter Spotted Gum – Ironbark Forest on the higher ground in the east and Tall Alluvial Moist Forest on the lower ground in the west. Fieldwork found a large portion of the Lower Hunter Spotted Gum – Ironbark Forest to be present however due to past clearing and agricultural practices there was no evidence of Tall Alluvial Moist Forest present on site. This area had primarily been replaced by cleared pasture with clumped remnant trees and a disturbed wetland assemblage within the drainage line. A total of four vegetation communities were delineated within the site:

- Lower Hunter Spotted Gum – Ironbark Forest (12.08ha).
- Cleared Open Pasture with scattered remnant trees (11.84)
- Freshwater Drainage Line Vegetation (2.14ha)
- Freshwater Dam Vegetation (0.03ha)

A general description of the flora assemblage identified on site is given below. A full list of the flora species recorded during fieldwork is listed in Appendix B. The results of the transect surveys and plot surveys are given in Appendix C. The distribution of the vegetation communities has been indicated in Figure 5*.

*Note on Vegetation Community Distribution Map. A map of vegetation of any area seeks to describe the distribution of the plant species in that area by defining a number of vegetation units (assemblages or communities), which are relatively internally homogenous. Whilst such mapping is a convenient tool, it greatly oversimplifies the real situation. Plants rarely occur in defined communities with distinct boundaries. Accordingly vegetation units used for the accompanying map should be viewed as indicative of their extent rather than being precise edges of communities.

Lower Hunter Spotted Gum – Ironbark Forest

Approximately 12.08ha of Dry Sclerophyll Open Forest occurring on the higher ground within the eastern portion of the site was found to be was found to be most consistent with Map Unit 17 Lower Hunter Spotted Gum – Ironbark Forest as described within the 'Vegetation Survey, Classification and Mapping, Lower Hunter and Central Coast Region' (NPWS, 2000). This area was found to be in generally good condition (Figure 6) despite disturbances such as past vegetation clearance, weed infestation and ongoing grazing by cattle. The eastern periphery of the assemblage and two outlying isolated areas were also affected by edge effects resulting in an increase in introduced grass species such as *Pennisetum clandestinum* (Kikuyu Grass) within the understorey (Figure 7).

The canopy was dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Eucalyptus crebra* (Narrow-leaved Ironbark) (Figure 8). Other canopy species noted included *Eucalyptus punctata* (Grey Gum) *and Eucalyptus tereticornis* (Forest Red Gum). The mid storey primarily consisted of juvenile canopy species particularly *C. maculata*. *Bursaria spinulosa* (Blackthorn) and *Daviesia ulicifolia* were the most common component of the shrub layer.

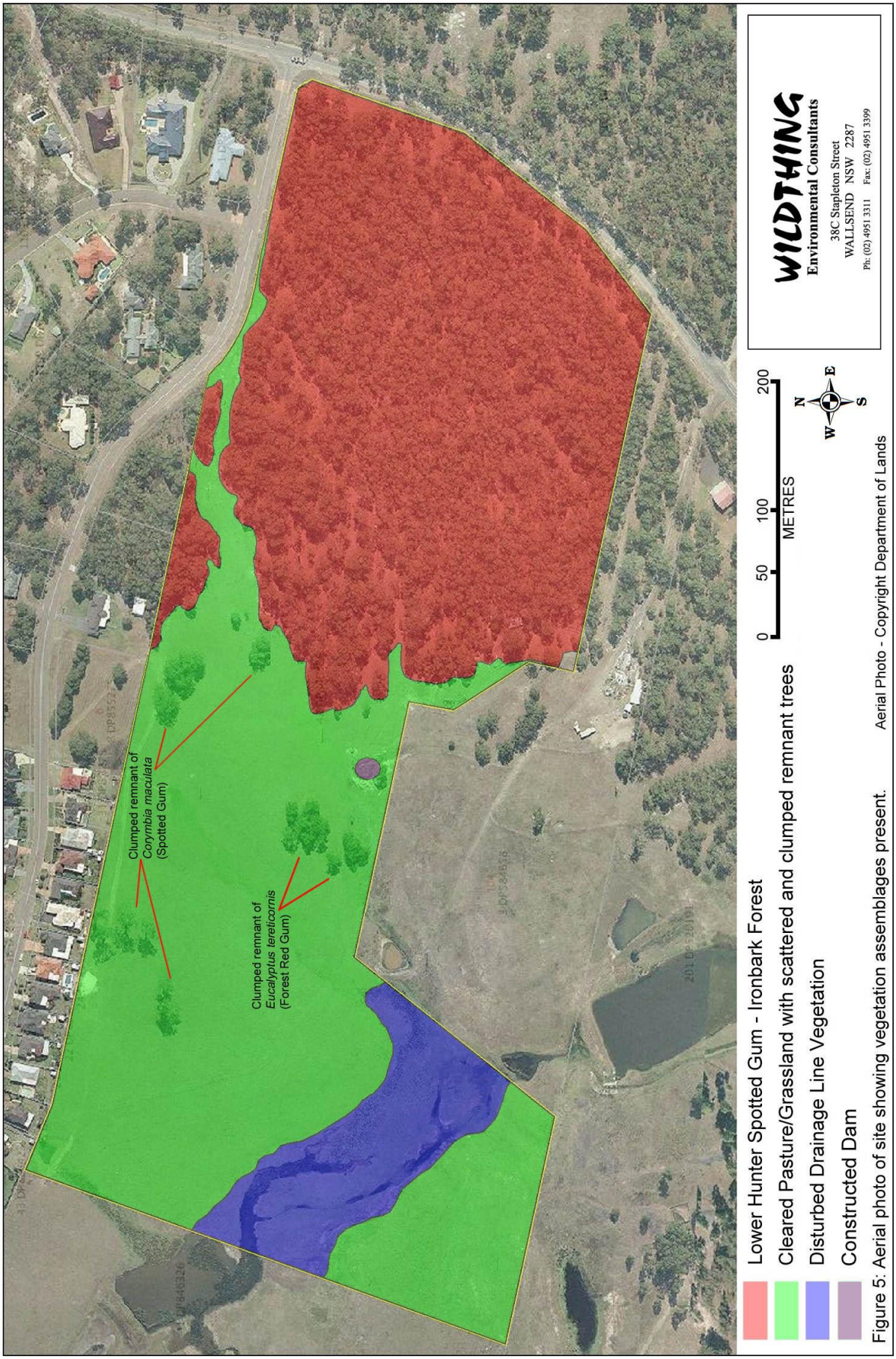

Figure 5: Aerial photo of site showing vegetation assemblages present.

Infestations of the weed species *Lantana camara* (Lantana) were also quite common throughout this assemblage (Figure 9). Other native shrub species noted included *Breynia oblongifolia* (Breynia) and *Leucopogon juniperinus* (Bearded Heath). The ground cover was composed of native grasses such as *Entolasia stricta*, *Microlaena stipoides* (Weeping Grass), *Aristida vagans* (Three-awn Speargrass) and *Themeda australis* (Kangaroo Grass). Other groundcovers included *Pratia purpurascens* (White Root), *Goodenia rotundifolia* and *Cheilanthes sieberi* (Mulga Fern).

Similar Vegetation Types:

Biometric No. & Type	(HU629) Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin
Peake (2006)	MU26 Lower Hunter Spotted Gum – Ironbark Forest
Hill (2003)	MU7 Lower Hunter Spotted Gum Ironbark Forest
NPWS (2000)	MU17 Lower Hunter Spotted Gum – Ironbark Forest

Structure

Stratum	**Height Range**	**Canopy Cover**
Canopy	10 - 30m	65%
Midstory	5 – 10m	10%
Shrub Layer	1 – 1.5m	20%
Ground	<1m	30%

Species Composition:

Canopy: (<30m) – *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Broad-leaved Ironbark), *Eucalyptus punctata* (Grey Gum), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark).

Midstory (5-10m) – Juvenile *Corymbia maculata* (Spotted Gum).

Shrub Layer: (<1-2m) – *Bursaria spinosa* (Blackthorn), *Leucopogon juniperinus* (Bearded Heath), *Acacia elongata*, **Lantana camara* (Lantana).

Ground Layer: (<1m) – *Entolasia stricta*, *Microlaena stipoides* (Weeping Grass), *Aristida vagans* (Three-awn Speargrass), *Cymbopogon refractus* (Barbed-Wire Grass), *Themeda australis* (Kangaroo Grass), *Pratia purpurascens* (White Root), *Goodenia rotundifolia*, *Cheilanthes sieberi* subsp. *sieberi* (Mulga Fern).

Figure 6: Lower Hunter Spotted Gum – Ironbark forest in far south-east of site.

Figure 7: Lower Hunter Spotted Gum – Ironbark forest in far south-west of remnant.

Figure 8: Edge effects within outlying isolated area of Lower Hunter Spotted Gum – Ironbark forest.

Figure 9: Lower Hunter Spotted Gum – Ironbark forest showing infestation of Lantana.

Open Pasture/Grassland with scattered remnant trees

Cleared pasture constituted the majority of the western portion of the site and was primarily composed of grasses and low introduced herbaceous species (Figure 10). Common grass species noted included introduced species such as *Pennisetum clandestinum* (Kikuyu) and *Sporobolus africanus* (Parramatta Grass). Native grasses included *Cymbopogon refractus* (Barbed-Wire Grass) and *Cynodon dactylon* (Common Couch). Herbaceous species noted included the introduced *Plantago lanceolata* (Plantain) and *Senecio madagascariensis* (Fireweed). A small number of scattered and clumped remnant trees were present within the pasture (Figure 11). The largest clump was dominated by *Eucalyptus tereticornis* (Forest Red Gum) (Figure 12). Other scattered trees were generally *C. maculata*.

Freshwater Drainage Line Vegetation

Vegetation adapted to wetter conditions was present within the drainage line in the far west of the site (Figure 13). This assemblage had been highly modified by activities such as historical vegetation clearance, historical coal mining activity, grazing and trampling by cattle, recent flooding, sedimentation and weed infestation. The drainage line was also found to be affected by relatively high salinity (Salinity 4.2ppt indicating a brackish environment), which was evidenced by a thin white salt crust in low dry areas (Figure 14). Flora species present where generally those adapted to increased salt levels and included common species such as *Schoenoplectus validus* (River Club Rush) and *Bolboschoenus caldwellii* (Sea Clubrush) (Figure 15). Introduced flora species recorded within the drainage line included *Juncus acutus* (Tall Spike Rush) (Figure 16).

Similar Vegetation Types:

Biometric No. & Type	(HU532) Coastal floodplain sedgelands, rushlands, and forblands of the North Coast
Hill (2003)	MU13 Freshwater Wetland Complex
NPWS (2000)	MU46 Freshwater Wetland Complex

Structure

Stratum	**Height Range**	**Canopy Cover**
Ground	<1m	20%

Species Composition:
Layer: (<1.2m) – *Schoenoplectus validus* (River Club Rush), *Paspalum distichum* (Water Couch), *Bolboschoenus caldwellii* (Sea Clubrush), *Juncus usitatus* (Common Rush) and *Juncus acutus* (Tall Spike Rush).

Freshwater Aquatic Vegetation (Constructed Dam)

One constructed dam was present within the site. Aquatic species noted included *Typha orientalis* (Cumbungi), *Azolla pinnata* (Ferny Azolla), *Ludwigia peploides* (Water Primrose) and *Juncus usitatus* (Common Rush) (Figure 15).

Figure 10: Pasture/Grassland in west of site.

Figure 11: Cleared Pasture/Grassland with remnant trees.

Figure 12: Pasture/Grassland with remnant clump of *Eucalyptus tereticornis* (Forest Red Gum).

Figure 13: Vegetation contained within drainage line.

Figure 14: *Bolboschoenus caldwellii* and salt crust within drainage line.

Figure 15: *Juncus acutus* (Tall Spike Rush) within the drainage line.

Figure 16: Vegetation present within the constructed dam.

4.1.1 ENDANGERED AND LOCALLY SIGNIFICANT ECOLOGICAL COMMUNITIES

Five vegetation communities mapped in the local area are currently listed as Endangered Ecological Communities on the NSW Threatened Species Conservation Act 1995. These include:

- Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion.
- Hunter Lowlands Redgum Forest in the Sydney Basin Bioregion
- River Flat Eucalypt Forest on Coastal Floodplains;
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast
- Kurri Sand Swamp Woodland in the Sydney Basin Bioregion

Based on the vegetation assessment, Lower Hunter Spotted Gum – Ironbark Forest was confirmed to be present in the east of the site. One very small clump of remnant trees in the centre of the site could be identified as Hunter Lowlands Red Gum Forest as it was comprised of *Eucalyptus tereticornis* (Forest Red Gum). The disturbed drainage line vegetation in the west of the site could also be a modified version of Freshwater Wetlands on Coastal Floodplains. No other vegetation communities were considered to be present within the site.

Forest occupying approximately 12.08ha of the eastern portion of the site was found to be consistent with the Endangered Ecological Community Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion. The Lower Hunter Spotted Gum – Ironbark Forest assemblage on site was

found to be relatively intact, although this assemblage had been subject to disturbance in the form of past tree removal, weed incursion, historical coal mining activity and grazing by cattle. The level of weed incursion was moderate in areas with *Lantana camara* (Lantana) the most invasive species. The western periphery of the assemblage was also affected by edge effects resulting in an increase in introduced grass species such as *Pennisetum clandestinum* (Kikuyu Grass) within the understorey. Smaller fragments of this community were present in the north of the site along with isolated paddock trees such as *Corymbia maculata* (Spotted Gum). This would result in the removal of up to 11.33ha Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees.

The remnant clump of specimens of *E. tereticornis* approximately 0.18 hectares in size and consisting of about 18 trees could be considered to be a highly disturbed remnant of Hunter Lowlands Red Gum Forest (Figure 11). The remnant surrounded by pasture was only composed of canopy trees and an understorey of pasture species. These remnant trees will be removed as part of the development. The loss of this remnant would result in a small incremental reduction of this community in the local area. However taking into account the degree of isolation of this highly altered small remnant the removal would not be considered to be significant.

The vegetation occurring within the drainage line in the west of the site although highly disturbed could be considered to constitute the Endangered Ecological Community Freshwater Wetlands on Coastal Floodplains. This assemblage had been highly modified by activities such as historical vegetation clearance, grazing, historical coal mining activity, changes to the flood regime, sedimentation and weed infestation. The drainage line was also found to be affected by relatively high salinity. The proposed subdivision will not extend into this assemblage as it occurs well below the 1 in 100 year flood level.

The impact of the proposal on this Endangered Ecological Communities is assessed in Section 5 and Appendix A of this report.

4.1.2 THREATENED PLANT SPECIES

Field surveys identified approximately 153 plant species occurring within the study site. Fourteen threatened and rare plant species were recorded within 10km of the site on the OEH Wildlife Atlas and DoE databases (Table 3). Eleven of these plants are listed as Rare or Threatened Australian Plants (ROTAP) (Briggs and Leigh, 1996).

Table 3: Threatened and Rare Flora species recorded within the locality.

FLORA SPECIES	TSC	EPBC	ROTAP
Cryptostylis hunteriana (Leafless Tongue Orchid)	V	V	3VC-
Tetratheca juncea (Black-eyed Susan)	V	V	3VCa
Acacia bynoeana (Bynoe's Wattle)	E1	V	3VC-
Grevillea parviflora subsp. *parviflora* (Small-flowered Grevillea)	V	V	
Eucalyptus glaucina (Slaty Red Gum)	V	V	3VCa

FLORA SPECIES	TSC	EPBC	ROTAP
Eucalyptus parramattensis subsp. *decadens* (Earp's Gum)	V	V	2V
Melaleuca biconvexa (Biconvex Paperbark)	V	V	
Syzygium paniculatum (Magenta Lillypilly)	E1	V	3VCi
Pterostylis gibbosa (Illawarra Greenhood)	E1	E	2E (Recom. 3E)
Euphrasia arguta	E4A	CE	3X
Asterolasia elegans	E1	E	2ECa
Rutidosis heterogama (Heath Wrinklewort)	V	V	2VCa
Streblus pendulinus (Siah's Backbone)		E	
Thesium australe (Austral Toadflax)	V	V	3VCi

Threatened Species Conservation Act 1995 (TSC Act)
V Vulnerable **E1** Endangered **E2** Endangered Population
E4A Critically Endangered Population
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
V Vulnerable **E** Endangered **CE** Critically Endangered
ROTAP (Rare or Threatened Australian Plants) Distribution
1. – Known from only one collection
2. – Geographic range in Australia less than 100km
3. – Geographic range in Australia greater than 100km.
+ – Also occurs overseas.

None of the aforementioned threatened flora species were found within the subject site during fieldwork. Suitable habitat of varying quality was considered present for five of these species, which included *Grevillea parvifolia* subsp. *parviflora, Eucalyptus glaucina* and *Rutidosis heterogama*. Suitable habitat for all other species was considered unlikely. A species-specific habitat assessment for the addressed threatened flora species has been provided in Section 4.2.4 of this report.

No ROTAP species were recorded during fieldwork.

4.1.3 LOCALLY AND REGIONALLY SIGNIFICANT PLANT SPECIES

A list of Regionally Significant Plant species, populations and vegetation communities for the Hunter Catchment which includes the Maitland City LGA has been established by the Hunter Rare Plants Committee of the Hunter Regional Botanic Gardens (Bell et. al., 2003). A number of regionally significant flora species other than those listed as threatened or considered to be rare were recorded on site (Table 4).

Table 4: Regionally significant flora species recorded within the locality

REGIONALLY SIGNIFICANT SPECIES	REGIONAL SIGNIFICANCE
Acacia falcata (Falcate Wattle)	W
Acacia parvipinnula (Silver-stemmed Wattle)	WN
Goodenia rotundifolia	S
Backhousia myrtlfolia (Grey Myrtle)	W
Corymbia maculata (Spotted Gum)	W
Eucalyptus punctata (Grey Gum)	W
Alphitonia excels (Red Ash)	S?
Acronychia oblongifolia	W
#Clerodendrum tomentosum (Hairy Clerodendrum)	W
Carex longebrachiata	W
#Lomandra glauca (Pale Mat-rush)	N
Eustrephus latifolius (Wombat Berry)	W
Caladenia catenata (White Fingers)	W

REGIONALLY SIGNIFICANT SPECIES	REGIONAL SIGNIFICANCE
Dianella caerulea var. *caerulea* (Blue Flax-lily)	W
#Anisopogon avenaceus (Oat Speargrass)	N
Aristida ramosa (Purple Wiregrass)	W?
#Imperata cylindrica var. *major* (Blady Grass)	W?

#Species only found in 2009 study (Wildthing Environmental Consultants, 2009)

Regional Significance (Hunter Rare Plants Database – Version 1 2003)

L	endemic to Hunter Region	**N**	at northern distributional limit in the Hunter
DA	disjunct in the Hunter Region, rare or localized (aggregated)	**U**	everywhere uncommon
		E	at eastern distributional limit in the Hunter
DB	disjunct in the Hunter Region, widespread and uncommon (broad)	**S**	at southern distributional limited in the Hunter
		W	at western distributional limited in the Hunter
R	rare but extends beyond the Hunter Region	**T**	may be threatened in the Hunter Region
S	Probably secure in the Hunter Region		

4.1.4 NOXIOUS WEEDS AND WEEDS OF STATE AND NATIONAL SIGNIFICANCE

A number noxious weed species were found to be present within the site and are listed below in Table 5. The site lies within the Maitland City Council Noxious Plants Advisory Committee.

Table 5: Noxious Weed species found on site.

WEED SPECIES	WEED CLASS MAITLAND CITY COUNCIL	ADDITIONAL SIGNIFICANCE
Lantana camara (Lantana)		N & T
Opuntia stricta var. *stricta* (Prickly Pear)	Class 4	N
Olea europaea subsp. *Cuspidate* (African Olive)		T
Senecio madagascariensis (Fireweed)	Class 4	N
Bryophyllum delagoense (Mother-of-millions)	Class 3	

N – Weed of National Significance (Listed in the Commonwealth Government's National Weeds Strategy 1997)

T – Listed as a Threatening Process under the NSW TSC Act 1995.

***Control Classes under the Noxious Weeds Act 1993.**

Class 1 & 2	This plant must be eradicated from the land and the land must be kept free of this plant.
Class 3	This plant must be fully and continuously suppressed and destroyed.
Class 4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the LCA. Must also, 'not be sold, propagated or knowingly distributed'.
Class 5	The requirements of the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

It is recommended that weed control be included within any works within the site to control weeds particularly the infestations of Lantana.

4.2 HABITAT APPRAISAL

4.2.1 HABITAT DESCRIPTION AND DISTRIBUTION IN THE VICINITY

The vegetation and landforms present within the study area offered habitat for a variety of native species. Based on the vegetation communities delineated in Section 4.1, four broad habitat categories, Dry Sclerophyll Forest, Open Grassland, Wetland/Aquatic were identified within the site and constructed dam.

Dry Sclerophyll Forest

Dry Sclerophyll Forest present within the eastern portion of the site covered approximately 12.08ha. The canopy was composed of a number of myrtaceous species such as *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Broad-leaved Ironbark), which provide blossom for nectivorous species (i.e. Gliders, Possums, Flying-foxes, Honeyeaters and Lorikeets). These tree species also provide a foraging resource for insectivorous species such as Thornbills and Fantails. Nesting opportunities are provided throughout the forest for bird species that nest in tree hollows and those which construct nests on branches. A number of hollow-bearing trees would provide some potential nesting and roosting sites for a variety of avifauna and other hollow dependant species such as arboreal marsupials and tree-roosting bats. Where possible, it is recommended that hollow-bearing trees be retained. Additionally any removal of hollow-bearing trees from the site will be required to be supervised by a suitably qualified, vaccinated and experienced fauna ecologist. Hunting opportunities exist for birds of prey, given that the variable tree coverage and understorey vegetation has created a myriad of ecotones and habitat densities. Such habitat is suitable for terrestrial species including small and medium sized mammals, macropods, reptiles and potentially for some frog species adapted to such areas. The Koala Feed Tree species *Eucalyptus tereticornis* (Forest Red Gum) listed under State Environmental Planning Policy 44 (SEPP 44) was present. This is discussed further in section 6.0.

The shrub layer, which was composed primarily of areas of dense stands of *Bursaria spinosa* (Blackthorn) and the weed *Lantana camara* (Lantana) provided refuge and nesting habitat for small bird species. Species such as *Acacia parvipinnula* would also provide a seasonal source of nectar for species such as gliders. It is recommended that all infestations of invasive weeds species, particularly *Lantana camara* (Lantana) and *Olea europaea* subsp. *cuspidate* (African Olive) are to be controlled within the site.

The generally grassy ground layer would give refuge to a number of reptile and small mammal species. Fallen timber and branches would also provide refuge for these species. It is recommended that fallen woody debris be retained where possible to provide essential habitat for foraging and camouflage for daytime roosts for native fauna. Although the area of Dry Sclerophyll Forest was in generally good condition this area had a considerable coverage of the weed *Lantana camara* (Lantana).

Grassland/Pasture with remnant trees

The Grassland/Pasture habitat, a result of past clearing and continued grazing was primarily composed of a mixture of native and introduced grasses. Such habitat provides opportunity for a variety of avifauna, including predominantly terrestrial species preferring open spaces, seed eating birds and several birds of prey, which may hunt over this area in search of potential prey species.

Macropods may also frequent such areas whilst grazing. Some species of bats may also forage over this cleared area for insects. However, the lack of vegetative cover often limits the value of such areas for many species, particularly some reptiles, small mammals and birds which are vulnerable to predation in open spaces.

Drainage Line/Aquatic Habitat

The Drainage Line Aquatic habitat was located in the far west of the site and was primarily composed of two highly disturbed drainage lines and surrounding swampy ground swampy ground containing sedges and other plants adapted to wetter conditions. Disturbances observed included past native vegetation removal and high salinity. The area had also been disturbed by trampling cattle and weed invasion. These areas would provide a suitable habitat resource for a variety of animals that are tolerant of, or prefer to utilise these areas, such as certain amphibians, reptiles, bats and birds (particularly wetland birds). Areas of surface water within the drainage lines would offer aquatic habitat for a variety of frogs, reptiles and provide a source of drinking water for native species such as macropods. Habitat would also be present for some species of fish such as eels. It is recommended that the vegetation community within the drainage that is synonymous with the ecologically endangered community Freshwater Wetlands on Coastal Floodplains of the NSW North Coast be retained, enhanced and maintained during and after the completion of the development. It is also recommended that the infestation of *Juncus acutus* (Tall Spike Rush) within the drainage line be removed.

Constructed Dam

The constructed dam within the site was found to provide suitable aquatic habitat for a range of waterbirds, frogs, other herpetofauna and fish species. These areas would also act as a water source for other native animals such as macropods and offer potential habitat for bats that prefer to hunt above or around water bodies.

4.2.2 HABITAT FRAGMENTATION & CORRIDORS

As a result of surrounding past agricultural, coal mining and residential development the area of Dry Sclerophyll Forest occurring within the site would likely form significant fragment of habitat (approximately 12ha) for a number of native species within the local landscape. This habitat fragment has a continuous link to a larger area of similar habitat to the south. This habitat linkage has been narrowed by the relatively recent construction of a Fire Station and Industrial shed to the immediate south. Similar habitat was also present to the east of the site over Mt Vincent Road to the north and east of the Council Waste Disposal Centre. The site also has tentative links to others areas of habitat such as Brooklyn Park next to Green Hills Shopping Centre. Links to northern habitat areas would be via the unformed vegetated Shamrock Hill Lane and remnant street trees to the north of the site along Mt Vincent Road.

As a result of the proposal only a native buffer of Dry Sclerophyll Forest will remain along Mt Vincent Road. This will result in a significant reduction of the habitat fragment occurring within the site and a decrease in the width of the corridor linking habitat to the east and south. This may have an impact on species such as the Threatened Squirrel Glider which has tentatively been recorded within the area. An aerial photo showing the location of surrounding habitat areas and their connectivity is shown in Figure 14.

4.2.3 SIGNIFICANT TREE SURVEY

A total of 97 habitat (hollow-bearing) trees were identified as a result of a significant tree survey within the site. A number of these habitat trees were considered to be significant as a result of their very large size, variety and number of hollows they contained. Most of the hollow-bearing trees were contained within the area of Lower Hunter Spotted Gum – Ironbark Forest in the east of the site. The proposal will require the removal of the majority of hollow-bearing trees from the site. Approximately 15 hollow-bearing trees will be retained within the vegetated buffer zone along Mt Vincent Road. The loss of up to 82 hollow-bearing trees would lead to a significant reduction of habitat for hollow dependent fauna species such as arboreal mammals, bird and microchiropteran bat species.

The removal of any hollow-bearing trees is to be supervised by a suitably qualified person to reduce the impact on any native fauna species which may be present. Details of each habitat tree including height, diameter at breast height (DBH), coordinates and fauna habitat attributes such as hollows are contained in Appendix D and the location of each habitat tree is shown in Figure D1.

4.2.2 HABITAT FOR SIGNIFICANT SPECIES

An assessment of habitat attributes on site has been undertaken for the threatened species listed in Section 3.5. The results of the assessment are displayed in Table 6. Those species identified in this assessment as having potential habitat available on site have been considered further under Section 5A of the EPA Act in Section 5.0 of this report. The description of the ecology of each species is contained in Appendix A.

Figure 17: Aerial photo showing habitat connectivity within the site and surrounding areas.

Table 6: Habitat Assessment for Significant Species

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
FLORA				
Cryptostylis hunteriana Leafless Tongue Orchid	TSC Act-V EPBC Act-V	This species is a saprophyte, which grows in small, localised colonies on flat plains close to the coast. This species has also been recorded in mountainous areas growing in moist depressions as well as in swampy habitats.	**Unlikely** - No habitat was considered to be present due to the lack of common vegetation associations and absence of local records.	No
Tetratheca juncea Black-eyed Susan	TSC Act-V EPBC Act-V	Heath and Dry Sclerophyll Forests on low nutrient soil with a dense understorey of grasses. Is most commonly found associated with species including, *Angophora costata* (Smooth-barked Apple), *Eucalyptus globoidea* (White Stringybark), *Corymbia gummifera* (Red Bloodwood) and *Acacia myrtifolia* (Myrtle Wattle).	**Unlikely** – No habitat was considered to be present within the site due to the lack of commonly associated species and the fact that this species has not been reported to occur within the Maitland City LGA (Hill, 2003).	**No**
Acacia bynoeana Bynoe's Wattle	TSC Act – E1 EPBC Act – V	Found in heath, woodland and dry sclerophyll forests on sandy soils. Commonly associated species include *Eucalyptus haemastoma* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood), *Angophora bakeri* and *Banksia spinulosa* (Hairpin Banksia).	**Unlikely** - Limited habitat was considered to be present within the area of Spotted Gum – Ironbark Forest.	No
Grevillea parviflora subsp. *parviflora* Small-flowered Grevillea	TSC Act-V EPBC Act-V	This species of Grevillea occurs in light clayey soils in woodlands. This species grows chiefly in south-western Sydney. Disjunct populations occur near Cessnock, Putty and Cooranbong (Fairley, 2004).	**Low** – Limited habitat was considered to be present within the area of Spotted Gum – Ironbark Forest. Habitat is marginalised by the lack of associated flora species and local records within the Maitland LGA.	**Yes**
Eucalyptus glaucina Slaty Red Gum	TSC Act-V EPBC Act-V	The Slaty Red Gum principally occurs in the Casino area in northern NSW and from Gloucester to Broke, in mid-northern NSW. It grows mostly on gentle slopes near drainage lines in alluvial and clayey soils, in open forest.	**Low** - Limited habitat was considered to be present within the west of the site. Any habitat on site also been marginalised by past disturbances.	**Yes**
Eucalyptus parramattensis subsp. *decadens* Earp's Gum	TSC Act - V EPBC Act – V ROTAP – 2V	Occurs in woodland on sandy soils in wet sites. In the Port Stephens area, the Drooping Red Gum occurs in open wet sclerophyll woodland on heavy, often waterlogged, inter-barrier depression soils.	**Unlikely** – No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	No

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
**Melaleuca biconvexa* Biconvex Paperbark	TSC Act – V EPBC Act-V	May occur in dense stands adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest.	**Unlikely** – Despite the occurrence of limited habitat in the east of the site this species is unlikely to be present due to the disturbance to this area and lack of local records.	No
Syzygium paniculatum Magenta Lillypilly	TSC Act-E1 EPBC Act-V	Occurs in coastal rainforests on sandy soils or stabilised coastal dunes from Jervis Bay to Bulahdelah in NSW.	**Unlikely -** No suitable habitat was considered to be present for this Lilly Pilly species.	No
Pterostylis gibbosa Illawarra Greenhood	TSC Act-E1 EPBC Act-E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). Occurs in open forest or woodland, on flat or gently sloping land with poor drainage. In the Hunter region, the species grows in open woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *E. tereticornis* (Forest Red Gum) and *Callitris endlicheri* (Black Cypress Pine).	**Unlikely** – Despite the occurrence of limited habitat in the east of the site this species is unlikely to be present due to the absence of vegetation associations and lack of local records.	No
Euphrasia arguta	TSC Act-E4A EPBC Act-CE	*Euphrasia arguta* has an annual habit and has been observed to die off over the winter months, with active growth and flowering occurring between January and April. Recorded from the Nundle area of the NSW north western slopes and tablelands near the Hastings River; and Barrington Tops.	**Unlikely** – No known local records of this species.	No
Asterolasia elegans	TSC Act-E1 EPBC Act-E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys. The canopy at known sites includes *Syncarpia glomulifera* subsp. *glomulifera* (Turpentine), *Angophora costata* (Smooth-barked Apple), *Eucalyptus piperita* (Sydney Peppermint), *Allocasuarina torulosa* (Forest Oak) and *Ceratopetalum gummiferum* (Christmas Bush).	**Unlikely** – No known associated species were present on site and no suitable habitat was considered to be present.	No
Rutidosis heterogama Wrinklewort	TSC Act – V EPBC Act – V	Dry sclerophyll forest and woodland, as well as heath, sand dunes and in disturbed areas such as roadsides. This species has been found on the Central Coast and Lower Hunter Valley, particularly around Cessnock.	**Low** - Limited habitat was considered to be present within the area of Spotted Gum – Ironbark Forest.	**Yes**
Streblus pendulinus Siah's Backbone	EPBC Act-E	Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800 m	**Unlikely** – No suitable habitat was considered present within the site due	**No.**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		above sea level. The species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest.	to a lack of rainforest habitat.	
Thesium australe Austral Toadflax	TSC Act-V EPBC Act-V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland or grassy woodland often found in damp sites in association with Kangaroo Grass (*Themeda australis*).	**Unlikely –** Marginal habitat was considered to be present within the site, however it is not known or predicted to occur within the location of the site.	No
FAUNA				
AMPHIBIANS				
Litoria aurea Green and Golden Bell Frog	TSC Act-E1 EPBC Act-E	This frog species inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. *L. aurea* is thought to be displaced from more established sites by other frog species thus explaining its existence on disturbed sites.	**Moderate -** Suitable habitat was considered to be present within the drainage lines in the west of the site.	**Yes**
Litoria littlejohni Littlejohn's Frog	TSC Act-V EPBC Act-V	Habitats include wet and dry sclerophyll forest, coastal woodland and heath. Associated characteristics include rocky streams and sandstone outcrops, semi-permanent dams and slow flowing streams. The water quality required for breeding is usually tannic (pH 6.2) and contains detritus, which is used as anchors for egg clusters.	**Unlikely -** No habitat was considered to be present due to the disturbance to the drainage line, lack of preferred water chemistry and lack of recent local records.	No
Mixophyes balbus Stuttering Frog	TSC Act-E1 EPBC Act-V	Occurs in wet forest regions of south-eastern Queensland, Eastern NSW and Victoria. In late spring, eggs are deposited among leaf litter on the banks of streams and subsequently are washed into the water during heavy rain.	**Unlikely -** No suitable habitat was available for this species due to the lack of wet forest, deep litter and rocky streams.	No
BIRDS				
Oxyura australis Blue-billed Duck	TSC Act-V	This duck is almost wholly aquatic, preferring deepwater in large permanent wetlands or dams where aquatic flora is abundant	**Low -** Marginal habitat was considered to be present within low lying wetland areas within the west of the site	**Yes**
Botaurus poiciloptilus Australasian Bittern	TSC Act-E1 EPBC Act-E	Favours permanent fresh-waters dominated by sedges, rushes, reeds or cutting grasses (eg. Phragmites, Scirpus, Eleocharis, Juncus, Typha, Baumea and Gahnia).	**Low - moderate** Habitat was considered to be present within low lying areas within the west of the site	**Yes**
Rostratula australis Australian Painted Snipe	TSC Act-E1 EPBC Act-E	Margins of swamps and streams, chiefly those covered with low and stunted vegetation.	**Moderate –** Suitable habitat was present for this species within the far west of the site.	**Yes**
Ephippiorhynchus asiaticus	TSC Act-E1	Inhabits swamps associated with river systems and large permanent	**Low**	**Yes**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
Black-necked Stork		pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	Only marginal habitat was considered to be present within the far west of the site.	
Dasyornis brachypterus Eastern Bristlebird	TSC Act-E1 EPBC Act-E	Habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey; in northern NSW occurs in open forest with tussocky grass understorey.	**Unlikely** There are no known local records of this species.	No
Callocepholon fimbriatum Gang Gang Cockatoo	TSC Act-V	Tall montane forests and woodlands in mature wet sclerophyll forests. Requires hollows in which to breed between October and January.	**Low – Moderate** – Suitable foraging and nesting habitat was present within the site.	**Yes**
Calyptorhynchus lathami Glossy Black Cockatoo	TSC Act-V	Lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering watercourses, with (Allo)Casuarina trees for foraging.	**Low –** Only a limited amount of foraging habitat in the form of a small number of *Allocasuarina littoralis* (Black Sheoak) specimens were present. Suitable nesting hollows were present.	**Yes**
Lathamus discolor Swift Parrot	TSC Act-E1 TSC Act-E	Open Forest to Woodland, also street trees and in parks and gardens, winter flowering eucalypts for feeding. This species nests in Tasmania during the summer months.	**Moderate** Foraging habitat was present within the area of Spotted Gum – Ironbark Forest. Preferred winter flowering foraging species such as *Corymbia maculata* (Spotted Gum) were present.	**Yes**
Lathamus discolour Turquoise Parrot	TSC Act - V	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	**Moderate** Foraging and suitable nesting habitat was present within the area of Spotted Gum – Ironbark Forest.	**Yes**
Glossopsitta pusilla Little Lorikeet	TSC Act-V	Tall Open Forests, woodlands, orchards, parks and street trees.	**Moderate** Foraging and suitable nesting habitat was present within the area of Spotted Gum – Ironbark Forest.	**Yes**
Anthochaera phrygia Regent Honeyeater	TSC Act-E4A EPBC Act-E	Temperate woodlands and open forest, including forest edges, preferring to forage on large-flowered Eucalypts.	**Low - Moderate** – Suitable foraging habitat was present in the form of flowering myrtaceous species particularly the winter flowering	**Yes**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
			Corymbia maculata (Spotted Gum).	
Daphoenositta chrysoptera Varied Sittella	TSC Act-V	Open eucalypt woodland/forest, mallee, inland acacia, coastal tea-tree scrubs, golf courses, orchards and parks.	**Moderate** - Suitable habitat was considered to be present within the area of Spotted Gum – Ironbark Forest.	**Yes**
Melithreptus gularis subsp. *gularis* Black-chinned Honeyeater	TSC Act-V	Usually found on the western side of the Great Dividing Range in dry sclerophyll forests and woodlands containing box-ironbark associations and River Red Gum. In the Hunter Valley this species is known to utilise drier coastal woodlands. Usually found in open woodlands.	**Low-moderate -** Suitable habitat was considered to be present within the area of Spotted Gum – Ironbark Forest. However the site would be nearing the eastern distribution of this species.	**Yes**
Pomatostomus temporalis subsp. *temporalis* Grey-crowned Babbler	TSC Act-V	Open forest, woodland, scrubland, farmland and outer suburbs. Prefers woodlands with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs.	**Moderate -** Suitable habitat was considered to be present within the area of Spotted Gum – Ironbark Forest.	**Yes**
Climacteris picumnus victoriae Brown Treecreeper	TSC Act-V	This species is a medium sized insectivorous bird that occupies Eucalypt woodlands, particularly open woodlands lacking a dense understorey, River Red Gums on watercourses and around lakeshores. It is sedentary and nests in tree hollows within permanent territories.	**Low – moderate-**This species was not recorded within the study area during fieldwork. Suitable habitat was considered to be present within the area of Spotted Gum – Ironbark Forest. However the site would be nearing the eastern distribution of this bird species.	**Yes**
Hieraaetus morphnoides Little Eagle	TSC Act - V	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.	**Low – moderate-**This species was not recorded within the study area during fieldwork. Suitable habitat was considered to be present within the area of Spotted Gum – Ironbark Forest.	**Yes**
Ninox connivens Barking Owl	TSC Act-V	This species is found in forest and woodland, encountered most commonly in savannah and paperbark woodlands. It sometimes roosts in rainforests, but it requires the more open country for hunting and hollow Eucalypts for breeding.	**Moderate** – Suitable hunting and limited roosting habitat was present within the site. A small amount of suitable nesting habitat was considered to be present.	**Yes**
Ninox strenua Powerful Owl	TSC Act-V	Inhabits a wide range of vegetation types from wet Eucalypt forests with a Rainforest understorey to Dry Open Forests and	**Moderate** – Suitable hunting and limited roosting habitat was present	**Yes**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		Woodlands. The species has been recorded utilising disturbed habitats such as exotic pine plantations and large trees in parks and gardens. Powerful Owls nest in a slight depression in the wood-mould on the base of a cavity in a large old tree, sometimes in excess of 25 metres above the ground.	within the site. A small amount of suitable nesting habitat was considered to be present.	
Tyto novaehollandiae Masked Owl	TSC Act-V	A range of wooded habitats that contain mature trees with large hollows for roosting and nesting, and more open areas for hunting.	**Moderate-High** – Suitable hunting habitat was present within the site. A small amount of suitable nesting habitat was considered to be present.	**Yes**
Tyto tenebricosa Sooty Owl	TSC Act - V	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	**Unlikely –** No suitable habitat was considered to be present with a lack of moist forest present on site.	
MIGRATORY BIRDS				
Apus pacificus Fork-tailed Swift	EPBC Act-M	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes.	**Unlikely-Low** – Only marginal habitat was considered to be present in the west of the site within the open farmland.	
Ardea alba Great Egret	EPBC Act-M	Inhabits shallows of rivers, larger dams, freshwater wetlands and irrigation areas.	**Moderate** – Suitable habitat was present on the western portion of the site.	
Ardea ibis Cattle Egret	EPBC Act-M	Inhabits stock paddocks, pastures, croplands, wetlands and drains.	**High** – Suitable habitat was present on the western portion of the site.	
Gallinago hardwickii Latham's Snipe	EPBC Act-M	Utilises a variety of habitat, such as soft wet ground or shallow water with tussock and other green and dead vegetation, and scrub or open wetland from sea-level to alpine bogs.	**Unlikely** – No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	
Rostratula benghalensis (sensu lato) Painted Snipe	EPBC Act-M	Found in margins of swamps and streams, chiefly those covered with low and stunted vegetation.	**Unlikely** – No suitable habitat was considered to be present with a lack of swamps and steam on site.	
Haliaeetus leucogaster White-bellied Sea-Eagle	EPBC Act-M	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania.	**Low –** Marginal habitat was considered to be present for this	

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		It also extends inland along some of the larger waterways, especially in eastern Australia. Considered to be a migratory species, however any movements are likely to be nomadic rather than migratory, in response to food availability.	species.	
Arenaria interpres Ruddy Turnstone	EPBC Act-M	The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year. In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral.	**Unlikely** – No suitable habitat was considered to be present with a lack of exposed rock coast lines or coral reefs present on site.	
Calidris canutus Red Knot	EPBC Act-M	The Red Knot is common in all the main suitable habitats around the coast of Australia. It is widespread along the coast south of Townsville and along the coasts of NSW and Victoria. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps.	**Unlikely** – No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	
Calidris tenuirostris Great Knot	TSC Act-V TSC Act-V EPBC Act-M	The Great Knot has been recorded around the entirety of the Australian coast, with a few scattered records inland. The species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	No
Limosa lapponica Bar-tailed Godwit	TSC Act-V EPBC Act-M	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	No

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		saltmarsh.		
Limosa limosa Black-tailed Godwit	TSC Act-V EPBC Act-M	Primarily coastal, including tidal mudflats, river edges, sandy beaches, brackish swamps as well as the shallows of lakes, reservoirs and sewage farms. However, this species also occurs inland on mudflats, muddy lakes and swamps at low tide.	**Unlikely** – No suitable habitat was considered to be present with a lack of mudflats, muddy lakes and swamps.	No
Calidris accuminata Sharp-tailed Sandpiper	EPBC Act-M	The Sharp-tailed Sandpiper spends the non-breeding season in Australia. The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	**Unlikely** – No suitable habitat was considered to be present.	
Calidris ferruginea Curlew Sandpiper	TSC Act-E1 EPBC Act-CE, M	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	**Unlikely** – No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	No
Calidris melanotos Pectoral Sandpiper	EPBC Act-M	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	**Unlikely** – No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	
Calidirs ruficollis Red-necked Stint	EPBC Act-M	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands.	**Unlikely** – No suitable habitat was considered to be present for this species. The site was also too far inland to provide suitable habitat for this species	
Limicola falcinellus Broad-billed Sandpiper	TSC Act-V EPBC Act-M	In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. Broad-billed Sandpipers favour sheltered parts of the coast such as	**Unlikely** – No suitable habitat was considered to be present within the site due to the lack of associated	No

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	waterlogged soils.	
Actitis hypoleucos Common Sandpiper	EPBC Act-M	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	**Unlikely** - No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	
Xenus cinereus Terek Sandpiper	TSC Act-V EPBC Act-M	Inhabits tidal mudflats, estuaries, shores and reefs, offshore islands and muddy edges of coastal swamps.	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	No
Numenius madagascariensis Eastern Curlew	EPBC Act-M	Within Australia, the Eastern Curlew has a primarily coastal distribution. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass.	**Unlikely** - No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	
Numenius phaeopus Whimbrel	EPBC Act-M	The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms.	**Unlikely** - No suitable habitat was considered to be present with a lack of mudflats, estuaries, beaches or rocky islets.	
Tringa stagnatilis Marsh Sandpiper	EPBC Act-M	It is recorded in all regions of NSW but especially the central and south coasts and (inland) on the western slopes of Great Divide and western plains. The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks.	**Unlikely** - No suitable habitat was considered to be present with a lack of estuarine habitat.	
Philomachus pugnax Ruff (Reeve)	EPBC Act-M	In Australia the Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. In NSW the species has	**Unlikely-Low** – Only marginal suitable habitat was considered to be present within the floodlands in the west of the site.	

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		been recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek.		
Charadrius bicinctus Double-banded Plover	EPBC Act-M	During the non-breeding season, it is common in eastern and southern Australia. The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers.	**Unlikely** - No suitable habitat was considered to be present within the site due to the lack of associated waterlogged soils.	
Charadrius leschenaultii Greater Sand Plover	TSC Act-V EPBC Act-M	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons.	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	No
Charadrius mongolus Lesser Sand Plover	TSC Act-V EPBC Act-M	Inhabits sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats.	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	No
Pluvialis fulva Pacific Golden Plover	EPBC Act-M	Most Pacific Golden Plovers occur along the east coast, and are especially widespread along the Queensland and NSW coastlines. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as *Sarcocornia*, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks. The species is also sometimes recorded on islands, sand and coral cays and exposed reefs and rocks.	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	
Pluvialis squatarola Grey Plover	EPBC Act-M	Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. During the non-breeding season, the species is found on the coast of Australia.	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	
Heteroscelus brevipes Grey-tailed Tattler	EPBC Act-M	In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake. It is more	**Unlikely** – No suitable habitat was considered to be present with a lack	

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
		heavily distributed along coastal regions north of Sydney. The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide.	of rocky platforms and intertidal mudflats.	
Hirundapus caudacutus White-throated Needletail	EPBC Act-M	Inhabits the airspace above forests, woodlands, farmlands, plains, lakes, coasts and towns.	**Low** – Marginal habitat was considered to be present for this species to be present in the airspace above the site.	
Pandion cristatus Eastern Osprey	TSC Act-V EPBC Act-M	Open and swamp forest adjacent to the coast or estuaries, fishing mainly in brackish or salt water.	**Unlikely** – No suitable habitat was considered to be present with a lack of estuarine habitat.	No
Merops ornatus Rainbow Bee-eater	EPBC Act-M	Inhabits areas such as open woodlands with sandy soils, sandridges, riverbanks, beaches, dunes, cliffs and rainforests.	**Unlikely** – No suitable habitat was considered to be present with a lack of sandy soils and rainforests.	
Monarcha melanopsis Black-faced Monarch	EPBC Act-M	Utilises a range of habitats including rainforests, eucalypt woodlands, coastal scrubs (Pizzey & Knight, 2001).	**Unlikely** – No suitable habitat was considered to be present.	
Monarcha trivirgatus Spectacled Monarch	EPBC Act-M	Wet forests, thickly wooded gullies, waterside vegetation and mangroves.	**Unlikely** – No suitable habitat was considered to be present with a lack of thickly wooded gullies and mangrove stands.	
Myiagra cyanoleuca Satin Flycatcher	EPBC Act-M	Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves, drier woodlands and open forests.	**Low** - Only marginal habitat that would be utilised during migration was considered to be present within the site.	
Rhipidura rufifrons Rufous Fantail	EPBC Act-M	Utilises a range of habitats including rainforests, wet sclerophyll forests, monsoon forests, scrubs, mangroves, watercourses, parks and gardens. During migration this species also utilises farms, street trees and buildings (Pizzey & Knight, 2001).	**Low** - Only marginal habitat that would be utilised during migration was considered to be present within the site.	
MAMMALS				
Dasyurus maculatus maculatus Tiger Quoll	TSC Act-V EPBC Act-E	Inhabits sclerophyll forests, rainforests and coastal woodlands. Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby.	**Low** - Only marginal habitat was considered to be present within the site as this species is usually found within higher quality remote habitat.	**Yes**
Phascogale tapoatafa Brush-tailed Phascogale	TSC Act-V	Sparsely distributed outside the semi-arid zone in dry sclerophyll forest and monsoonal forest and woodland.	**Moderate** - Suitable habitat was considered to be present for this	**Yes**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
			species within the area of spotted gum – Ironbark Forest.	
Phascolarctos cinereus Koala	TSC Act-V EPBC Act-V	Coastal woodland and open forest containing suitable food trees.	**Low -** With the occurrence of the Koala Feed Tree species, *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum) suitable habitat was considered to be present on site.	**Yes**
Petaurus norfolcensis Squirrel Glider	TSC Act-V	Dry sclerophyll forests and woodlands with exudates for foraging and hollows for nesting.	**Moderate - High -** Suitable foraging and nesting habitat was considered to be present within the areas of dry sclerophyll forest in the east of the site. This glider species is known to occur within the local area.	**Yes**
Potorous tridactylus tridactylus Long-nosed Potoroo	TSC Act-V EPBC Act-V	This species is known from a variety of habitats, including Rainforest, Open Forests and Woodlands with dense groundcover, and dense, wet coastal heathlands. Soft (often sandy) substrates are preferred by this species.	**Unlikely -** No habitat was considered to be present due to the lack of dense ground cover, disturbed nature of local area and lack of local records.	No
Petrogale penicillata Brush-tailed Rock-wallaby	TSC Act-E1 EPBC Act-V	Found in steep rocky sites in sclerophyll forests with a grassy understorey.	**Unlikely** – No suitable habitat was considered to be present with a lack of steep rocky terrain.	No
Pseudomys novaehollandiae New Holland Mouse	EPBC Act-V	Known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes.	**Unlikely** – No local records present for this species.	
Pteropus poliocephalus Grey-headed Flying-Fox	TSC Act-V EPBC Act-V	Wet and Dry Sclerophyll Forests, Rainforest, Mangroves and Paperbark swamps and Banksia Woodlands.	**High -** Suitable foraging habitat was present primarily within the area of Spotted Gum – Ironbark Forest and scattered remnant trees.	**Yes**
Mormopterus norfolkensis Eastern Freetail-bat	TSC Act-V	This species appears to live in Sclerophyll Forests and Woodland. Roosts in tree hollows or under loose bark.	**High –** species recorded on site. Suitable hunting and roosting habitat was present within the site.	**Yes**
Falsistrellus tasmaniensis Eastern False Pipistrelle	TSC Act-V	Inhabits sclerophyll forests and has been observed roosting in holes and hollow trunks of Eucalypts.	**High –** This species was previously recorded on site (Wildthing Environmental Consultants, 2009). Suitable hunting and roosting habitat was present within the site.	**Yes**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELYHOOD OF OCCURRENCE ON SITE	7-PART TEST REQUIRED
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	TSC Act-V	This microchiropteran bat species occupies a range of habitats including eucalypt forests, Mallee or open country. Roosts in tree hollows, animal burrows, dry clay cracks, under rock slabs and in abandoned Sugar Glider nests.	**Moderate** Suitable hunting and roosting habitat was present within the site.	**Yes**
Miniopterus australis Little Bentwing-bat	TSC Act-V	Tropical Rainforest to warm-temperate Wet and Dry Sclerophyll Forest; caves or similar structures for roosting.	**High - R**ecorded during survey. Suitable hunting habitat was present on site.	**Yes**
Miniopterus schreibersii oceanensis Large Bentwing-bat	TSC Act-V	Wet and Dry Tall Open Forest, Rainforest, Monsoon Forest, Open Woodland, Paperbark Forests and Open Grasslands; caves or similar structures for roosting. It occasionally uses tree hollows.	**High** –This species was previously recorded on site (Wildthing Environmental Consultants, 2009). Suitable hunting habitat was present.	**Yes**
Myotis Macropus Southern Myotis	TSC Act-V	Various habitats of the coast and adjacent ranges with suitable waterbodies for hunting; caves or similar structures for roosting. It occasionally uses tree hollows.	**Moderate** Suitable hunting habitat was present on over the waterbodies in the west of the site.	**Yes**
Scoteanax rueppellii Greater Broad-nosed Bat	TSC Act-V	Tree-lined creeks, woodland/clearing ecotones and rainforest creeks, roosting mainly in tree hollows.	**Moderate** Suitable hunting and roosting habitat was present within the site.	**Yes**
Vespadelus troughtoni Eastern Cave Bat	TSC Act-V	The Eastern Cave Bat roosts in caves and occurs in wet/dry sclerophyll forests to the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally buildings.	**Low** Suitable hunting habitat only was present on site.	**Yes**
Chalinolobus dwyeri Large-eared Pied Bat	TSC Act-V EPBC Act-V	This species has been found occupying Dry Sclerophyll Forest and Woodland. Roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels.	**Low -** Suitable hunting habitat only was present on site.	**Yes**

4.3 FAUNA APPRAISAL RESULTS

A full list of fauna species observed during the survey is contained in Appendix E.

4.3.1 SMALL TERRESTRIAL MAMMAL TRAPPING

During this component of the survey no species were captured. The previously trapping survey within the site captured one specimen of the introduced *Rattus rattus* (Black Rat) (Wildthing Environmental Consultants, 2009).

4.3.2 MEDIUM TERRESTRIAL MAMMAL TRAPPING

During this component of the survey no species were captured. The previously medium terrestrial trapping survey within the site captured two specimens of the introduced *Rattus rattus* (Black Rat)(Wildthing Environmental Consultants, 2009).

4.3.3 ARBOREAL MAMMAL TRAPPING

Two mammal species, *Petaurus breviceps* (Sugar Glider) and *Trichosurus vulpecula* (Common Brushtail Possum) were captured during the arboreal mammal trapping survey. Previous arboreal mammal trapping within the site (Wildthing Environmental Consultants, 2009) also recorded one specimen of *T. vulpecula*. The results of the arboreal mammal trapping survey are shown in Table 7.

Table 7: Arboreal Mammal Trapping Results.

DATE	TRAP NO	SPECIES	SEX
Trapping period 20 - 24 July 2015			
Tuesday 21/07/15	A19	*Petaurus breviceps* (Sugar Glider) Weight – 135g Tail Length – 185mm Body Length – 150mm	Male
Friday 24/07/15	A12	*P. breviceps* Weight – 92g Tail Length – 165mm Body Length – 160mm White-tipped tail	Female
Friday 24/07/15	A14	*Trichosurus vulpecula* (Common Brushtail Possum)	Female
Friday 24/07/15	A18	*P. breviceps* Weight – 112g Tail Length – 177mm Body Length – 148mm	Male

4.3.4 HARP TRAPPING

During the harp trapping component of the survey no microchiropteran bat species were captured. Previous harp trapping within the site (Wildthing Environmental Consultants, 2009) captured nine specimens of *Nyctophilus geoffroyi* (Lesser Long-eared Bat).

4.3.5 MICROCHIROPTERAN BAT CALL DETECTION

Four species, *Miniopterus australis* (Little Bentwing Bat), *Mormopterus* sp. 2 (Free-tailed Bat), *Chalinolobus gouldii* (Gould's Wattled Bat) and *Mormopterus norfolkensis* (Eastern Freetail Bat) were positively identified during the Bat Call Survey (Table 8). A number of calls were only able to be identified to genus level. *M. australis* and *M. norfolkensis* are listed as Vulnerable under TSC Act 1995 and have been further assessed in Section 5.0 of this report. Other calls were only identified to genus level, these being *Vespadelus* sp. and *Nyctophilus* sp. Calls attributed to the genus *Vespadelus* sp.1 were thought to be from either *V. pumilus* (Eastern Forest Bat), *V. troughtonii* (Eastern Cave Bat) or *V. vulturnus* (Little Forest Bat). Calls attributed to the genus *Vespadelus* sp.2 were thought to be from either *V. regulus* (Southern Forest Bat) and *V. darlingtoni* (Large Forest Bat). Calls attributed to the genus *Nyctophilus* sp. were thought to be from either from *N. gouldi* (Gould's Long-eared Bat) or *N. geoffroyi* (Lesser Long-eared Bat).

A previous bat call survey within the site also recorded *Falsistrellus tasmaniensis* (Eastern Falsistrelle), *Miniopterus schreibersii oceanensis* (Large Bentwing-bat), *C. gouldii, C. morio, M.* sp 2, *Vespadelus* sp. and *Nyctophilus* sp (Wildthing Environmental Consultants, 2009).

Miniopterus australis, Mormopterus norfolkensis, M. schreibersii oceanensis and *F. tasmaniensis* are listed as vulnerable under the TSC Act (1995) and as a consequence has been further assessed within Section 5 and Appendix A of the report. As *V. troughtoni* is also threatened the precautionary principle has been applied and further consideration has also been given to this species.

Table 8: Microchiropteran bat Anabat survey results.

DATE	SPECIES
Survey period 9, 14 and 30 July 2015	
Thursday 09/07/15	*Vespadelus* sp.1 *Nyctophilus* sp. *Miniopterus australis* *Mormopterus* sp. 2 *Vespadelus* sp.2
Tuesday 14/07/15	*Vespadelus* sp.1 *Miniopterus australis*
Thursday 30/07/15	*Chalinolobus gouldii* *Nyctophilus* sp.
Wednesday 05/08/15	*Mormopterus norfolkensis* *Vespadelus* sp.1 *Chalinolobus gouldii*

4.3.6 AMPHIBIAN SURVEY

Three frog species, *Crinia signifera* (Common Eastern Froglet), *Limnodynastes peronii* (Striped Marsh Frog) and *Litoria fallax* (Dwarf Tree Frog) were recorded on site during the survey. *C. signifera* was heard calling from the dam, *L. fallax* was observed close to the dam and *L. peronii* was

observed in the grassland. A previous amphibian surveys within the site (Wildthing Environmental Consultants, 2009) also recorded the additional species *Litoria verreauxii* (Verreaux's Tree Frog).

None of these species are listed as threatened under state or national legislation.

4.3.7 REPTILE SURVEY

One species of reptile *Lampropholis delicata* (Grass Skink) was identified on site during the survey. Additional reptiles previously recorded within the site included *Varanus varius* (Lace Monitor), *Carlia tetradactyla* (Southern Rainbow Skink) and *Pogona barbata* (Common Bearded Dragon)(Wildthing Environmental Consultant, 2009).

These reptile species are not listed as threatened under state or national legislation.

4.3.8 DIURNAL AVIFAUNA SURVEY

A number of avifauna species were found to be present across the various habitats of the site. Common birds recorded within the area of Open Forest in the east of the site at the time of the survey were *Rhipidura albiscapa* (Grey Fantail), *Manorina melanocephala* (Noisy Miner), *Cracticus tibicen* (Australian Magpie) *Pachycephala pectoralis* (Golden Whistler) and *Corvus coronoides* (Australian Raven). Birds observed near the wetland the drainage line in the far east of the site included *Threskiornis molucca* (Australian Ibis), *Threskiornis spinicollis* (Straw-necked Ibis), *Egretta novaehollandiae* (White-faced Heron), *Porphyrio porphyrio* (Purple Swamp Hen), *Elseyornis melanops* (Black-fronted Dotterel), *Chenonetta jubata* (Australia Wood Duck) and *Hirundo neoxena* (Welcome Swallow).

A large number of *Haliastur sphenurus* (Whistling Kites) were observed within the vicinity of a decease cow in the east of the site.

Also there were:

- no whitewash, regurgitation pellets or prey remains consistent with Owl species noted, and
- no chewed *Allocasuarina littoralis* (Black Oak) and cones found on site consistent with those eaten by Glossy Black Cockatoos.

A complete list of bird species recorded during the survey is listed in Appendix E.

4.3.9 NOCTURNAL AVIFAUNA SURVEY

There were no responses heard as a result of the owl and mammal calls played during the survey.

4.3.10 SPOTLIGHTING SURVEY

One species of mammal, *Trichosurus vulpecula* (Common Brushtail Possum), was observed during the spotlighting survey.

4.3.11 INCIDENTAL OBSERVATIONS

A number of incidental observations were recorded across the site including *Vulpes vulpes* (Red Fox), *Macropus gigantea* (Eastern Grey Kangaroo) and scats belonging to *Oryctolagus cuniculus* (European Rabbit). The occurrence of the Red Fox and European Rabbit are listed as a Key threatening processes under the NSW Threatened Species Conservation Act, 1995 and has been further addressed in Section 5.0 of this report.

4.3.12 REGIONALLY SIGNIFICANT FAUNA SPECIES

A list of Regionally Significant Fauna species for the Hunter Catchment which includes the Maitland City LGA has been produced from Stage 1 of the LHCCREMS – Regional Biodiversity Conservation Strategy (Lake Macquarie City Council., 2012). A number of regionally significant fauna species other than those listed as threatened were recorded on site. These species include:

- *#Pogona barbata* (Eastern Bearded Dragon)
- *#Carlia tetradactyla* (Southern Rainbow Skink)
- *Petaurus breviceps* (Sugar Glider)
- *Macropus giganteus* (Eastern Grey Kangaroo)
- *#?Vespadelus pumilus* (Eastern Forest Bat)
- *#?Vespadelus regulus* (Southern Forest Bat)

#species recorded during the 2009 survey (Wildthing Environmental Consultants, 2009).

4.3.13 SURVEY LIMITATIONS

As with all reports of this type the main survey limitation is considered to be the short period of time in which the fieldwork was carried out during one season. Limitations to the likelihood of detecting certain subject species were also encountered during this survey. Such limitations were generally related to the seasonal detectability of species, be it as a result of known flowering periods for flora or migratory movements by fauna. Another pertinent limitation was the cool weather experienced at the time of the survey, which may have had an impact on the diversity of species recorded within the site.

These limitations have been overcome by applying the precautionary principle in all cases where the survey methodology may have given a false negative result. This precautionary principle was achieved by recognising that most threatened species are rare and therefore unlikely to be encountered during a survey even if they may utilise the site at other times. These species have been assessed on the basis of the presence of their habitat and the likely significance of that habitat to a viable local population.

5.0 CONSIDERATIONS UNDER SECTION 5A OF THE EPA ACT

Considerations of the effects of the proposal under the guidelines of Section 5A of the Environmental Planning and Assessment Act (1995) are given in Appendix A. The species dealt with were those species identified on site during the fieldwork and those considered to have potential habitat available within the study area as detailed in Section 4.2.2 of this report.

Three Endangered Ecological communities were found to be present within the site, being:

- Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion (12.08ha);
- Hunter Lowlands Redgum Forest in the Sydney Basin Bioregion (0.18ha);
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast (2.14ha).

The area of Dry Sclerophyll Forest in the east of the site was found to be most consistent with that of Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion. Despite disturbances such as past tree removal and ongoing cattle grazing this area of EEC was found to be in relatively good condition, although the western periphery edge of this community and two outlying smaller fragments tended to be subject to greater edge effects particularly from introduced grasses. *Lantana camara* (Lantana) was a common invasive species within this community. Cattle grazing has had an impact on the height and density of the ground and shrub layers of this community. The proposal will result in the removal of approximately 11.33ha of this EEC and would likely be considered to be a significant loss of the community within the local area.

One small isolated clumped area (0.18ha) of remnant *Eucalyptus tereticornis* (Forest Red Gum) had some similarities to the EEC Hunter Lowlands Redgum Forest. However this remnant area lacked any associated flora species and had an understorey largely consisting of introduced grasses. The removal of the highly disturbed area of vegetation is unlikely to be significant.

Approximately 2.14ha of aquatic vegetation occurring along the drainage line in the far west of the site was found to be most consistent with Freshwater Wetlands on Coastal Floodplains of the NSW North Coast. This area was found to occur in brackish water and had been subject to prolonged grazing and trampling by cattle. This community will not be directly impacted by the proposal. It is recommended that this EEC be protected and enhanced. It is also recommended that the infestation of *Juncus acutus* (Tall Spike Rush) within the drainage line be removed.

No threatened flora species were found within the site during fieldwork completed for this report or previous studies (Wildthing Environmental Consultants, 2009). The site was considered to contain potential habitat for 3 of the 14 threatened flora species addressed in the report, being; *Grevillea parvifolia* subsp. *parviflora* (Small-flowered Grevillea), *Eucalyptus glaucina* (Slaty Red Gum) and *Rutidosis heterogama* (Heath Wrinklewort). Habitat for these flora species would be confined to the area of Dry Sclerophyll Forest in the east of the site.

Threatened Fauna

A total of four threatened fauna species all species of microchiropteran were recorded within the site during fieldwork completed for this report and past surveys (Wildthing Environmental Consultants, 2009), being:

- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Miniopterus australis* (Little Bentwing-bat);
- *Miniopterus schreibersii oceanensis* (Large Bentwing Bat);
- *Mormopterus norfolkensis* (Eastern Freetail Bat)

As a result of the similarity of the calls within the Genus Vespadelus, an additional threatened species *Vespadelus troughtoni* (Eastern Cave Bat) was also tentatively considered to utilise the site. Suitable hunting habitat was present over the site for these microchiropteran bat species. Preferred roosting habitat in the form of tree hollows was present for *F. tasmaniensis* and *M. norfolkensis* within the area of Dry Sclerophyll Forest. Preferred roosting habitat in the form of caves and man-made structures such as culverts was absent for *M. australis*, *M. schreibersii oceanensis* and *V. troughtoni*.

Of the remaining threatened fauna species suitable habitat within the site was found to be present for 28 of the 89 addressed species, being:

- *Litoria aurea* (Green and Golden Bell Frog);
- *Oxyura australis* (Blue-billed Duck);
- *Botaurus poiciloptilus* (Australasian Bittern);
- *Rostratula benghalensis australis* (Australian Painted Snipe);
- *Ephippiorhynchus asiaticus* (Black-necked Stork);
- *Melithreptus gularis gularis* (Black-chinned Honeyeater);
- *Anthochaera phrygia* (Regent Honeyeater);
- *Pomatostomus temporalis temporalis* (Grey-crowned Babbler);
- *Climacteris picumnus victoriae* (Brown Treecreeper);
- *Daphoenositta chrysoptera* (Varied Sittella);
- *Callocephalon fimbriatum* (Gang Gang Cockatoo);
- *Calyptorhynchus lathami* (Glossy-Black Cockatoo);
- *Glossopsitta pusilla* (Little Lorikeet);
- *Lathamus discolour* (Turquoise Parrot);
- *Lathamus discolor* (Swift Parrot);
- *Hieraaetus morphnoides* (Little Eagle);
- *Ninox connivens* (Barking Owl);
- *Ninox strenua* (Powerful Owl)
- *Tyto novaehollandiae* (Masked Owl);
- *Dasyurus maculatus maculatus* (Tiger Quoll);
- *Phascolarctos cinerea* (Koala);
- *Petaurus norfolcensis* (Squirrel Glider);
- *Phascogale tapoatafa* (Brush-tail Phascogale);
- *Pteropus poliocephalus* (Grey-headed Flying-fox);
- *Saccolaimus flaviventris* (Yellow-bellied Freetail Bat);
- *Chalinolobus dwyeri* (Large-eared Pied Bat);
- *Myotis macropus* (Southern Myotis);
- *Scoteanax rueppellii* (Greater Broad-nosed Bat).

Taking the habitat and local records into consideration the most likely of these species to utilise the study area would include *P. temporalis temporalis, G. pusilla D. chrysoptera*, *P. poliocephalus* and *S. rueppellii.*

The proposal will result in a significant loss of the EEC Lower Hunter Spotted Gum – Ironbark Forest and an incremental loss habitat in the local area for a number of the threatened species assessed. However given the recommendations the proposal is less likely to cause the extinction of any species, population or endangered ecological community in the local area.

6.0 CONSIDERATIONS UNDER SEPP 44 – 'KOALA HABITAT PROTECTION'

The principal aim of State Environment Planning Policy 44 - Koala Habitat Protection, is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and to reverse the current trend of Koala population decline.

This policy applies to areas of more than one hectare or an area, which has together with any adjoining land in the same ownership an area of more than 1 hectare, whether or not the development application applies to the whole, or only part of the land. In addressing SEPP44 there are two questions to be considered.

6.1 FIRST CONSIDERATION - IS THE LAND 'POTENTIAL KOALA HABITAT'?

'Potential Koala Habitat' is defined in SEPP 44 as, "...an area of native vegetation where trees of the type listed in Schedule 2 (Koala feed tree species) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".

Two species of 'Koala Feed Tree', *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum) were recorded within the site. These trees species did not constitute greater than 15% of the total number of trees contained within the site. Therefore the site would not be considered to constitute 'Potential Koala Habitat', and accordingly no further provisions of this policy apply to the site.

7.0 CONSIDERATIONS UNDER THE COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Considerations have been made to the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999. Assessments have been made to determine whether or not the proposal or activity has, will have, or is likely to have a significant impact on a matter of National Environmental Significance. The matters of National Environmental Significance and the appropriate responses are listed below:

- *World Heritage properties;*

The proposed development does not affect any World Heritage properties.

- *wetlands recognised under the Ramsar convention as having international significance;*

The proposed site is within proximity to the Hunter Estuary Wetlands. The proposal is unlikely to have any impact on this Ramsar site.

- *listed threatened species and communities;*

Twenty-nine nationally threatened species were recorded on the DoE database as occurring or having potential habitat available within 10km of the site, these being:

Cryptostylis hunteriana	Leafless Tongue Orchid
Tetratheca juncea	Black-eyed Susan
Acacia bynoeana	Bynoe's Wattle
Grevillea parviflora subsp. *parviflora*	Small Flowered Grevillea
Eucalyptus glaucina	Slaty Red Gum
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum
Melaleuca biconvexa	Biconvex Paperbark
Syzygium paniculatum	Magenta Lillypilly
Pterostylis gibbosa	Illawarra Greenhood
Euphrasia arguta	
Asterolasia elegans	
Rutidosis heterogama	Heath Wrinklewort
Streblus pendulinus	Siah's Backbone
Thesium australe	Austral Toadflax
Litoria aurea	Green and Golden Bell Frog
Litoria littlejohni	Littlejohn's Tree Frog
Mixophyes balbus	Stuttering Frog
Botaurus poiciloptilus	Australasian Bittern
Rostratula australis	Australian Painted Snipe
Dasyornis brachypterus	Eastern Bristlebird
Lathamus discolor	Swift Parrot
Anthochaera phrygia	Regent Honeyeater
Dasyurus maculatus maculatus	Tiger Quoll
Phascolarctos cinereus	Koala
Potorous tridactylus tridactylus	Long-nosed Potoroo
Petrogale penicillata	Brush-tailed Rock-wallaby
Pseudomys novaehollandiae	New Holland Mouse
Pteropus poliocephalus	Grey-headed Flying-fox
Chalinolobus dwyeri	Large-eared Pied Bat

No nationally threatened species were recorded within the site during the survey. Habitat of varying quality was considered to be available within the site a number of these species. They include *Grevillea parviflora* subsp. *parviflora, Eucalyptus glaucina, Pterostylis gibbosa, Rutidosis heterogama, Litoria aurea, Botaurus poiciloptilus, Rostratula australis, Lathamus discolour, Anthochaera Phrygia, Dasyurus maculatus maculatus, Phascolarctos cinereus, Pteropus poliocephalus* and *Chalinolobus dwyeri.* All nationally listed species that were considered to have potential habitat on site have been addressed under the provisions of state legislation (ie: Section 5A of the NSW Environmental Planning and Assessment Act 1979). As stated within Section 5, the proposal will lead to a loss of habitat within the locality, which may be considered to be locally significant.

One threatened ecological community, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, was recorded on the DoE database as occurring or having potential habitat available within 10km of the site. The newly listed critically endangered ecological community Central Hunter Valley eucalypt Forest and Woodland was also considered.

No species consistent with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland were present on site. This community therefore does not occur on site and the proposed development will not impact on the survival of this community.

Species consistent with Central Hunter Valley eucalypt Forest and Woodland were present on site, including the dominant canopy species of *Corymbia maculata* (Spotted Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark). The subdominant species of *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum) were also present. The proposed development may involve the removal of up to 11.33ha forest occupying approximately 12.08ha of the eastern portion of the site. The impact on this community by the proposed development is therefore considered to be significant.

- *migratory species protected under international agreements;*

Thirty-six nationally listed migratory species were recorded on the DoE on-line database as occurring or having potential habitat available within 10km of the study area, these being:

Migratory Terrestrial Birds

Haliaeetus leucogaster	White-bellied Sea Eagle
Hirundapus caudacutus	White-throated Needletail
Merops ornatus	Rainbow Bee-eater
Monarcha melanopsis	Black-faced Monarch
Monarcha trivirgatus	Spectacled Monarch
Myiagra cyanoleuca	Satin Flycatcher
Rhipidura rufifrons	Rufous Fantail

Migratory Wetland Birds

Actitis hypoleucos	Common Sandpiper
Ardea alba	Great Egret
Ardea ibis	Cattle Egret
Arenaria interpres	Ruddy Turnstone
Calidris acuminata	Sharp-tailed Sandpiper
Calidris canutus	Red Knot
Calidris ferruginea	Curlew Sandpiper
Calidris melanotos	Pectoral Sandpiper
Calidris ruficollis	Red-necked Stint
Calidris tenuirostris	Great Knot
Charadrius bicinctus	Double-banded Plover
Charadrius bicinctus	Double-banded Plover
Charadrius leschenaultii	Greater Sand Plover
Charadrius mongolus	Lesser Sand Plover
Gallinago hardwickii	Latham's Snipe
Heteroscelus brevipes	Grey-tailed Tattler
Limicola falcinellus	Broad-billed Sandpiper
Limosa lapponica	Bar-tailed Godwit
Limosa limosa	Black-tailed Godwit
Numenius madagascariensis	Eastern Curlew
Numenius phaeopus	Whimbrel
Pandion cristatus	Eastern Osprey
Philomachus pugnax	Ruff (Reeve)
Pluvialis fulva	Pacific Golden Plover
Pluvialis squatarola	Grey Plover
Rostratula benghalensis	Painted Snipe
Tringa stagnatilis	Marsh Sandpiper
Xenus cinereus	Terek Sandpiper

Migratory Marine Birds

Apus pacificus	Fork-tailed Swift

No threatened migratory species were recorded within the site. Potential habitat was considered present for a number of the listed migratory species. The proposal is unlikely to have a significant Impact on any of these species.

Under the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines (Department of the Environment, Water, Heritage and the Arts, 2009) an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

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

- *nuclear activities;*

The proposal does not involve any type of nuclear activity.

- *the Commonwealth marine environment;*

The proposal does not involve the modification of the Commonwealth marine environment.

8.0 RECOMMENDATIONS

The recommendations given in the report have been listed here along with a brief discussion of their implementation.

- Protection and enhancement of the proposed remaining buffer of Lower Hunter Spotted Gum Ironbark Forest along Mt Vincent Road;
- Protection and enhancement of the area of Freshwater Wetland in the west of the site;
- Protection of native fauna during habitat removal (Fauna ecologist on site during habitat removal);
- Installation of compensatory fauna nest boxes along Mt Vincent Road;
- Reconstruction of Lower Hunter Spotted Gum – Ironbark Forest within an area of Grassland/Pasture (approximately 2ha) on higher ground within the far south-west of the site.
- Provision of compensatory habitat (Offsetting). This will need to be undertaking with the consultation with the Office of Environment and Heritage (OEH), Maitland City Council and the proponent.

To help ensure these measures are carried out a vegetation/habitat management plan will need to be developed to address any impacts associated with the proposal to ensure the long-term viability of remaining and rehabilitated habitat.

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APPENDIX A
CONSIDERATIONS UNDER SECTION 5A OF THE EPA ACT

CONSIDERATIONS UNDER SECTION 5A OF THE EPA ACT - SIGNIFICANT EFFECT ON THREATENED SPECIES, POPULATIONS OR ECOLOGICAL COMMUNITIES, OR THEIR HABITATS.

Consideration of this development under the guidelines of Section 5A of the Environmental Planning & Assessment Act (1979) as amended by the Environmental Planning and Assessment Amendment Act (1997) has been made. The heads of consideration of this Section are given in italics followed by the answers applicable to this site. Each species is dealt with separately.

*Threatened species also recorded during 2009 survey (Wildthing, 2009)

Endangered Ecological Communities recorded on site:

1. *****Lower Hunter Spotted Gum – Ironbark Forest
2. *****Hunter Lowland Red Gum Forest
3. *Freshwater Wetlands on Coastal Floodplains

Threatened Species present on site:

4.	*Miniopterus australis*	Little Bentwing-bat
5.	*Mormopterus norfolkensis*	Eastern Freetail Bat

Threatened Species tentatively identified as being present on site:

6.	*Vespadelus troughtoni*	Eastern Cave Bat

Threatened fauna species recorded within the study area during 2009 survey (Wildthing, 2009):

7.	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle
8.	*Miniopterus schreibersii oceanensis*	Large Bentwing Bat

Species Considered to have potential habitat within the site:

9. Plants

Grevillea parviflora subsp. *parviflora*	Small Flower Grevillea
Eucalyptus glaucina	Slaty Red Gum
Pterostylis gibbosa	Illawarra Greenhood
Rutidosis heterogama	Wrinklewort

10. Frogs

Litoria aurea	Green and Golden Bell Frog

11. Waterbirds

Oxyura australis	Blue-billed Duck
Botaurus poiciloptilus	Australasian Bittern
Rostratula benghalensis australis	Australian Painted Snipe
Ephippiorhynchus asiaticus	Black-necked Stork

12. Woodland Birds

Melithreptus gularis gularis	Black-chinned Honeyeater
Anthochaera phrygia	Regent Honeyeater
Pomatostomus temporalis temporalis	Grey-crowned Babbler
Climacteris picumnus vitoriae	Brown Treecreeper
Daphoenositta chrysoptera	Varied Sittella

13. Cockatoos, Parrots and Lorikeets

Callocephalon fimbriatum	Gang Gang Cockatoo
Calyptorhynchus lathami	Glossy-Black Cockatoo
Glossopsitta pusilla	Little Lorikeet
Neophema pulchella	Turquoise Parrot

	Lathamus discolor	Swift Parrot
14.	Birds of Prey	
	Hieraaetus morphnoides	Little Eagle
15.	Owls	
	Ninox connivens	Barking Owl
	Ninox strenua	Powerful Owl
	Tyto novaehollandiae	Masked Owl
16.	Medium terrestrial marsupials	
	Dasyurus maculatus maculatus	Tiger Quoll
17.	Large Arboreal Mammals	
	Phascolarctos cinereus	Koala
18.	Small Arboreal Mammal	
	Petaurus norfolcensis	Squirrel Glider
	Phascogale tapoatafa	Brush-tail Phascogale
19.	Megachiropteran Bats	
	Pteropus poliocephalus	Grey-headed Flying-fox
20.	Microchiropteran Bats	
	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
	Chalinolobus dwyeri	Large-eared Pied Bat
	Myotis macropus	Southern Myotis
	Scoteanax rueppellii	Greater Broad-nosed Bat

Endangered Ecological Communities recorded within the study area

1. Lower Hunter Spotted Gum – Ironbark Forest

Description

Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion is the name given to the ecological community that occurs principally on Permian geology in the central to lower Hunter Valley. Lower Hunter Spotted Gum – Ironbark Forest is dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Broad-leaved Ironbark). *Eucalyptus punctata* (Grey Gum), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark) also occur occasionally. The understorey is marked by the tall shrub, *Acacia parvipinnula*, and by the prickly shrubs, *Daviesia ulicifolia*, *Bursaria spinosa, Melaleuca nodosa* and *Lissanthe strigosa*. Other shrubs include *Persoonia linearis, Maytenus silvestris* and *Breynia oblongifolia*. The ground layer is diverse; frequent species include *Cheilanthes sieberi, Cymbopogon refractus, Dianella revoluta, Entolasia stricta, Glycine clandestina, Lepidosperma laterale, Lomandra multiflora, Microlaena stipoides, Pomax umbellata, Pratia purpurascens, Themeda australis* and *Phyllanthus hirtellus* (NPWS 2000, Hill 2003, Bell 2004).

Conservation Status

Threatened Species Conservation Act 1995 – Listed as an Endangered Ecological Community

Distribution

It is restricted to a range of approximately 65km by 35km centred on the Cessnock – Beresfield area.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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 to endangered ecological communities.

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

Not applicable to endangered ecological communities.

c) in the case of an endangered ecological community or critically 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.

Dry Sclerophyll Forest occupying approximately 12.08ha of the eastern portion of the site was found to be consistent with the Endangered Ecological Community Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion. The Lower Hunter Spotted Gum – Ironbark Forest assemblage on site was found to be generally intact, although this assemblage had been subject to disturbance in the form of past tree removal, weed incursion and grazing by cattle. Past tree vegetation clearance was evidenced by the relatively large number of younger tree species. A small number of dead trees

had also been ringbarked. *Lantana camara* (Lantana) was a common weed species within this assemblage. The eastern periphery of the assemblage and two outlying isolated areas were also affected by edge effects resulting in an increase in introduced grass species such as *Pennisetum clandestinum* (Kikuyu Grass) within the understorey. Under the current land practices the long-term integrity of Lower Hunter Spotted Gum – Ironbark Forest on site would continue to decline.

The proposal will result in the removal of the majority Lower Hunter Spotted Gum – Ironbark Forest (approximately 11.33ha) from within the site. A narrow area of approximately 0.75ha will be left *in-situ* within a buffer zone in the far east of the site along Mt Vincent Road. The removal of approximately 11.33ha from within the site would be likely to be a significant loss of this community within the local area. To help mitigate the loss of Lower Hunter Spotted Gum Ironbark Forest within the site a number of recommendations have been recommended. These recommendations include:

- Remaining areas of Lower Hunter Spotted Gum – Ironbark Forest are to be protected and enhanced (approximately 0.75ha) ;
- An area (approximately 2ha) of pasture/grassland in the far south-west of the site is to be revegetated. This area would be restored as best as possible to Lower Hunter Spotted Gum – Ironbark Forest. All seed a tube stock would need to be locally sourced;
- An offsetting strategy be undertaken using the Biobanking Assessment Methodology (DECC, 2009). Under Biobanking Assessment Methodology Lower Hunter Spotted Gum – Ironbark Forest occurring on site would be regarded as a red flag area. A red flag area is an area of land that is identified by the methodology as having high biodiversity conservation values. The impact of the development on the biodiversity values of a red flag area cannot be offset by the retirement of biodiversity credits unless the Director General of the OEH determines that strict avoidance of the red flag area is unnecessary in the circumstances.

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.

As stated approximately 12.08ha of Lower Hunter Spotted Gum – Ironbark Forest was present within the east of the site. Mapping of Lower Hunter Spotted Gum – Ironbark (House, 2003) estimated that approximately 26 000ha of the community remains with its tree canopy cover in a 'substantially unmodified' condition, representing approximately 40% of its pre-European distribution. In the Maitland Local Government Area, (Hill, 2003) assessed Lower Hunter Spotted Gum – Ironbark Forest as exposed to high levels of threat from development, tree dieback and grazing, and under moderate levels of threat from fragmentation, weeds and fire. According to 'The Maitland Greening Plan' Stage 2 Part B (Maitland City Council, 2002 Lower Hunter Spotted Gum – Ironbark Forest has been reduced by 91% since 1750 inside the Maitland (LGA) and in the year 2000 occupied 1204 hectares.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this endangered ecological community. However the OEH has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this community recover in NSW. Three strategies are pertinent to the proposed subject site: 1) Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants in the land use planning process, particularly development consents, rezonings and regional planning; 2) Promote regeneration by avoiding prolonged or heavy grazing; 3) Undertake restoration including bush regeneration and revegetation. It is considered that the proposal does not comply with the PAS for this endangered ecological community.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The area of Lower Hunter Spotted Gum – Ironbark Forest has been subject to clearing in the past which is evidenced by the number of younger regrowth trees. The removal of approximately 11.33ha of this community within the site would be viewed as significant.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of up to 82 hollow-bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nest boxes be placed into the nearby area to replace those hollows removed.
- **Removal of dead wood and dead trees:** Dead wood and dead trees present within the site will be removed as a result of the proposal. It is recommended that fallen woody debris be retained where possible within the scope of the development.
- **Invasion, establishment and spread of *Lantana camara*:** Infestations of Lantana were found to be common within the area of Lower Hunter Spotted Gum – Ironbark Forest. There is potential for further infestation. It is recommended that Lantana be managed within this assemblage on site as part of any future development.
- **Competition and grazing by the feral European Rabbit Oryctolagus cuniculus:** Evidence of the European Rabbit was recorded within the site including the area of Lower Hunter Spotted Gum – Ironbark Forest. The proposed rezoning and subsequent future development unlikely to significant increase Rabbit numbers. It is recommended that the feral European rabbit (Oryctolagus cuniculus) be controlled on site to reduce competition for native fauna.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Invasion of native plant communities by exotic perennial grasses:** Introduced grasses such as *Pennisetum clandestinum* (Kikuyu Grass) area common throughout the site and occur within the fringes of the Lower Hunter Spotted Gum – Ironbark Forest. These grasses have the potential to further invade this community. It is unlikely that the proposal will further exacerbate invasion by exotic grasses. It is recommended that the remaining forest on site be enhanced and maintained to deter the invasion of exotic perennial grasses.
- **Bushrock removal:** A small amount of Bushrock was present within the Lower Hunter Spotted Gum – Ironbark forest and would be removed as a result of the proposal. It is recommended that bushrock be retained where possible in the scope of the development.
- **Invasion of native plant communities by African Olive *Olea europaea L.* subsp. *cuspidate*:** African Olive was found within the study area. The African Olive present has the

potential for further infestation regardless of the proposal. However given the recommendation for a vegetation management plan for this area which will include regular weed control the impact from this threatening process would be reduced.

- **High frequency fire resulting in the disruption of life cycle processors in plants and animals and loss of vegetation structure and composition**: It is difficult to ascertain the disruption and structural changes, if any, past fires have caused the site.

Another important threat to the community is the ongoing impact of grazing cattle. Cattle would contribute to the compaction of the soil, increase erosion and contribute to the nitrification of the soil by the addition of waste products. Cattle would also be a source of weed infestation.

Bibliography:

Bell, SAJ. (2004) *The vegetation of Werakata National Park, Hunter Valley New South Wales.* Cunninghamia **8**, 331-347.

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Maitland City Council (2002) *The Maitland City Council Greening Plan*. Maitland, NSW.

National Parks and Wildlife Service (2000) *Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region*. NSW National Parks and Wildlife Service, Sydney.

National Parks and Wildlife Service (2005). *NSW Scientific Committee's Final Determination to list the Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin Bioregion as an Endangered Ecological Community.* NSW National Parks and Wildlife Service, Sydney.

OEH (2015) *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin Bioregion Action Statement.* http://www.environment.nsw.gov.au [Date Accessed: 4 August 2015].

2. Hunter Lowland Redgum Forest in the Sydney Basin Bioregion

Description

The Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions is generally an open forest with most common canopy trees species being *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus punctata* (Grey Gum) although other frequently occurring canopy species are *Angophora costata*, *Corymbia maculata* (Spotted Gum), *Eucalyptus crebra* and *Eucalyptus moluccana*, with a number of other eucalypts being less frequently recorded. The mid stratum is characterised as open with sparse shrubs of *Breynia oblongifolia* (Breynia), *Leucopogon juniperinus*, *Daviesia ulicifolia* (Gorse Bitter Pea) and *Jacksonia scoparia* (Dogwood). There is consistently a ground layer of grasses and herbs, characterised by *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Echinopogon caespitosus* var. *caespitosus* (Bushy Hedgehog Grass), *Cheilanthes sieberi* subsp. *sieberi* (Mulga Fern) and *Pratia purpurascens* (White Root).

Conservation Status

Threatened Species Conservation Act 1995 – Listed as an Endangered Ecological Community

Distribution

Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion is an open forest assemblage found on gentle slopes and drainage flats on the Hunter Valley Floor.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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 to endangered ecological communities.

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

Not applicable to endangered ecological communities.

c) in the case of an endangered ecological community or critically 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.

A remnant clump of specimens of *E. tereticornis* approximately 0.18 hectares in size and consisting of about 18 trees could be considered to be a very small highly disturbed remnant of Hunter Lowlands Red Gum Forest. The remnant surrounded by pasture was only composed of canopy trees and an understorey of introduced pasture species. The proposed development will result in the removal of these remnant trees. Taking into account the degree of isolation of this highly altered small remnant the removal is unlikely to be considered significant.

d) in relation to the habitat of a threatened species, population or ecological community:

(ii) 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.

The 0.18 hectare remnant containing 18 specimens of *Eucalyptus tereticornis* was found to be highly disturbed and surrounded by pasture. As a result of the development this remnant clump of trees will be removed. However taking into account the highly altered nature of the isolated small remnant the removal is unlikely to be significant.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this endangered ecological community. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of this EEC and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this community recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for this endangered ecological community.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of this small remnant area of trees is unlikely to be significant.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nest boxes be placed into the nearby area to replace those hollows removed.
- **Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus*:** The European Rabbit was recorded within the site. The proposed rezoning, subdivision and subsequent future development is unlikely to significant increase Rabbit numbers. It is recommended that the feral European rabbit (*Oryctolagus cuniculus*) be controlled on site to reduce competition for native fauna.
- **Invasion of native plant communities by exotic perennial grasses:** Introduced grasses dominated the understorey of the remnant clump of trees. It is unlikely that the proposal will further exacerbate invasion by exotic grasses. It is recommended that the remaining forest on site be enhanced and maintained to deter the invasion of exotic perennial grasses.
- **High frequency fire resulting in the disruption of life cycle processors in plants and**

animals and loss of vegetation structure and composition: It is difficult to ascertain the disruption and structural changes, if any, past fires have caused the site.

Another important threat to the community is the ongoing impact of grazing cattle. Cattle would contribute to the compaction of the soil, increase erosion and contribute to the nitrification of the soil by the addition of waste products.

Bibliography:

Maitland City Council (2002) *The Maitland City Council Greening Plan*. Maitland, NSW.

Maitland City Council (2014) *Hunter Lowland Redgum Project (2004-2007) - Protecting and Enhancing Threatened Vegetation Communities in Maitland*. Maitland, NSW.

National Parks and Wildlife Service (2000) *Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region*. NSW National Parks and Wildlife Service, Sydney.

NSW Scientific Committee (2002). *Hunter Lowland Red Gum Forest in the Sydney Basin Bioregions.* Endangered Ecological Community Determination. Final DEC, Sydney, NSW.

3. Freshwater Wetlands on Coastal Floodplains of the NSW North Coast

Description

Freshwater wetlands is an ecological community associated with periodic, semi permanent or permanent inundation by freshwater. Coastal Floodplains include coastal river valleys, alluvial flats and drainage lines below the escapement of the Great Dividing Range. While most floodplains are below 20m in elevation some may occur on localised river flats up to 250m elevation.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as an Endangered Ecological Community

Distribution

Known from along the majority of the NSW coast. However, it is distinct from Sydney Freshwater Wetlands which are associated with sandplains in the Sydney Basin bioregion.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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 to endangered ecological communities.

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

Not applicable to endangered ecological communities.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(ii) 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.

The vegetation occurring within the drainage line in the west of the site although highly disturbed could be considered to constitute the Endangered Ecological Community Freshwater Wetlands on Coastal Floodplains. This assemblage had been highly modified by activities such as historical vegetation clearance, continued grazing, changes to the flood regime, sedimentation and weed infestation. The drainage line was also found to be affected by relatively high salinity. As this assemblage occurs well below the 1 in 100 year flood level the proposal does not directly impact this EEC. However there is potential for runoff from the development into this already disturbed community. It is recommended that appropriate precautions be undertaken to prevent this happening as a result the development. It is also recommended that the vegetation community within the drainage that is synonymous with the ecologically endangered community Freshwater Wetlands on Coastal Floodplains of the NSW North Coast be retained, enhanced and maintained during and after the completion of the development. Taking the recommendations into consideration the proposed development is unlikely to cause the extinction of this endangered ecological community in the locality.

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.

As stated any areas of land which could be defined as Freshwater Wetlands on Coastal Floodplains occur below the 1 in 100 year flood level and would not be directly impacted upon by the proposed development. However there is potential for runoff from the development into this already disturbed community. Taking the recommendations given in (a) no area of habitat important to the long-term survival of this ecological community will be removed, modified, fragmented or isolated in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this endangered ecological community. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of this EEC and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this community recover in NSW. It is considered that the proposal does not significantly conflict with the PAS for this endangered ecological community.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. No vegetation is proposed to be removed from this already disturbed community.
- **Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus*:** The European Rabbit was recorded within the site. The proposed rezoning and subsequent future development unlikely to significant increase Rabbit numbers.
- **Invasion of native plant communities by exotic perennial grasses:** Introduced grasses are very common within this community. It is unlikely that the proposal will further exacerbate invasion by exotic grasses. It is recommended that the remaining forest on site be enhanced and maintained to deter the invasion of exotic perennial grasses.

Another important threat to the community is the ongoing impact of grazing cattle. Cattle would contribute to the compaction of the soil, increase erosion and contribute to the nitrification of the soil by the addition of waste products. It is recommended that intensive cattle grazing be reduced in this area.

Bibliography:

Office of Environment and Heritage (2008). *Freshwater Wetlands on Coastal Floodplains (Freshwater Wetlands).* DECC (February 2008).

Threatened Species present on site:

4. *Miniopterus australis* Little Bentwing-bat

Description

Miniopterus australis (Little Bentwing-bat) has uniform chocolate fur on the back and slightly lighter fur on the belly. It has a short muzzle and domed head. The ears are short and rounded. The last phalanx on the third finger of the wing is about four times the length of the middle phalanx. This species is very similar to *Miniopterus schreibersii oceanensis* (Large Bentwing-bat) but has a smaller forearm (37 to 41mm).

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

This species inhabits tropical rainforest to warm-temperate wet and dry sclerophyll forest occurring along the coastal plains and adjacent ranges from Cape York to north-eastern N.S.W. It is a sub-canopy hunter with a preference for well-timbered areas but it is also known to hunt in clearings adjacent to forests. Prey items include crane flies, ants, moths and wasps. Flight characteristics include rapid movement with considerable manoeuvrability.

The species is a cave dweller that congregates in the summer months in maternity roost colonies and disperses during winter. In the southern part of their range they hibernate during winter but in the north they remain active throughout the year. Recorded roosts include caves, mines, stormwater drains, disused railway tunnels and houses. Mating, fertilisation and implantation occur from July to August, followed by a period of retarded embryonic development until mid-September. Pregnant females congregate in specified large nursery caves to rear their young. Births occur in December, when single young are born. It is often found to roost with the Large Bentwing-bat (*Miniopterus schreibersii*), and benefits from this larger species' ability to increase the roost temperature using metabolic heat. There is a huge nursery colony of 100,000 adult bats at Mt. Etna caves, in central Queensland.

Distribution

This species inhabits tropical rainforest to warm-temperate wet and dry sclerophyll forest occurring along the coastal plains and adjacent ranges from Cape York to north-eastern N.S.W. around the Hunter River. Its distribution within Australia becomes increasingly coastal towards the southern limit of its range in N.S.W.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Miniopterus australis (Little Bentwing-bat) was positively identified within the site as a result of the microchiropteran bat call survey. Hunting habitat was present over the entire site for this species, however roosting habitat in the form of caves or man-made structures such as tunnels and culverts was absent. The proposed development will result in the removal of the majority of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees in the western portion of the site. The proposal will result in the reduction the quality of hunting habitat within the local area however is unlikely to adversely affect the long-term survival of this microchiropteran bat

species in the local area.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed development is likely to result in the disturbance of the site between the 1 in 100 flood level and the proposed approximate 0.75ha boundary of retained Spotted Gum - Ironbark forest to the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees. No areas of habitat are likely to become isolated for this species. The proposal will result in a reduction in the quality of hunting habitat for *M. australis* however no areas of habitat important to the long-term survival of *M. australis* is likely to be removed, fragmented or isolated.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No draft or approved recovery plan has been prepared for *M. australis*. The Office of Environment and Heritage refers to a number priority actions of in relation to this microchiropteran bat species to help recover the species in New South Wales. The priority actions include:

- Protect known roosting and nursery sites and surrounding forest from disturbance by restricting and/or monitoring access;
- Retain stands of native vegetation, particularly within 10km of roosts;
- Reduce use of pesticides within breeding and foraging habitat;
- Undertake non-chemical weed control to prevent obstruction of maternity cave and other roost entrances;

- Exclude fire from 100m of maternity cave, winter roost or other significant roost entrances and ensure smoke/flames do not enter these roosts;
- Control foxes, feral cats and goats around maternity caves, winter roosts and other significant roost sites;
- Ensure any fencing and gating of roosts is done in a bat friendly manner allowing adequate entrance and exit space for all species using the roost;
- Check with OEH before undertaking recreational caving activities;
- Ensure adequate foraging habitat is retained when undertaking hazard reduction activities, particularly during the breeding/reproduction season;
- Ensure appropriate hygiene protocols are implemented when undertaking research and survey work.

The majority of these actions are only relevant to site containing known roosting areas for *M. australis.* The proposal is unlikely to compromise the listed priority action statements.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nest boxes be placed into the nearby area to replace those hollows removed.

Bibliography:

Churchill, S. (1998). *Australian Bats*. Reed New Holland Publishers, Sydney, Australia.

NPWS. (2003). *Atlas of NSW Wildlife*, at 'www.nationalparks.nsw.gov.au'.

5. *Mormopterus norfolkensis* Eastern Freetail-bat

Description

Mormopterus norfolkensis (Eastern Freetail-bat) has dark brown to reddish brown fur on the back and is slightly paler below. Like other freetail-bats it has a long (3 - 4 cm) bare tail protruding from the tail membrane. Like other freetail-bats, they have hairless faces with wrinkled lips and triangular ears.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

Mormopterus norfolkensis occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.

Distribution

The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Mormopterus norfolkensis (Eastern Freetail-bat) was positively identified within the site as a result of the microchiropteran bat call survey. Hunting habitat was present over the entire site. Preferred hunting habitat and roosting habitat in the form of tree hollows was present primarily within the area of Spotted Gum – Ironbark Forest in the east of the site. A small number of isolated remnant trees containing suitable hollows were also found over the western portion of the site.

The proposal will result in the removal of approximately 11.33ha of hunting habitat and up to 82 hollow-bearing trees resulting in a reduction in habitat for *M. norfolkensis* within the local area.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(ii) 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 to threatened species.

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.

The proposal will involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees. Approximately 82 hollow-bearing trees will also require removal. No areas of habitat are likely to become isolated for this species. The proposal will result in a reduction habitat for *M. norfolkensis* however no areas of habitat important to the long-term survival of *M. norfolkensis* is likely to be removed, fragmented or isolated.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this microchiropteran bat species although a Priority Action Statement (PAS) has been developed for this species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. Two strategies suggested are pertinent to the subject site. These include 1) Retain native vegetation that is floristically and structurally diverse, and 2) Protect roost sites from disturbance It is considered that the proposal does not comply with the PAS for the above species. The installation of nest boxes in within the remaining habitat on site will provide some compensatory habitat.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.

- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.

Bibliography:

Churchill, S. (1998). *Australian Bats*. Reed New Holland Publishers, Sydney, Australia.

NPWS. (2003). *Atlas of NSW Wildlife*, at 'www.nationalparks.nsw.gov.au'.

Threatened Species tentatively identified as being present on site:

6. *Vespadelus troughtoni* Eastern Cave Bat

Description

A small chestnut-brown bat with rufous tones on the head, and darker wings. It has smallish, conical ears and a short, up-tipped nose. The most reliable physical distinguishing feature is the shape of the male's penis.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

This species remains one of the least known members of its genus in Eastern Australia. It is a cave-dweller, known from wet sclerophyll forest and tropical woodlands from the coast and Dividing Range to the drier forests of the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally in buildings. In all situations, the roost sites are frequently in reasonably well-lit areas. Single-sex colonies varying in size from 6 to 50 individuals are more commonly recorded; however a large colony of 500 individuals of equal sex ratio has been recorded in a mine. These bats were huddled together and only occupied one-third of a square metre of ceiling.

Distribution

Although it is widely distributed, relatively few records of this species exist, particularly in the southern part of its range where it appears to be localised. The main population stretches from Cape York south to the mid-north coast of NSW. Little is known of its diet and hunting behaviour. Similarly, information on reproductive activities is limited to the noted capture of lactating females in December in the Atherton Tablelands.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Echo-location calls possibly ascribed to *V. troughtoni* were recorded during the microchiropteran bat call survey. Hunting habitat was present over the entire site. Hunting habitat was present over the entire site for this species, however roosting habitat in the form of caves or man-made structures such as tunnels and culverts was absent. The proposed development will result in the removal of the majority of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees in the western portion of the site. The proposal will result in the reduction the quality of hunting habitat within the local area however is unlikely to adversely affect the long-term survival of this microchiropteran bat species in the local area.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed development is likely to result in the disturbance of the site between the 1 in 100 flood level and the proposed approximate 0.75ha boundary of retained Spotted Gum - Ironbark forest to the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees. No areas of habitat are likely to become isolated for this species. The proposal will result in a reduction in the quality of hunting habitat for *V. troughtoni* however no areas of habitat important to the long-term survival of *M. australis* is likely to be removed, fragmented or isolated.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this microchiropteran bat species although a Priority Action Statement (PAS) has been developed for this species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. One strategy is pertinent to the proposed subject site: Protect known and potential habitat from clearing and isolation, particularly dry open forest and woodland around cliffs, rock overhangs and old mine workings. Due to the restricted habitat available on site it is considered that the proposal does comply with the PAS for this threatened species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the

development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.

- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nest boxes be placed into the nearby area to replace those hollows removed.

Bibliography:

Churchill, S. (1998). *Australian Bats*. Reed New Holland Publishers, Sydney, Australia.

NPWS. (2003). *Atlas of NSW Wildlife*, at 'www.nationalparks.nsw.gov.au'.

Threatened fauna species recorded within the study area during 2009 survey (Wildthing, 2009):

7. *Falsistrellus tasmaniensis* Eastern False Pipistrelle

Description

The Eastern False Pipistrelle is relatively large with a head-body length of about 65 mm. It weighs up to 28 grams. It is dark to reddish-brown above and paler grey on its underside. It has long slender ears set well back on the head and some sparse hair on the nose.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

These bats inhabit sclerophyll forests from the Great Divide to the east coast. In Tasmania they are found in wet sclerophyll and coastal mallee. A preference has been noted for wet habitats where trees are more than 20m high. Based upon the size and shape of its wings the bat it thought to be highly mobile with a relatively large hunting range. A specimen of this species has been radio-tracked and found to move 12km from where it was hunting to where it was roosting in a very large tree.

On the mainland they eat moths, rove beetles, chafers, weevils, plant bugs, flies and ants. Their flight is swift and direct, within or just below the tree canopy. They tend to fly fast in a fixed horizontal plane with sudden darting changes in course. It has been observed roosting in holes and hollow trunks of Eucalypts, with recorded colony sizes ranging from 3 to 36 individuals. Colonies are usually almost entirely male or female groups, although evenly mixed colonies sometimes occur. They have been recorded roosting in a cave at Jenolan, NSW, and they are occasionally found in old wooden buildings.

Males produce sperm in late summer and store it in the epididymis over the winter. Females produce a large 'hibernation follicle' in autumn. Ovulation, fertilisation and pregnancy occur in late spring and early summer. Single young is born in December. Lactation continues through January and February. The Eastern Falsistrelle hibernates generally during winter, particularly in the southern extent of its range.

Distribution

The Eastern False Pipistrelle occurs along the coastal ranges from southern Queensland to western Victoria, and is endemic to Australia.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Calls consistent with *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) were recorded within the site during the 2009 survey (Wildthing Environmental Consultants, 2009). Hunting habitat was present over the entire site. Preferred hunting habitat and roosting habitat in the form of tree hollows was present primarily within the area of Spotted Gum – Ironbark Forest in the east of the site. A small number of isolated remnant trees containing suitable hollows were also found over the western portion of the site.

The proposal will result in the removal of approximately 11.33ha of hunting habitat and up to 82

hollow-bearing trees resulting in a reduction in habitat for *F. tasmaniensis* within the local area.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(iii) 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 to threatened species.

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.

The proposal will involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees. Approximately 82 hollow-bearing trees will also require removal. No areas of habitat are likely to become isolated for this species. The proposal will result in a reduction habitat for *F. tasmaniensis* however no areas of habitat important to the long-term survival of *F. tasmaniensis* is likely to be removed, fragmented or isolated.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this microchiropteran bat species although a Priority Action Statement (PAS) has been developed for this species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. Two strategies suggested are pertinent to the subject site. These include 1) Retain native vegetation that is floristically and structurally diverse, and 2) Protect roost sites from disturbance It is considered that the proposal does not comply with the PAS for the above species. The installation of nest boxes in within the remaining habitat on site will provide some compensatory habitat.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.

Bibliography:

Churchill, S. (1998). *Australian Bats*. Reed New Holland Publishers, Sydney, Australia.

NPWS. (2003). *Atlas of NSW Wildlife*, at 'www.nationalparks.nsw.gov.au'.

Phillips, W. (1995). *Eastern False Pipistrelle (Falsistrellus tasmaniensis). In: The Mammals of Australia, pp: 520-521. Strahan, R. (Ed).* Reed Books, Australia.

8. *Miniopterus schreibersii oceanensis* Large Bentwing Bat

Description

The *Miniopterus schreibersii oceanensis* (Large Bent-wing Bat) has chocolate to reddish-brown fur on its back and slightly lighter coloured fur on its belly. It has a short snout and a high 'domed' head with short round ears. The wing membranes attach to the ankle, not to the base of the toe. The last bone of the third finger is much longer than the other finger-bones giving the "bent wing" appearance.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

The Large Bent-wing bat hunts in forested areas, catching moths and other flying insects above the tree tops. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. It is a cave (and similar man-made structures) roosting species that generally feeds above the forest canopy in wet and dry tall open forest, catching insects on the wing. However, the species has also been recorded utilising rainforest, monsoon forest, open woodland, paperbark forests and open grasslands. Moths are the main prey item. Flight is very fast and typically relatively level with swift shallow dives; the estimated flight speed is 50km per hour.

Distribution

The Large (or 'Common') Bentwing-bat may occur throughout the world. However, Parnaby (1992) notes that the Australasian populations are unlikely to be the same species that occurs outside this area. Within Australia, it is found across the coastal and near coastal areas of the north of the NT and WA and also down the east coast from Cape York to Adelaide on the coastal plains and adjacent ranges.

The species is known to migrate over large distances, apparently utilising different roosts for different seasonal needs. The pattern of movement varies with local climate and the dispersion of suitable roost sites. It hibernates over winter in the southern parts of its range and development of the embryo may be delayed over winter by lowering body temperature using roosts in the cooler areas of a cave. Pregnant females roost in large colonies in nursery caves. Birth generally occurs around December. Females cluster together in a roost that generally possesses a domed roof, which allows for the retention of warm air, which may also promote faster growth. The young can fly by 7 weeks and reach adult size and are weaned by 10 weeks. The mothers then leave the cave to disperse to their winter roosts and a few weeks later, usually in March, there is a mass exodus of juveniles. The maternity colony is deserted by April.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Miniopterus schreibersii oceanensis (Large Bentwing-bat) was positively identified within the site during the previous survey (Wildthing Environmental Consultants, 2009). Hunting habitat was present over the entire site for this species, however roosting habitat in the form of caves or man-

made structures such as tunnels and culverts was absent. The proposed development will result in the removal of the majority of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees in the western portion of the site. The proposal will result in the reduction the quality of hunting habitat within the local area however is unlikely to adversely affect the long-term survival of this microchiropteran bat species in the local area.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed development is likely to result in the disturbance of the site between the 1 in 100 flood level and the proposed approximate 0.75ha boundary of retained Spotted Gum - Ironbark forest to the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees. No areas of habitat are likely to become isolated for this species. The proposal will result in a reduction in the quality of hunting habitat however no areas of habitat important to the long-term survival of for *M. schreibersii oceanensis* is likely to be removed, fragmented or isolated.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for this microchiropteran bat species although a Priority Action Statement (PAS) has been developed for this species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. The PAS identified a number of broad strategies to help

these flora species recover in NSW: These strategies include: Control foxes and feral cats around roosting sites, particularly maternity caves; Retain native vegetation around roost sites, particularly within 300 m of maternity caves; Minimise the use of pesticides in foraging areas; and Protect roosting sites from damage or disturbance. It is considered that the proposal does not comply with the PAS for the above species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.

Bibliography:

Churchill, S. (1998). *Australian Bats*. Reed New Holland Publishers, Sydney, Australia.

NPWS. (2003). *Atlas of NSW Wildlife*, at 'www.nationalparks.nsw.gov.au'.

Threatened Plant Species Considered to have potential habitat within the site:

9. Plants

Grevillea parviflora* ssp. *parviflora **Small-flowered Grevillea**

Description

Grevillea parviflora ssp. *parviflora* is a low spreading to erect shrub usually less than a metre high. Its erect narrow leaves are 2-3.5 mm long and less than 1.3mm wide with silky hairs on the underside and a short pointed tip. Leaf margins are curved back, or even rolled completely under. The small flowers are spider-like and clustered in groups of 6-12. The whole flower, both tube and protruding style, is white.

Conservation Status

Threatened Species Conservation Act 1995 – Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Vulnerable
ROTAP-not listed.

Habitat Requirements and Ecology

This Grevillea grows in sandy or light clay soils usually over thin shales and occurs in a range of vegetation types from heath and shrubby woodland to open forest. It is found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests, and commonly occurs in open, slightly disturbed sites such as along tracks. Plants are capable of suckering from a rootstock and most populations demonstrate a degree of vegetative spread, particularly after disturbance such as fire. Flowering has been recorded between July-December as well as April-May. Flowers are insect-pollinated and seed dispersal is limited.

Distribution

Sporadically distributed throughout the Sydney Basin with the main occurrence centred around Picton, Appin and Bargo (and possibly further south to the Moss Vale area). Separate populations are also known further north from Putty to Wyong and Lake Macquarie on the Central Coast and Cessnock and Kurri Kurri in the Lower Hunter.

Eucalyptus glaucina **Slaty Red Gum**

Description

Eucalyptus glaucina occurs as a tree, often to 18m, sometimes to 30m. The bark is smooth throughout, white or grey. Juvenile leaves are ovate, pale green or glaucous and slightly discolorous. Adult leaves are lanceolate to broadly lanceolate, acuminate and moderately thick. Fruits are hemispherical or ovoid, 7-10mm long, 7-10mm wide; disc broad, ascending; valves 3-5. The seeds are brown-black.

Conservation Status

Threatened Species Conservation Act 1995 – Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Vulnerable
ROTAP- 3VCa

Habitat Requirements and Ecology

It grows mostly on gentle slopes near drainage lines in alluvial and clayey soils, in open forest. It is closely aligned with *E. tereticornis* (Forest Red Gum), but distinguished by the glaucous buds.

Distribution

The Slaty Red Gum principally occurs in the Casino area in northern NSW and from Gloucester to Broke, in mid-northern NSW.

Rutidosis heterogama **Heath Wrinklewort**

Description

Rutidosis heterogama is a perennial herb and a member of the Asteraceae family. It grows to 30cm tall from a woody base. The flowerhead is yellow and has 6 to 8 rows of shiny and translucent golden-tawny scales, usually flowering in Autumn.

Conservation Status

Threatened Species Conservation Act 1995 – Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Vulnerable
ROTAP-2VCa.

Habitat Requirements and Ecology

Found growing in dry sclerophyll forest and woodland, as well as heath, sand dunes and in disturbed areas such as roadsides. This species has been recorded in the Kurri Sand Swamp Woodland, as well as in Lower Hunter Spotted Gum Ironbark Forest.

Distribution

It has been recorded on the north coast and northern tablelands, mainly in coastal districts from Maclean to the Hunter Valley and inland to Torrington. Populations of this species have been recently recorded in the Kurri Kurri and Cooranbong areas (Stevenson, 2004).

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Neither *G. parviflora* ssp. *parviflora, E. glaucina* nor *R. heterogama* were found to be present within the site during fieldwork. Suitable habitat for these flora species was considered to be contained within the area of Lower Hunter Spotted Gum – Ironbark Forest in the east of the site. Few records of these flora species are known from the Maitland LGA. The proposal will result in the removal of suitable habitat (approximately 11.33ha Lower Hunter Spotted Gum – Ironbark Forest) from within the site, however considering the lack of nearby records the action is considered unlikely to have an adverse effect on the life cycle of these flora species such that a viable local population of the species is likely to be placed at risk of extinction.

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

No endangered population has been identified utilising the site.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed rezoning is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As there species were not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of these species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for these threatened flora species. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statements identified a number of broad strategies to help these flora species recover in NSW. Strategies included protecting areas of known and potential habitat from clearing and further fragmentation. It is considered that the proposal does not comply with the PAS for these flora species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- ***Lantana camara* -** Infestations of Lantana were found to be common within the area of Lower Hunter Spotted Gum – Ironbark Forest. There is potential for further infestation. It is recommended that Lantana be managed within this assemblage on site as part of the development.

- **Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus*:** Evidence of the European Rabbit was recorded within the site including the area of Lower Hunter Spotted Gum – Ironbark Forest. The proposed development is unlikely to significant increase Rabbit numbers.
- **Invasion of native plant communities by exotic perennial grasses:** Introduced grasses such as *Pennisetum clandestinum* (Kikuyu Grass) area common throughout the site and occur within the fringes of the Lower Hunter Spotted Gum – Ironbark Forest. These grasses have the potential to further invade this community. It is unlikely that the proposal will further exacerbate invasion by exotic grasses. It is recommended that the remaining forest on site be enhanced and maintained to deter the invasion of exotic perennial grasses.
- **High frequency fire resulting in the disruption of life cycle processors in plants and animals and loss of vegetation structure and composition**: It is difficult to ascertain the disruption and structural changes, if any, past fires have caused the site.

Another important threat to the community is the ongoing impact of grazing cattle. Cattle would contribute to the compaction of the soil, increase erosion and contribute to the nitrification of the soil by the addition of waste products. Cattle would also be a source of weed infestation.

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Robinson, L. (1994). *Field Guide to the Native Plants of Sydney (2nd edn.).* Kangaroo Press Pty. Ltd., New South Wales.

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10. Frogs

Litoria aurea **Green and Golden Bell Frog**

Description

The common name of *L. aurea* is derived from its body colouration described as being dull olive to bright emerald green above with blotches of brown or golden-bronze.

Conservation Status

Threatened Species Conservation Act 1995 – Endangered under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Vulnerable
ROTAP-not listed.

Habitat Requirements and Ecology

This frog species inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. *L. aurea* is thought to be displaced from more established sites by other frog species thus explaining its existence on disturbed sites. The Green and Golden Bell Frog is a summer breeder and voraciously cannibalistic. The males call from August through to January using a distinctive four part call: "crawk-awk, crawk, crok, crok".

Distribution

Litoria aurea was formerly known to inhabit the eastern seaboard of New South Wales and Victoria from Byron Bay through to the Gippsland Lake Region as well as highland sites (New England District, south-western slopes of N.S.W. and Monaro District). Recent literature indicates that the northern and southern distribution limits have not changed, however, *L. aurea* is no longer found on sites above an altitude of 300m above sea level.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

The Green and Golden Bell Frog was not recorded within the site despite targeted nocturnal and diurnal surveys. Areas of suitable habitat were considered to be present for this frog species within the drainage line in the west of the site. Some areas of preferred habitat in the form of emergent wetland vegetation was present and the ground was slightly saline which may offer some protection from diseases such as Chytrid Fungus. The Green and Golden Bell Frog has also been recorded within the Wentworth Swamps approximately 5km to the west of the site. The prevalence of *Gambusia holbrooki* (Plague Minnow) and disturbance from grazing cattle would reduce the quality of habitat for this species.

As suitable habitat for the Green and Golden Bell Frog is only contained within the drainage line which occurs below the 1 in 100 year flood level the proposed development is unlikely to have a direct impact on the life cycle of any viable local population of this species. However it is recommended that potential impacts such as runoff from the development be mitigated.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

As the area of suitable habitat for the Green and Golden Bell Frog occurs well below the 1 in 100 year flood level the proposed development will not directly impact this area. However there is potential for runoff from the development within the site to enter the drainage line. No areas of suitable habitat are likely to be fragmented or isolated as a result of the development within the site. With the recommendation to mitigate the runoff into the drainage line from the development within the site the proposal is unlikely to have a significant impact important to the long-term survival of any local population of this frog species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Draft Recovery Plan has been developed for the Green and Golden Bell Frog. Objectives include:

- To avoid direct impacts and retain habitat;
- Minimise impacts where ever possible;
- Mitigate or ameliorate impacts; and as a last resort;
- Compensate or offset for any unavoidable impacts.

Given the recommendation of treatment of runoff water from future development and limitation of cattle grazing within the site it is considered that the proposal will not compromise the draft recovery plan.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. No vegetation clearance is proposed for the drainage line habitat.
- **Predation by *Gambusia holbrooki* (Plague Minnow):** This species of fish was observed within the drainage line in large numbers and would be likely to have an impact on any local populations of Green and Golden Bell Frog. However the proposal is not likely to further exacerbate the predation of this fish on frog eggs and tadpoles.
- **Predation by the European Red Fox *Vulpes vulpes:*** The Red Fox was observed within the site during fieldwork and may feed on frog species within the site. The proposal is unlikely to increase numbers of this species.
- **Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands:** The disturbed drainage line is unlikely to be significantly affected by the proposal provided runoff originating from the development is treated appropriately.
- **Anthropogenic climate change**: Has the potential to have an adverse effect on this frog species. The proposal is unlikely to significantly contribute to Climate Change.
- **Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis:** It is possible that this fungus has an impact on frogs in the local area. The proposal is unlikely to have any impact on this threatening process.

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11. Waterbirds

Oxyura australis **Blue-billed Duck**

Description

The Blue-billed Duck is a small chestnut coloured duck with a dark head and distinct scooped blue bill.

Conservation Status

Threatened Species Conservation Act 1995 – Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed

Habitat Requirements and Ecology

The Blue-billed Duck is almost wholly aquatic, preferring deepwater in large permanent wetlands or dams where aquatic flora is abundant. They feed on the seeds and leaves of freshwater plants as well as on midges, caddisfly and dragonfly larvae. When feeding, they swim low in the water with the tail submerged, diving often for food. The Blue-billed Duck migrates each year between breeding swamps and overwintering lakes. Breeding is in spring with cup-shaped nests built in vegetation over water or on small islands in lakes. It has also been known to use the old nests of other waterfowl.

Distribution

The species is endemic to Australia occurring mainly in the south-east and south-west regions. The species is widespread through N.S.W., though mainly found south of the Murray-Darling Basin. Young birds may disperse widely.

Botaurus poiciloptilus **Australasian Bittern**

Description

The Australasian Bittern is a large, stocky heron-like water bird with a long thin neck and long straight bill.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Endangered under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Endangered.

Habitat Requirements and Ecology

The Australasian Bittern lives alone or in loose groups and favours permanent fresh-waters with tall dense vegetation dominated by sedges, rushes, reeds or cutting grasses (eg. Phragmites, Scirpus, Eleocharis, Juncus, Typha, Baumea and Gahnia). Breeding is sometimes loosely colonial but in other cases pairs have been observed to maintain territories when several are present in a reedbed. The Australasian Bittern feeds on insects, small fish, eels, frogs and other aquatic life, sometimes in ricefields. It is partly nocturnal in habits, and, keeping as it does to the depths of reedy swamps, is seldom seen during the day unless flushed. The breeding season is from October to January and it is during this time that the distinct 'booming' calls can be heard.

Distribution

Within Australia, the Australasian Bittern occurs in the south-east and south-west, as well as in Tasmania and is also known as a vagrant in the north-west of Australia. This species is probably sedentary in permanent habitat with possible regular short distance movements during winter and is occasionally irruptive following heavy rains and floods, or drought elsewhere.

Rostratula benghalensis australis **Australian Painted Snipe**

Description

The Australian Painted Snipe is a medium-sized freshwater wader with a long bill that drops slightly at the tip. It is strongly patterned and has fairly short legs.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Endangered under schedule 2.

Environmental Protection and Biodiversity Conservation Act 1999 – Endangered & Migratory.

Habitat Requirements and Ecology
It is usually found in pairs, frequenting the margins of swamps and streams, chiefly those covered with low and stunted vegetation. It probes in mud along the shore to gather snails, water insects and aquatic plants. When flushed, it flies close to the ground, making for the nearest cover, and is then exceedingly difficult to flush again. The Painted Snipe appears to be nomadic, with movements mainly north in winter and south in summer. It requires shallow fresh water for breeding, though the nest is not deserted if the water dries up. Nests are usually in groups, and consist of a shallow depression in the ground, lined with grass or leaves and frequently sheltered by a low bush or tuft of grass. Nests have been recorded at a density of 24 nests/ha but other smaller colonies have had distances of 15-50 m between nests.

Distribution
The better watered areas of Eastern Australian.

Ephippiorhynchus asiaticus **Black-necked Stork**
Description
The Black-necked Stork, formerly known as the Jabiru, is a large glossy black and white stork with very long red legs and a large straight black bill.

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Endangered under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology
The Black-necked Stock inhabits shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation. They mainly forage in shallow, still water, preferring open wetlands, and taking a variety of prey, including eels and other fish, frogs, turtles, snakes, and small invertebrates, such as crabs and small insects. Vertebrates form the main mass of the diet, with medium-sized eels contributing the greatest biomass and were also the only food seen to be delivered to nestlings.

In NSW, breeding activity has been recorded in most months, with activities from nest construction to fledging of young recorded from May to January. Most activity, however, takes place between June and December, and clutches present May to September. In NSW, Storks usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 m in diameter, made in a live or dead tree, in or near a freshwater swamp.

Distribution
The Black-necked Stork ranges through India, south-eastern Asia, southern New Guinea and into northern and eastern Australia. Its core distribution in Australian is in the north. In eastern Australia the Black-necked Stork has been recorded as far south as Victoria and inland to the Macquarie Marshes and Griffith.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted and incidental surveys: *Botaurus poiciloptilus* (Australasian Bittern), *Ephippiorhynchus asiaticus* (Black-necked Stork), *Oxyura australis* (Blue-billed Duck) and *Rostratula benghalensis australis* (Australian Painted Snipe) were not recorded on site during the survey. Suitable habitat was found to be present within the drainage line in the far west of the site for all of the above species. However the drainage line would only provide limited habitat for the majority of these species. Species most likely to utilise the site include the Australian Bittern and Australian Painted Snipe.

As suitable habitat for these waterbird species is only contained within the drainage line which occurs below the 1 in 100 year flood level the proposed development is unlikely to have a direct impact on the life cycle of any viable local population of this species. However it is recommended that impacts such as runoff from any future development be mitigated.

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

Not applicable.

c) in the case of an endangered ecological community or critically 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.

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.

The proposed rezoning is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As these species were not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of these mobile species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed these bird species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. No vegetation clearance is proposed for the drainage line habitat.
- **Predation by the European Red Fox *Vulpes vulpes:*** The Red Fox observed within the site during fieldwork and may feed on frog species within the site. The proposal is unlikely to increase numbers of this species.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.
- **Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands:** The disturbed drainage line is unlikely to be significantly affected by the proposal provided runoff originating from the proposed development is treated appropriately.
- **Anthropogenic Climate Change**: Has the potential to have an adverse effect on these waterbird species. The proposal is unlikely to significantly contribute to Climate Change.

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12. Woodland Birds

Melithreptus gularis gularis **Black-chinned Honeyeater**

Description

The cap is black, with a white crescent around the nape, and there is a diagnostic black 'chin' beneath the bill and extending down the white throat (though this can be difficult to see in the field). There is a small crescent of blue skin above the eye. The back and wings are a dull olive-green and the tail is greyish-brown. The underparts are white, with a greyish-buff tint on the breast. The bill is short, black and slightly downcurved. The call is a ringing, bubbling trill, repeated several times.

Conservation Status

Threatened Species Conservation Act 1995 – Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed

Habitat Requirements and Ecology

Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*).

Distribution

Within its eastern range, the Black-chinned Honeyeater is found predominantly west of the Great Dividing Range in a narrow belt through from southern Queensland, through N.S.W. and south into Victoria and South Australia. In N.S.W., this species is mainly found in drier sclerophyll forests and woodlands containing box-ironbark associations and River Red Gum. Black-chinned Honeyeaters are also known from the drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys.

Anthochaera phrygia **Regent Honeyeater**

Description

The Regent Honeyeater is a distinctive, medium-sized, black and yellow honeyeater with a sturdy, curved bill. Adults weigh 35 - 50 grams, are 20 - 24 cm long and have a wings-pan of 30 cm. Its head, neck, throat, upper breast and bill are black and the back and lower breast are pale lemon in colour with a black scalloped pattern. Its flight and tail feathers are edged with bright yellow. There is a characteristic patch of dark pink or cream-coloured facial-skin around the eye.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Critically Endangered under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Endangered.

Habitat Requirements and Ecology

It occurs in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of Eucalypts that are characteristic of the dry forests and woodlands of south-eastern Australia. The Regent Honeyeater prefers to forage on large-flowered Eucalypts (e.g. *Eucalyptus sideroxylon*, *E. melliodora*, *E. albens*, *E. leucoxylon*), particularly where these trees grow in more productive areas and yield plentiful and predictable nectar flows. They also forage on mistletoe and *Banksia* flowers, and arthropods. In parts of coastal N.S.W. they are also attracted to stands of *Eucalyptus robusta* (Swamp Mahogany). Nests are constructed of strips of Eucalypt bark, dried grass and other plant material. They are placed in an upright fork 4 to 25m above ground, and 2-3 eggs are laid. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.

Distribution
It is nomadic, although it does seem to return to nesting areas sporadically. Small flocks regularly, sometimes annually, visit the northern tablelands and the north western and central western slopes of N.S.W. in the spring and summer. Individuals also appear on the N.S.W. coast at most times of year but primarily in winter.

Pomatostomus temporalis temporalis **Grey-crowned Babbler**
Description
The Grey-crowned Babbler is the largest of the four Australian babblers, reaching to 30 cm long. Its distinctive bill is scimitar-shaped, long and heavy. The broad white eyebrow and a pale grey crown-stripe are other distinguishing characters. A dark band passes from the bill through the eye, separating the pale throat and brow to giving a 'masked' look. It has dark greyish-brown upperparts and is paler brown on the underparts, grading to a whitish throat. It is distinctive in flight, showing white tips to the tail feathers, and orange-buff patches in the broad, rounded wings. Young birds have dark brown eyes, with the iris becoming paler with age, reaching a yellow colour by about three years. This species has a loud and often repeated 'ya-hoo' call which is a duet between the male and female (the female says 'ya' and the male answers with 'hoo'). It is used to maintain the bond between the pair and as a territorial call. The 'ya-hoo' duet sequence is repeated rapidly, up to thirty times in a row. The Grey-crowned Babbler is distinctly larger than the three other babbler species and is also the only one to possess the distinctive rufous wing patches.

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology
Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Flight is laborious so birds prefer to hop to the top of a tree and glide down to the next one. Birds are generally unable to cross large open areas. Live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. All members of the family group remain close to each other when foraging. A soft 'chuck' call is made by all birds as a way of keeping in contact with other group members.

Distribution
The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. West of here the subspecies *rubeculus*, formerly considered a separate species (Red-breasted Babbler) is still widespread and common. The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands.

Climacteris picumnus victoriae **Brown Treecreeper**
Description
The Brown Treecreeper is a grey-brown bird with black streaking on the lower breast and belly and black bars on the undertail. Pale buff bands across the flight feathers are obvious in flight. The face is pale, with a dark line through the eye, and a dark crown. Sexes differ slightly in all plumages, with small patches of black and white streaking on the centre of the uppermost breast on males, while the females exhibit a rufous and white streaking.

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology
Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.

Distribution
The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys.

Daphoenositta chrysoptera **Varied Sittella**
Description
The Varied Sittella is a small songbird with a sharp, slightly upturned bill, short tail, barred undertail, and yellow eyes and feet.

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology
The Varied Sittella inhabits Eucalypt forests, woodlands, mallee orchards and golf courses. This species is not found in treeless deserts, open grasslands and heavier rainforests. It prefers rough-barked species and mature smoothed-barked gums with dead branches. The Varied Sittella feeds from arthropods gleaned from crevices and decorticating bark of standing live and dead trees.

Distribution
The Varied Sittella is sedentary and inhabits most of mainland Australia apart from those areas mentioned in the habitat requirements.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted and incidental searches neither the Regent Honeyeater, Grey-crowned Babbler, Varied Sittella, Black-chinned Honeyeater nor Brown Treecreeper were recorded within the site during the survey period. Also no evidence such as dome shaped nests consistent with that of the Grey-crowned Babbler were observed. The site, particularly within the 12.08ha area of Spotted Gum – Ironbark forest occurring within the east of the site would be considered to provide suitable foraging and nesting habitat for all of these woodland species.

The proposal will result in the removal of habitat in the form of up to 11.33ha of Lower Hunter Spotted Gum – Ironbark Forest resulting in an incremental reduction in habitat for these bird species within the local area. However it is unlikely to adversely affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

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

Not applicable.

c) in the case of an endangered ecological community or critically 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.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As these species were not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of these mobile species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Recovery Plan has been completed for the Regent Honeyeater. The plan recommends the retention of preferred foraging species such as *Corymbia maculata* (Spotted Gum) and Mistletoe. Future development will result in the removal of a large number of foraging species, which is likely to significantly compromise the Recovery Plan.

For the remaining bird species no Recovery or Threat Abatement Plan has been developed. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of these species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help these species recover in NSW. Strategies suggested include retaining existing vegetation and remnant stands along roadsides and in paddocks. It is considered that the proposal does not comply with the PAS for these species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nest boxes be placed into the nearby area to replace those hollows removed.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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13. Cockatoos, Parrots and Lorikeets

Callocephalon fimbriatum **Gang Gang Cockatoo**

Description

These birds are primarily slate-grey, with the males easily identified by their scarlet head and wispy crest, while females have a grey head and crest and feathers edged with salmon pink on the underbelly. They range in length from 32 to 37 cm, with a wingspan of 62 to 76 cm.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology

In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.

Distribution

In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes.

Calyptorhynchus lathami **Glossy-Black Cockatoo**

Description

The Glossy Black-cockatoo is a dusky brown to black cockatoo with a massive, bulbous bill and a broad, red band through the tail.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology

The Glossy Black-Cockatoo inhabits Wet and Dry Sclerophyll Forests and Woodlands. It prefers highland habitats in the northern part of its range but may be found closer to the coast when and where conditions are suitable. In the south they are widespread in lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering watercourses.

Glossy Black-Cockatoos forage primarily on the seeds of (*Allo*)*Casuarina* species, but will also take wood borers from large *Acacia* stems. *Allocasuarina torulosa, A. verticillata* and *A. littoralis* are the predominant food trees in N.S.W. On Kangaroo Island, *Casuarina stricta* is the predominant food source. They have also been observed eating *Angophora*, *Acacia* and *Eucalyptus* seeds. It now appears to supplement its diet with the seeds of exotic pine trees. A sign that foraging individuals have recently fed at a site is a scattering of leaves, twigs and freshly chewed cones under the (*Allo*)*Casuarina* trees. While feeding they are tame and relatively easy to approach. Flocks of Glossy Black-Cockatoos have been seen but are not common. They are usually seen in pairs or threes (being a pair and their young), or as feeding groups consisting of 10-12 birds that are likely to be loose family aggregations. Such groups seem to occupy an area permanently and have a distinctive flight pattern of slow, shallow wing-beats. Nesting takes place from March to August in the hollows of large Eucalypts, 10-20m above the ground, where a single egg is laid.

Distribution

The Glossy Black-Cockatoo inhabits Sclerophyll Forests and Woodlands of eastern Victoria to central Queensland, extending to the western slopes in New South Wales. A subspecies, *C. l. halmaturinus* exists on Kangaroo Island, South Australia.

Lathamus discolor **Swift Parrot**

Description

The Swift Parrot is most closely related to Rosellas, though its habits are most closely aligned with those of the Lorikeets, which it also resembles morphologically. The main distinction of the Swift Parrot is the long red tail that is not found in Lorikeets, which generally have dumpier green tails.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Endangered under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Endangered.

Habitat Requirements

The Swift Parrot prefers Dry Sclerophyll Forest in Tasmania and Open Forest to Woodland in the north on the mainland. It has also been recorded utilising street trees and in parks and gardens. Swift Parrots forage on the nectar of Eucalypts, often in mixed flocks with Lorikeets. The preferred winter food species are *Eucalyptus sideroxylon* (Red Ironbark), *E. albens* (White Box), *E. ovata* (Swamp Gum), *E. robusta* (Swamp Mahogany) and *E. melliodora* (Yellow Gum) and have also been observed eating the seeds and flowers of *Xanthorrhoea* spp. (Grass Trees). They also feed on insects and their larvae, fruits, berries, seeds and vegetable matter. While feeding, individuals may be approached and watched from under the feed tree. When there is an abundance of food, large congregations of hundreds of birds may gather in noisy and crowded roosts. Nesting occurs in Tasmania from September to January in a hollow branch of Eucalypts and they return to the mainland during March and April.

Distribution

The species is patchily distributed within the south-eastern corner of mainland Australia and Tasmania. During winter the Swift Parrot inhabits mainland Australia from Adelaide (S.A.) through Victoria, and up the east coast to south-east Queensland, as well as visiting the south and central western slopes and the Riverina in N.S.W. The Swift Parrot returns to eastern Tasmania in spring to breed.

Neophema pulchella **Turquoise Parrot**

Description

The male Turquoise Parrot is a highly distinctive bird with bright green upperparts and a turquoise-blue crown and face. Its shoulders are turquoise-blue, grading to deep blue at the flight-feathers. It has a chestnut-red patch on the upper-wing. The upper-breast of the Turquoise Parrot has an orange tint, while the yellow abdomen may have an orange centre. Females and immature individuals are generally duller, have whitish lores, a green, rather than yellow throat and breast and no red on the shoulder and upper-wing area.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed

Habitat Requirements

Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.

Distribution

The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.

Glossopsitta pusilla **Little Lorikeet**

Description

The Little Lorikeet is a small green bird with a black bill and red patch covering forehead/throat, but not ear-coverts. The eyes are orange-yellow.

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology
This Lorikeet species occurs in forests, woodlands, large trees within open country, timbered watercourses, shelterbelts and street trees. It nests in small hollow in eucalypt species.

Distribution
The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted and incidental avifauna surveys no threatened parrot species were recorded on site. Foraging habitat was available for these species within the 12.08ha area of Lower Hunter Spotted Gum – Ironbark Forest and scattered and clumped trees through the remainder of the site. Suitable nesting habitat for the Little Lorikeet in the form of tree hollows was common throughout the area of Lower Hunter Ironbark Forest.

The proposal will result in the removal of foraging habitat and nesting in the form of 11.33ha of Lower Hunter Spotted Gum – Ironbark Forest. The proposal will result in a significant amount of habitat within the locality for these two parrot species, however it is unlikely to adversely affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

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

No endangered population has been identified utilising the site.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed development is likely to result in the disturbance of the site between the 1 in 100 flood level and the proposed approximate 0.75ha boundary of retained Spotted Gum - Ironbark forest to the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest and a number of scattered and clumped remnant trees. No areas of habitat are likely to become isolated for these mobile species. The proposal will result in a reduction in suitable foraging and nesting habitat however no areas of habitat important to the long-term survival of for these parrot species is likely to be removed, fragmented or isolated.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the above species although a Priority Action Statement (PAS) has been developed for each species. The objective of the PAS is to promote the recovery of threatened species, populations and ecological communities and manage key threatening processes. Strategies include retaining large old trees, especially those that are hollow-bearing. It is considered that the proposal does not comply with the PAS for the above parrot species. Habitat rehabilitation is a PAS considered pertinent to the proposal for the above parrot species. The installation of nest boxes in within the remaining habitat on site will provide some compensatory habitat.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.

- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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14. Birds of Prey

***Hieraaetus morphnoides* Little Eagle**
Description

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

Distribution

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Hieraaetus morphnoides (Little Eagle) was not observed on site during the recent survey. No evidence of its presence was found (ie prey remains). Potential hunting habitat for these species was available all over the majority of the site with preferred habitat occurring within the area of Spotted Gum – Ironbark Forest. Due to the lack of dense vegetation only limited roosting habitat would be available for the Little Eagle. Potential nesting and roosting habitat was considered to be present within the Spotted Gum – Ironbark Forest.

The proposal is likely to result in a loss of lower quality hunting habitat that may be viewed as an incremental decline of habitat in the local area. Therefore the development may adversely affect this prey species such that a viable local population of these species is likely to be placed at risk of extinction.

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

Not applicable.

c) in the case of an endangered ecological community or critically 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.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As this species was not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of this mobile species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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 has prepared Priority Action Statements (PAS) to promote the recovery of this species. Strategies outlined include: Protect and maintain high quality habitat, which consists of open forest and woodland with a mosaic of open and timbered areas, including wooded farmland, gallery forests and wooded floodplains along water courses and around wetlands; Improve prey availability through restoration of degraded remnants, particularly riparian areas; Undertake revegetation, using a diverse mix of locally appropriate native species, and ensuring the creation of a mosaic of open and wooded areas; and Increase the abundance of paddock trees, particularly large ones, by protecting existing trees, and supplementary planting or protection of natural regrowth. It is considered that the proposal does not comply with the PAS for the above bird of prey species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native

fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.

- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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15. Owls

Ninox connivens **Barking Owl**

Description

The Barking Owl is medium-sized owl (42 cm, 650 g) smaller than the similar Powerful Owl and larger than the Southern Boobook. It has bright yellow eyes and no facial-disc. Upperparts are brown or greyish-brown, and the white breast is vertically streaked with brown. The large talons are yellow.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

The Barking Owl is found in forest and woodland, encountered most commonly in savanna and paperbark woodlands. It sometimes roosts in rainforests, but it requires the more open country for hunting and hollow Eucalypts for breeding. These owls are usually found in pairs which occupy permanent territories, generally greater than 100 ha. The main call of the species is a repetitive barking 'wook wook', hence the common name. It does occasionally produce a rather loud and disturbing scream that has earned it a second common name of the 'screaming woman bird'. Mammals and birds are the main prey, though it also feeds on insects and other invertebrates. In Southern Australia it feeds particularly on rabbits. It also kills hares, rats, mice, occasional small bats and some marsupials, including possums. It kills birds up to the size of Magpies and Tawny Frogmouths.

Distribution

The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains (especially the Pilliga) and in some northeast coastal and escarpment forests.

Ninox strenua **Powerful Owl**

Description

The Powerful Owl is the largest owl in Australasia. It is a typical hawk-owl, with staring yellow eyes and no facial-disc. Adults reach 60 cm in length, have a wingspan of up to 140 cm and weigh up to 1.45 kilograms.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not Listed.

Habitat Requirements and Ecology

The Powerful Owl inhabits a wide range of vegetation types from wet Eucalypt forests with a Rainforest understorey to Dry Open Forests and Woodlands. The species has been recorded utilising disturbed habitats such as exotic pine plantations and large trees in parks and gardens. The Powerful Owl is the largest predator of nocturnal forest-dwelling animals in Australian forests. Major prey species in NSW forests are the Greater Glider, Common Ringtail Possum, Sugar Glider, Grey-headed Flying Fox, and several species of diurnal birds, including the Pied Currawong, Magpie and Lorikeets. It rests during the day amid thick foliage, often grasping food-remains. The male of the species employs a slow, far-carrying 'whoo-hoo' call, more deliberate than the female call, which is higher pitched with the second note slightly higher than the first. Powerful Owls nest in a slight depression in the wood-mould on the base of a cavity in a large old tree, sometimes in excess of 25 metres above the ground. These trees are usually found growing on a hillside in heavy forest and may be utilised intermittently for

several years. The breeding season of the Powerful Owl is highly synchronised, being strictly winter breeders. Pairs appear to mate for life and occupy exclusive territories that can be greater than 800ha in size (Kavanagh, 2000).

Distribution

The Powerful Owl is found in the coastal areas and adjacent ranges of eastern Australia from South Australia to around Rockhampton in Queensland, generally within 200km from the coast. Within N.S.W., Powerful Owls are distributed throughout the length of the Great Dividing Range, which is their stronghold, and extend from the coast to the western slopes where they occur in much lower numbers

Tyto novaehollandiae **Masked Owl**

Description

A medium-sized owl to 40 - 50 cm long, with dark eyes set in a prominent flat, heart-shaped facial disc that is encircled by a dark border. The feet are large and powerful, with fully feathered legs down to the toes.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

Within this range they inhabit a range of wooded habitats that contain both mature trees for roosting and nesting and more open areas for hunting. They are most commonly encountered within Open Forest with a sparse understorey as well as along the ecotones of these areas to more or less densely vegetated habitats. Their diet comprises mainly ground-dwelling prey, including several species of native and introduced Rodents, *Antechinus* spp. and Bandicoots. On occasions, other prey such as Possums, Gliders and other birds are taken. Masked Owls usually roost in large hollows inside large, old living trees, most often Eucalypts. Within dry forests they often choose hollow trees in gullies or drainage lines. Pairs appear to mate for life and occupy exclusive territories in order of 1000ha in size.

Distribution

Masked Owls in N.S.W. are distributed throughout the length of the Great Dividing Range and extend from the coast to the western slopes.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Ninox connivens (Barking Owl), *Ninox strenua* (Powerful Owl) and *Tyto novaehollandiae* (Masked Owl) were not observed on site during the recent survey. No evidence of their presence was found (ie regurgitation pellets, prey remains) nor was a response heard during the call playback census. Potential hunting habitat for these species was available all over the majority of the site with preferred habitat occurring within the area of Spotted Gum – Ironbark Forest. Due to the lack of dense vegetation only limited roosting habitat would be available for the Powerful and Barking Owl. With the presence of a small number of larger hollows within the Spotted Gum – Ironbark Forest, potential nesting and roosting habitat was considered to be present.

The proposal is likely to result in a loss of lower quality hunting habitat that may be viewed as an

incremental decline of habitat in the local area. Therefore the development may adversely affect these owl species such that a viable local population of these species is likely to be placed at risk of extinction.

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

Not applicable.

c) in the case of an endangered ecological community or critically 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.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As these species were not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of these mobile species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

Draft Recovery Plans have been completed for Large Forest Owls and the Barking Owl (NPWS, 2003a). The recovery plans recommend that developments containing bushland protect nest and roost sites, patches of habitat and prey bases. The proposal will result in the removal of hunting habitat. It

is considered that the proposal is likely to significantly compromise these recovery plans.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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16. Medium terrestrial marsupials

***Dasyurus maculatus maculatus* (Tiger Quoll)**

Description

The Tiger Quoll (*Dasyurus maculatus maculatus*) is the largest marsupial carnivore on the Australian mainland.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 –Endangered

Habitat Requirements

It is an agile climber but spends most of its time on the floor of sclerophyll forests, rainforests and coastal woodlands and heathlands. It has occasionally been seen utilising open country, grazing lands and rocky outcrops (NPWS, 1999). Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby. A large area of relatively good quality vegetation is required for foraging. It is an opportunistic hunter of a variety of prey, including birds and their young, rats and other small terrestrial and arboreal mammals, gliders, small Macropods, reptiles and Arthropods.

Distribution

The Tiger Quoll is widespread in eastern Australia, with its distribution being spread between two subspecies. The nominate subspecies, *D. m. maculatus* occurs from southern Queensland to Tasmania whereas *D. m. gracilus* occurs in northern Queensland.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Despite targeted surveys, which involved cage trapping and spotlighting, *Dasyurus maculatus maculatus* (Tiger Quoll) was not recorded on site during the survey.

Suitable hunting and limited nesting habitat was found to be present within the area of Spotted Gum – Ironbark Forest in the east of the site. This species however is most commonly found in more isolated, pristine areas of habitat and would be unlikely to be present within the local area. Also there was a paucity of local records of the Tiger Quoll in the immediate local area on the OEH database. The proposal will result in the incremental reduction in suitable habitat in the local area however it is unlikely to adversely affect the life cycle of the Tiger Quoll such that a viable local population is likely to be placed at risk of extinction.

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

Not applicable.

c) in the case of an endangered ecological community or critically 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.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As this species was not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to significantly impact the long-term survival of the Tiger Quoll in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the Tiger Quoll. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of this species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help this species recover in NSW. It is considered that the proposal does not comply with the PAS for this species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A small number of suitable denning hollow logs will be removed as a result of the development.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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17. Large Arboreal Mammals

Phascolarctos cinereus **Koala**

Description

The *Phascolarctos cinereus* (Koala) is the sole member of the family Phascolarctidae. It is a short stocky arboreal marsupial with large furry ears and a vestigial tail. The fur colour of the koala varies from pale grey in the northern parts of its range to grey-brown in the south.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Listed as Vulnerable in NSW & Victoria.

Habitat Requirements

The Koala is limited to areas where there are acceptable food trees. Its diet is generally restricted to that of Eucalypt leaves and much less-often, non-Eucalypt foliage. The foliage of *Eucalyptus camaldulensis* (River Red Gum), *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. viminalis* (Manna Gum), and *E. robusta* (Swamp Mahogany) are some of the preferred Eucalypt species. Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted, or nutrient deprived.

Koalas sleep in the fork of a tree during the day and feed at night with the peak of activity just after sunset. It is generally a solitary animal with a social behaviour pattern that influences its breeding biology. Breeding biology of the Koala is characterised by the occurrence of discrete core breeding groups which are sedentary. A core group may comprise up to several dozen individuals that are usually well separated from other breeding groups. These core groups produce a continual supply of dispersing nomadic sub-adults. Individual Koalas within core breeding groups occupy semi-exclusive territories. There is interaction with and marginal overlap of territories between adjacent individual animals. The territories of breeding males generally occur within a matrix of adjacent territories of breeding females. In the overlap zones of adjacent territories of breeding Koalas, individual trees occur that are habitually used for interaction between the two animals concerned. These breeding core interaction trees (sometimes termed "home range trees") are readily identifiable by scratched "trails" up the bole and copious dung deposits at the base of the tree. Breeding occurs in summer and young females produce one young (rarely twins) each year.

Distribution

The Koala occurs along the east coast of Australia and extends into woodland, mulga and River Red Gum forests west of the Great Dividing Range. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest. They are rare or absent in wet forests in the south above 600 m which may be due more to distribution of Eucalypt species than climate.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

No sign of the Koala or indications of its presence (i.e scratches, scats) could be noted during fieldwork despite targeted surveys. Two preferred Koala Trees, *Eucalyptus punctata* (Grey Gum) and *Eucalyptus tereticornis* (Forest Red Gum) were found to be present within the site. There were few recent records of the Koala in local area. The proposal will result in an incremental reduction in

suitable foraging habitat in the local area, however considering the scarcity of local records it is unlikely to result in the extinction of any local population of this species.

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

Not applicable.

c) in the case of an endangered ecological community or critically 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.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As this species was not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of the Koala in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Draft Recovery Plan has been completed for the Koala. It is important to retain as many feed tree species as possible within the site. It is considered that the proposal will not significantly compromise this draft recovery plan.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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18. Small Arboreal Mammal

Petaurus norfolcensis **Squirrel Glider**

Description

The Squirrel Glider (*Petaurus norfolcensis*) is a medium sized arboreal gliding marsupial with long grey fur and a pronounced black dorsal strip extending from between the eyes to the base of the tail. The belly fur is white and the tail is grey and fluffy. The gliding membrane (patagium) extends from the wrist to the ankle. The Squirrel Glider is similar to the Sugar Glider (*Petaurus breviceps*) however is larger with a longer pointed face, longer and narrower ears and a much bushier furred tail.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements

Throughout its range *P. norfolcensis* is found in dry forest and woodland associations dominated by winter flowering eucalypts or with an understorey of winter flowering Banksias or gum producing Acacias (Smith, 2002). Squirrel Gliders nest in tree hollows or "dens" with a range of entrance diameters of 4-15cm. Squirrel Glider colonies and individuals may change nest sites frequently within their home range. The Squirrel Glider eats a high proportion of invertebrates from the foliage of Eucalypts and *Acacias* supplemented by plant exudates in the form of Eucalypt and *Melaleuca* sap and *Acacia* gum.

Distribution

The Squirrel Glider is distributed throughout the dry sclerophyll forests and woodlands of eastern Australia from South Australia to Cairns.

Phascogale tapoatafa **Brush-tailed Phascogale**

Description

The Brush-tailed Phascogale is tree-dwelling marsupial carnivore with a characteristic, black, bushy 'bottlebrush' tail, with hairs up to 4 cm long. Its fur is grey above and pale cream below and it has conspicuous black eyes and large naked ears.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements

The Brush-tailed Phascogale is known from a variety of forest types from Rainforest to Woodland, but is most frequently recorded in the drier Sclerophyll Forests with little ground cover, on ridges up to 600m altitude. A nocturnal species, the Brush-tailed Phascogale is mainly arboreal but also forages on the ground, eating insects and occasionally small vertebrates. It requires small tree hollows and suitable foraging sites in the canopy, sub-canopy, and ground layer of vegetation. During the day it sleeps in a nest lined with leaves or shredded bark in a tree hollow, emerging at dusk to feed. Animals may return to the nest occasionally through the night and, when several share a nest, they tend to show a similar pattern of nocturnal activity.

Distribution

The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in

deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Neither *Petaurus norfolcensis* (Squirrel Glider) or *Phascogale tapoatafa* (Brush-tailed Phascogale) were recorded on site during fieldwork or previous studies despite targeted trapping and spotlighting surveys. Suitable habitat was considered to be present within the 12.08ha area of Spotted Gum – Ironbark Forest in the east of the site.

Petaurus norfolcensis is known to be present in the local area within similar habitat near the Stockland Greenhills Shopping Centre approximately 1km to the north-east which has tenuous connections to habitat on site (Wildthing Environmental Consultants, 2007). The area of Spotted Gum – Ironbark Forest contained suitable foraging habitat in the form of flowering myrtaceous trees, and a small number of gum producing trees such as *Acacia parvipinnula*. Suitable nesting hollows were also found to be present.

Suitable foraging and nesting was also found to be present for *P. tapoatafa*. There were fewer records for this species within the local area according to the OEH database.

The majority of habitat for these two fauna species will be removed from the site as a result of the proposal. Considering the absence of these two fauna species during two targeted surveys the proposal is unlikely to adversely affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As these species were not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of these mammal species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for the Squirrel Glider or Brushtail Phascogale. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of the Squirrel Glider and Brushtail Phascogale and the abatement of key threatening processes in NSW. The Priority Action Statements identified a number of broad strategies to help these species recover in NSW. These actions include:

- Ensure the largest hollow-bearing trees (including dead trees) are given highest priority for retention.
- Delineate boundaries of population to identify the extent to which populations are interconnected.

The proposed action may result in the clearing of a large portion of habitat suitable for these species, which would be considered to significantly compromise these actions.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site, have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.

- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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19. Megachiropteran Bats

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

Description

The Grey-headed Flying-fox is a large species of megachiropteran bat which possess a mantle of rusty brown fur that full encircles the neck. The fur on the back is dark grey and as the common name suggests, the head is covered with light grey fur. The grey belly fur is often flecked with white and ginger. The fur extends down the legs to the toes, which contrasts with other *Pteropus* species, which are furred only to the knees. This species weighs up to a kilogram and has a forearm length of up to 180mm.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 –Vulnerable.

Habitat Requirements and Ecology

Grey-headed Flying-foxes are known to occupy a variety of habitats, including wet and dry sclerophyll forests, rainforest, mangroves and paperbark swamps and *Banksia* woodlands. Here they forage on a range of fruits and blossoms. Their diet is so varied that they have been recorded eating the fruit or blossom of more than 80 species of plant. The predominant food source is Eucalypt blossom and fruits from trees such as *Ficus* spp. (Figs). It is likely to act as an important pollinator for many of the trees on which they utilise blossoms. They also inhabit cultivated areas where they feed on introduced trees including commercial food crops, and can become a 'pest' animal in these areas. Ironically, this has led to this species being the most intensively researched bat in Australia.

As with most species of Flying-fox, *P. poliocephalus* roost communally where they form large communal colonies called 'camps'. Camps are mostly in rainforest patches, mangroves, paperbark forests and modified vegetation in urban areas. These camps may contain thousands of individuals, and up to 200 000 individuals have been recorded at one camp. They may move up to 70km from the camp each night to forage. Young are raised in maternity camps after birthing in September to October. The young are able to fly at 3 months of age and puberty is reached at 18 months, although males do not achieve effective fertility until 30 months. Vocal communication is highly sophisticated, with over 20 different situation-specific calls being recorded. Recently, it has been identified as being a potential carrier of viral pathogens, such as Lyssa-virus.

Distribution

The Grey-headed Flying-fox is distributed predominantly along the sub-tropical east coast, from Rockhampton (Qld) through NSW to SE Victoria.

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

This species was not recorded on site during the survey despite targeted searches that included spotlighting and listening. The site contains seasonal foraging resources for this mobile species in the form of flowering myrtaceous species. No roosting habitat was present due to the lack of a dense canopy layer. The proposed development will result in the removal of seasonal foraging habitat, which may be seen as an incremental loss of habitat within the locality. However the proposal is not likely to cause extinction of the local population of this mobile species.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically 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 to threatened species.

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.

The proposed rezoning and subdivision is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. The proposed development is unlikely to impede the long-term survival of this mobile species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

A Recovery Plan has been completed for the Grey-headed Flying-fox. The plan recommends the retention of roost sites and as many foraging species as possible. The proposal does not comply with this recovery plan.

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 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.
- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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20. Microchiropteran Bats

Saccolaimus flaviventris **Yellow-bellied Sheathtail-bat**

Description

The Yellow-bellied Sheathtail-bat is a large, insectivorous bat up to 87 mm long. It has long, narrow wings, a glossy, jet-black back, and a white to yellow belly extending to the shoulders and just behind the ear. It has a flattened head and a sharply-pointed muzzle. The tail is covered with an extremely elastic sheath that allows variation in the tail-membrane area. Males have a prominent throat pouch; females have a patch of bare skin in the same place.

Conservation Status

Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

It has been reported from a wide variety of habitats. Hunting height appears to vary depending upon the height of the dominant vegetation in Eucalypt forests it feeds above the canopy, but in Mallee or open country it comes lower to the ground. Prey species include Beetles, Long-horned Grasshoppers, Shield Bugs and Flying Ants.

Usually solitary, but occasionally occurring in colonies of less than ten individuals, the Yellow-bellied Sheathtail-bat roosts in tree hollows, animal burrows, dry clay cracks, under rock slabs and in abandoned Sugar Glider nests. It has also been found resting on the walls of buildings in broad daylight, and one such individual, caught at Queanbeyan (NSW), appeared to be so exhausted that it made no effort to escape. Similar reports suggest that it is migratory in southern Australia and that individuals found resting in the open are in the course of a winter migration from the cooler to warmer areas. They have been reported from southern Australia only between January and June.

Males have a prominent throat-pouch which is devoid of glandular tissue but a sub-cutaneous gland lies behind it. The throat-pouch is represented by a rudimentary fold of skin in the female. There is no seasonal difference in testicular size in males and there is no relationship between reproductive condition in males and the size of the throat pouch. Pregnancy is always restricted to the right uterine horn. Single young are born between December and mid-March. Sub-adults have only been collected in January and February.

Distribution

This species is widespread across Australia and its apparent rarity is probably due to its flying so high and fast that it is seldom collected

Chalinolobus dwyeri **Large-eared Pied Bat**

Description

A small to medium-sized bat with long, prominent ears and glossy black fur. The lower body has broad white fringes running under the wings and tail-membrane, meeting in a V-shape in the pubic area. This species is one of the wattled bats, with small lobes of skin between the ears and corner of the mouth.

Conservation Status

Threatened Species Conservation Act 1995 – Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Vulnerable

Habitat Requirements and Ecology

This species has been found occupying dry sclerophyll forest and woodland, both to the east and west of the Great Divide. Recordings of this species have also been made in subalpine woodland and at the

ecotone of rainforest and wet Eucalypt forest.

The Large-eared Pied Bat roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels. Colonies recorded have ranged in size from 3 to 37 individuals, and are usually located in the twilight area not far from the cave entrance. The physiology of the bat suggests that it feeds primarily on small insects below the canopy. They fly relatively slowly with rapid but shallow wing beats. During autumn and early winter the males have enlarged testes. At this time, the facial glands on either side of the muzzle become swollen and show a cream colour beneath the skin. They exude a milky secretion when compressed. It is probable that these glands have a secondary sexual function. It is not known whether mating occurs in the autumn or spring; hence the duration of pregnancy is also unknown. The females give birth in November, commonly to twins, and the young are independent by late February. They leave the cave soon after and the females remain another month before abandoning the roost in late March for the winter. It is thought that during the cooler winter months the colony disperses for individual hibernation.

Distribution
The Large Pied Bat ranges from Rockhampton in central Queensland to Bungonia in southern NSW.

Myotis macropus **Southern Myotis**

Description
Myotis macropus is similar to most other bats with a grey-brown fur colour. The main distinguishing feature of this species is its unusually large feet.

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology
Myotis macropus seldom occurs far from suitable water bodies which range from rainforest streams to large reservoirs and even brackish water. It hunts by raking the surface of the water for aquatic insects and small fish. Some aerial hunting also occurs for prey items include moths, beetles, crickets, cockroaches, flies and many water insects. It roosts in small colonies of between 15 and several hundred individuals with recorded roosts including caves, mines and disused railway tunnels as well as dense rainforest foliage in the tropical parts of its range. Some occurrences of roosting in tree hollows are also noted.

Distribution
The Large-footed Myotis has been recorded along much of the coastal strip of Australia occurring from the east of South Australia, around the Victorian, New South Wales, Queensland and Northern Territory coasts and into Western Australia as far as the Kimberleys (the northern population is likely to be a different subspecies - currently undergoing taxonomic revision). In N.S.W., the Large-footed Myotis is found in various habitats of the coast and adjacent ranges. Recently, it has also been found along the Murray River valley well into South Australia.

Scoteanax rueppellii **Greater Broad-nosed Bat**

Description
The Greater Broad-nosed Bat is a large powerful bat, up to 95 mm long, with a broad head and a short square muzzle. It is dark reddish-brown to mid-brown above and slightly paler below. It is distinguished from other broad-nosed bats by its greater size. While similar to the Eastern False Pipistrelle *Falsistrellus tasmaniensis*, it differs by having only two (not four) upper incisors

Conservation Status
Threatened Species Conservation Act 1995 – Listed as Vulnerable under schedule 2.
Environmental Protection and Biodiversity Conservation Act 1999 – Not listed.

Habitat Requirements and Ecology

This species apparently feeds on large moths and beetles, and some small vertebrates, emerging just after sundown, flying slowly and directly at a height of 3-6 metres, deviating only slightly to catch larger insects. It is also predatory on vertebrates including other bats, and is a noted carnivore on other captured bats in bat traps. *S. rueppellii* is known to hunt along tree-lined creeks, the junction of woodland and cleared paddocks, and low along rainforest creeks. It may have a preference for wet gullies in tall timber country.

The species roosts mainly in tree hollows but it has also been found in the roof spaces of old buildings. Little is known of the reproductive cycle, but it is suggested that the species follows the typical Vespertilionid pattern. What is known is that females congregate in maternity colonies and single young are born in January, slightly later than the other Vespertilionid bats that share its range. Males appear to be excluded from the colony during the birthing and rearing of the young.

Distribution

The Greater Broad-nosed Bat occurs only along the eastern coastal strip of Queensland and NSW where it is restricted to the coast and adjacent areas of the Great Dividing Range. In NSW it extends as far south as the Bega Plain. They are only found at low altitudes (below 500m).

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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.

Chalinolobus dwyeri, Scoteanax rueppellii, Myotis macropus and *Saccolaimus flaviventris* were not identified on site during fieldwork despite the undertaking of harp trapping and echolocation call recording. The site provided hunting habitat for all of these threatened microchiropteran bat species. Preferred hunting habitat in the form of suitable areas of surface water for *M. macropus* was found to be confined to the drainage line and small dam in the west of the site. Roosting habitat was available in the form of tree hollows and loose bark for *Scoteanax rueppellii* and *Saccolaimus flaviventris.* No preferred roosting habitat for *C. dwyeri* and *M. macropus* in the form of caves and similar man made structures was present on site. However, *M. macropus* has also been known to utilise tree hollows on occasions.

The development will result in a significant reduction in hunting habitat and roosting habitat however is unlikely to cause extinction of the local population of these mobile species within the local area.

It is recommended that compensatory bat nest boxes be erected prior to any work on site to replace the loss of habitat for hollow dependent bats.

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

Not applicable to threatened species.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(iv) 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 to threatened species.

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.

The proposal is likely to result in the disturbance of the site between the 1 in 100 flood level at the west of the site and the mount Vincent Road boundary at the east of the site. This may involve the removal of up to 11.33ha of habitat in the form of Lower Hunter Spotted Gum – Ironbark Forest in the eastern portion of the site and a number of scattered and clumped remnant trees in the western portion of the site. An approximate 0.75ha of corridor spanning the eastern boundary of the site will remain intact to prevent fragmentation and isolation from other areas of habitat. As these species were not recorded on site during the current study and previous study (Wildthing Environmental Consultant, 2009), the proposed development is unlikely to impede the long-term survival of these mobile species.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

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

No Recovery or Threat Abatement Plan has been developed for these microchiropteran bat species. However the Office of Environment and Heritage has prepared Priority Action Statements (PAS) to promote the recovery of this species and the abatement of key threatening processes in NSW. The Priority Action Statement identified a number of broad strategies to help these species recover in NSW. Strategies listed included retaining stands of native vegetation, especially those with hollow-bearing trees (including dead trees), and retain other structures containing bats It is considered that the proposal does not comply with the PAS for these species.

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

The 'Key Threatening Processes' currently listed under Schedule 3 of the TSC Act that are relevant to the site have been listed in bold below followed by an assessment of the applicability of the threatening process in regards to the proposal and the species considered.

- **Clearing of Native Vegetation**: The clearing of vegetation is listed as a major factor contributing to the loss of biological diversity. The removal of native vegetation for the

development is likely to result in a reduction of habitat in the local area and may be viewed as being part of this Key Threatening Process.

- **Predation by the European Red Fox *Vulpes vulpes*:** The Red Fox was recorded within the Lower Hunter Spotted Gum – Ironbark Forest and is considered to have an impact on native fauna in the local area. The proposal is unlikely to result in an increase in the number of this introduced species.
- **Removal of dead wood and dead trees:** Dead wood and dead trees were present within the site particularly within the area of Spotted Gum – Ironbark Forest. A number of dead trees will have to be removed as a result of the development.
- **Loss of hollow-bearing trees:** The proposed development will result in the loss of a number of hollow bearing trees. It is recommended that hollow-bearing trees be avoided where possible and compensatory nestboxes be placed into the nearby area to replace those hollows removed.
- **Predation by the Feral Cat *Felis catus*:** The Feral Cat was not observed within the site during the survey period although it would be considered likely to be having some impact on native fauna in the local area. The proposal is unlikely to increase numbers of this species.

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APPENDIX B

FLORA LIST

KEY

Introduced species are indicated by an asterisk ("*").

Species previously identified by Wildthing Environmental Consultants (2009) are indicated by a hashtag ("#").

Species previously identified (Wildthing Environmental Consultants, 2009) and identified in the current flora surveys are indicated by a hashtag and a caret ("#^").

The following standard abbreviations are used to indicate sspecific taxa:

subsp. -subspecies
var.- variety
× - hybrid between the two indicated species

Threatened Species Conservation Act 1995 (TSC Act)

V Vulnerable
E1 Endangered
E2 Endangered Population
E4A Critically Endangered Population

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

V Vulnerable
E Endangered
CE Critically Endangered

ROTAP (Rare or Threatened Australian Plants)

Distribution

1. – Known from only one collection
2. – Geographic range in Australia less than 100km
3. – Geographic range in Australia greater than 100km.
+ – Also occurs overseas.

Conservation Status

E. – Endangered. Species at risk of disappearing from the wild within 20 years. Includes populations of 100 or less individual plants.
V. – Vulnerable. Species not presently endangered, but at risk over 20-50 years.
R. – Rare in Australia, but not currently under threat. Includes species within a very restricted area or small populations over a wide range.
K. – Poorly known. Accurate knowledge is inadequate.
C. – Reserved. The species has at least one population within a national park or other reserve.

Size of Reserved Populations

a. – 1000 plants or more known within a conservation reserve.
i. – Less than 1000 plants known within a conservation reserve.
- - Reserved population size not accurately known.
t - Total known population reserved.

National Parks and Wildlife Act 1974 - Schedule 13 Protected Native Plants

1 Group 1 **4** Group 4
2 Group 2 **5** Group 5
3 Group 3

Regional Significance (Hunter Rare Plants Database – Version 1 2003)

L endemic to Hunter Region
DA disjunct in the Hunter Region, rare or localized (aggregated)
DB disjunct in the Hunter Region, widespread and uncommon (broad)
R rare but extends beyond the Hunter Region
U everywhere uncommon
N at northern distributional limit in the Hunter
E at eastern distributional limit in the Hunter
S at southern distributional limited in the Hunter
W at western distributional limited in the Hunter
T may be threatened in the Hunter Region
S Probably secure in the Hunter Region

Table B1: List of flora recorded within the site.

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
FILICOPSIDA (Ferns)	**Adiantaceae**						
	#^Adiantum aethiopicum	Common Maidenhair Fern					
	Azollaceae						
	**Azolla pinnata*	Ferny Azolla					
	Dennstaedtiaceae						
	#Pteridium esculentum	Common Bracken Fern					
	Dicksoniaceae						
	#Calochaena dubia	Soft Bracken Fern					
	Schizaeaceae						
	#^Cheilanthes sieberi	Mulga Fern					
MAGNOLIOPSIDA: Subclass MAGNOLIIDAE (Dicotyledons-flowing plants)	**Apiaceae**						
	Hydrocotyle bonariensis						
	Apocynaceae						
	#^Parsonsia straminea	Monkey Rope					
	Asteraceae						
	#Ageratina adenophora	Crofton Weed					
	#^Bidens pilosa	Cobblers Pegs					
	#^Calotis cuneata var. *cuneata*						
	#Cassinia aculeata						
	#^Cirsium vulgare	Black Thistle					
	#Coreopsis lanceolata	Coreopsis					
	#^Cotula australis	Carrot Weed					
	#Cotula coronopifolia	Waterbuttons					
	Cymbonotus lawsonianus	Bears ears					

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	#^Epaltes australis						
	**Facelis retusa*	Annual Trampweed					
	#^Hypochaeris radicata	Flatweed					
	#^ Lagenophora stipitata	Bottle Daisy					
	#Ozothamnus diosmifolium	Everlasting					
	#^Senecio madagascariensis	Fireweed					
	**Sonchus oleraceus*	Common Sow Thistle					
	#Tagetes minuta	Stinking Roger					
	#Vernonia cinerea var. *cinerea*						
	Bignoniaceae						
	#^Pandorea pandorana	Wonga Wonga Vine					
	Cactaceae						
	#^Opuntia stricta	Prickly Pear					
	Campanulaceae						
	#Wahlenbergia communis	Tall Bluebell					
	Caryophyllaceae						
	**Cerastium glomeratum*	Mouse-ear Chickweed					
	Casuarinaceae						
	#Allocasuarina littoralis	Black Sheoak					
	Chenopodiaceae						
	Einadia nutans	Climbing Saltbush					
	Clusiaceae						
	#Hypericum gramineum						
	Convolvulaceae						
	#^Dichondra repens	Kidney Weed					

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	Crassulaceae						
	Bryophyllum delagoense	Mother-of-millions					
	#^Crassula sieberana	Austral Stonecrop					
	Epacridaceae						
	#^Leucopogon juniperinus	Bearded Heath					
	Euphorbiaceae						
	#^Breynia oblongifolia	Breynia					
	#^Glochidion ferdinandi var. *ferdinandi*	Cheese Tree					
	#Poranthera microphylla						
	Fabaceae (Subfamily Faboideae)						
	#^Daviesia ulicifolia	Gorse Bitter Pea					
	#Desmodium rhytidophyllum						
	#^Desmodium varians	Slender tick-trefoil					
	Glycine clandestina	Love Creeper					
	Glycine tabacina						
	#^Hardenbergia violacea	Happy Wonderer					
	#Pultenaea villosa	Hairy Bush Pea					
	#^Trifolium repens	White Clover					
	**Vicia sativa*	Vetch					
	Fabaceae (Subfamily Mimosoideae)						
	#^Acacia elongata						
	#^Acacia falcata	Falcate Wattle					W
	#Acacia longifolia	Sydney Golden Wattle					
	#Acacia myrtifolia	Myrtle Wattle					
	#^Acacia parvipinnula	Silver-stemmed Wattle					WN
	#Acacia ulicifolia	Prickly Moses					
	Goodeniaceae						
	#Goodenia heterophylla subsp. *heterophylla*	Variable-leaved Goodenia					

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	#^Goodenia rotudifolia						S
	Lauraceae						
	#Cassytha pubescens	Common Devils Twine					
	#Cinnamomum camphora	Camphor Laurel					
	Linaceae						
	#Linum marginale	Native Flax					
	Lobeliaceae						
	#^Pratia purpurascens	White Root					
	Loranthaceae						
	#Amyema pendulum						
	#^Dendrophthoe vitellina	Mistletoe					
	Malvaceae						
	#^Sida rhombifolia	Paddy's Lucerne					
	Myrsinaceae						
	#^Rapanea variabilis	Mutton Wood					
	Myrtaceae						
	#^Backhousia myrtlfolia	Grey Myrtle					W
	#Callistemon salignus	Willow Bottlebrush					
	#^Corymbia maculata	Spotted Gum					W
	#Eucalyptus crebra	Narrow-leaved Ironbark					
	#^Eucalyptus fibrosa subsp. *fibrosa*	Broad-leaved Ironbark					
	#^Eucalyptus punctata	Grey Gum					W
	Eucalyptus siderophloia	Grey Ironbark					
	#^Eucalyptus tereticornis	Forest Red Gum					
	#Melaleuca nodosa	Ball Honeymyrtle					

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	Oleaceae						
	#^Ligustrum sinense	Small-leaved Privet					
	#^Notelaea longifolia	Mock Olive					
	#^Olea europaea subsp. *cuspidata*	African Olive					
	Onagraceae						
	Ludwigia peploides	Water Primrose					
	Oxalidaceae						
	Oxalis perennans	Oxalis					
	Pittosporaceae						
	#Billardiera scandens	Apple Dumplings					
	#^Bursaria spinosa	Blackthorn					
	#Pittosproum undulatum	Sweet Pittosporum					
	Plantaginaceae						
	#Plantago debilis	Slender Plantain					
	#^Plantago lanceolata	Plantain					
	Polygonaceae						
	**Rumex crispus*	Curles Dock					
	Primulaceae						
	#^Anagallis arvensis	Scarlet Pimpernel					
	Proteaceae						
	#Hakea sericea	Needlebush					
	Ranunculaceae						
	#^ Clematis aristata	Old Man's Beard					
	Rhamnaceae						

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	#^Alphitonia excelsa	Red Ash					S?
	Rubiaceae						
	#^Opercularia hispida	Stinkweed					
	#^Pomax umbulata	Pomax					
	Rutaceae						
	Acronychia oblongifolia						W
	Asperula conferta	Common Woodruff					
	Santalaceae						
	#Exocarpus cupressiformis	Cherry Ballart					
	Solanaceae						
	#^Solanum mauritianum	Tree Tobacco					
	#^Solanum nigrum	Blackberry Nightshade					
	Solanum prinophyllum	Forest Nightshade					
	Stackhousiaceae						
	#^Stackhousia viminea						
	Thymelaeaceae						
	#Pimelea linifolia subsp. *linifolia*	Rice Flower					
	Verbenaceae						
	#Clerodendrum tomentosum	Hairy Clerodendrum					W
	#^Lantana camara	Lantana					
	#Verbena bonariensis	Purple Topped Verbena					
	Vitaceae						
	#Cayratia sp.	Native Grape					
LILOPSIDA (Monocotyledons)	**Anthericaceae**						

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
Liliidae	*Caesia parviflora*	Pale Grass Lily					
	Commelinaceae						
	#^Commelina cyanea						
	Cyperaceae						
	#^Bolboschoenus caldwellii						
	#Carex appressa						
	#^Carex longebrachiata						W
	#Lepidosperma laterale	Variable Sword-sedge					
	Schoenoplectus validus.						
	Hydrocharitaceae						
	Ottelia ovalifolia	Swamp Lily					
	Iridaceae						
	#^Romulea rosea	Onion Grass					
	Juncaceae						
	**#^Juncus acutus*	Spiny Rush					
	Juncus cognatus						
	#^Juncus usitatus	Common Rush					
	Juncaginaceae						
	#Triglochin striata	Streaked Arrow-grass					
	Lomandraceae						
	Lomandra confertifolia	Mat-rush					
	Lomandra filiformis	Wattle Mat-rush					
	#Lomandra glauca	Pale Mat-rush					N
	Lomandra gracilis						
	#Lomandra longifolia	Spiny Mat Rush					
	#Lomandra multiflora subsp. *multiflora*						

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	Luzuriagaceae						
	Eustrephus latifolius	Wombat Berry					W
	Orchidaceae						
	#^Caladenia catenata	White Fingers					W
	#Dendrobium aemulum	Ironbark Orchid					
	Pterostylis concinna	Trim Greenhood					
	#Pterostylis sp.	Greenhood					
	Phormiaceae						
	#^Dianella caerulea var. *caerulea*	Blue Flax-lily					W
	Poaceae						
	#Andropogon virginicus	Whisky Grass					
	#Anisopogon avenaceus	Oat Speargrass					N
	#^Aristida ramosa	Purple Wiregrass					W?
	#^Aristida vargans	Three-awn Grass					
	**#^Axonopus fissifolius*	Narrow-leaved Carpet Grass					
	#Briza maxima	Quaking Grass					
	#Cortaderia selloana	Pampas Grass					
	#^Cymbopogon refractus	Barbed Wire Grass					
	#^Cynodon dactylon	Common Couch					
	#Dichelachne micrantha	Plume Grass					
	#^Digitaria parviflora	Smallflower Fingergrass					
	#^Echinopogon caespitosus var. *caespitosus*	Hedgehog Grass					
	#^Ehrharta erecta	Panic Veldgrass					
	#^Entolasia marginata						
	#^Entolasia stricta						
	#^Eragrostis brownii	Browns Love Grass					
	#Imperata cylindrica var. *major*	Blady Grass					W?
	#^Microlaena stipoides var. *stipoides*	Weeping Meadow Grass					

CLASS	SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	ROTAP	NPW ACT	REGIONALLY SIGNIFICANT
	#^Oplismenus imbecllis	Basket Grass					
	Panicum effusum	Hairy Panic					
	#Panicum simile	Two Colour Panic					
	#Paspalum distichum	Water Couch					
	#Paspalum urvillei						
	**Pennisetum clandestinum*	Kikuyu Grass					
	#^Rytidosperma tenuius	Wallaby Grass					
	#^Setaria gracilis	Slender Pigeon Grass					
	Sporobolus africanus	Parramatta Grass					
	#^Themeda australis	Kangaroo Grass					
	Smilacaceae						
	#Smilax glyciphylla	Native Sarsaparilla					
	Typhaceae						
	Typha orientalis	Cumbungi					

APPENDIX C

VEGETATION TRANSECT & QUADRAT DATA

C1.0 TRANSECT METHODOLOGY

Three walking transects were undertaken within the bounds of the site to provide detail on the floral assemblages occurring therein. The location of the transects is shown in Figure C1.

* - Introduced species

Transect 1

Community – Constructed dam and Cleared Open Pasture with scattered remnant trees

Date: 30 July 2015
Length: 100m
Aspect: South-West
Location: E – 366132, N – 6373287 to E – 366054, N – 6373354

Species Recorded:

Eucalyptus tereticornis	Forest Red Gum
**Senecio madagascariensis*	Fireweed
Azolla pinnata	Ferny Azolla
Typha orientalis	Broadleaf Cumbungi
Ludwigia peploides	Water Primrose
Juncus usitatus	
Cirsium vulgare	Black Thistle
Microlaena stipoides	Weeping Grass
Oxalis perennans	Oxalis
**Hypochaeris radicata*	Flatweed
Einadia nutans	Climbing Saltbush
Cotula australis	Carrot Weed
Anagallis arvensis	Scarlett Pimpernel
**Cerastium glomeratum*	Mouse-ear Chickweed
Lagenophora stipitata	Bottle-daisy
Cymbonotus lawsonianus	Bears ears
Cynodon dactylon	Common Couch
**Trifolium repens*	White Clover
**Facelis retusa*	Annual Trampweed
**Sida rhombifolia*	Paddy's Lucerne
Pratia purpurascens	White Root
**Solanum nigrum*	Blackberry Nightshade
Cymbopogon refractus	Barbed Wire Grass
Lomandra filiformis	Wattle Mat-rush

Number of species: 24

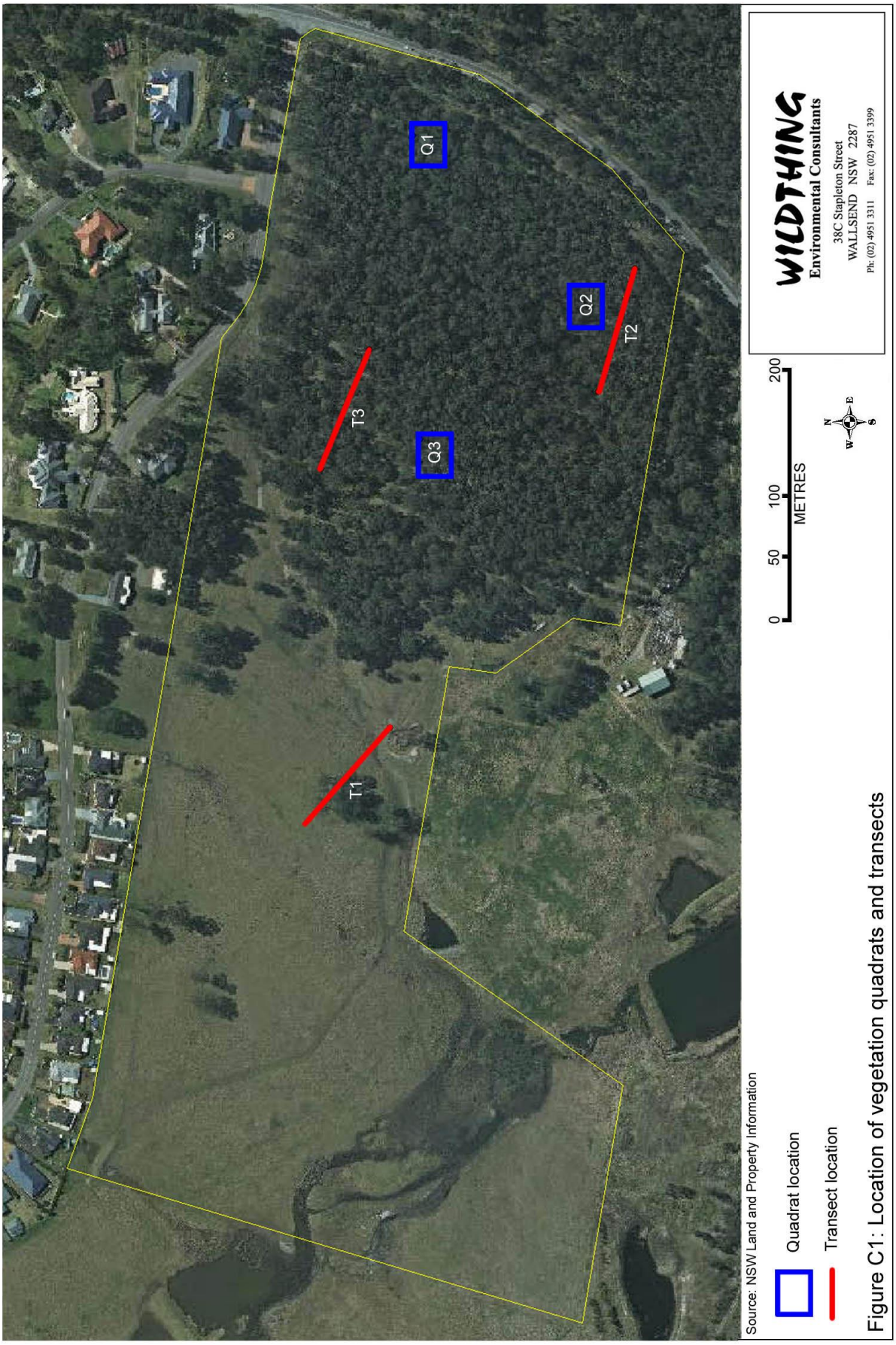

Figure C1: Location of vegetation quadrats and transects

Transect 2 -

Community – Lower Hunter Spotted Gum – Ironbark Forest

Date: 30 July 2015
Length: 100m
Aspect: South-West
Location: E – 366328, N – 6373342 to E – 366418, N – 6373306

Species Recorded:

Bursaria spinosa	Boxthorn
**Lantana camara*	Lantana
Eucalyptus fibrosa	Broad-leaved Ironbark
Dichondra repens	Kidney Weed
Pratia purpurascens	White Root
**Senecio madagascariensis*	Fireweed
Glycine clandestina	Love Creeper
Entolasia stricta	
Microlaena stipoides	Weeping Grass
Leucopogon juniperinus	Bearded Heath
Corymbia maculata	Spotted Gum
Cheilanthes sieberi	Mulga Fern
Cymbonotus lawsonianus	Bears ears
Echinopogon caespitosus var. *caespitosus*	Hedgehog Grass
Dianella caerulea var. *caerulea*	Blue Flax Lily
Cymbopogon refractus	Barbed Wire Grass
Lomandra filiformis	Wattle Mat-rush
Goodenia rotundifolia	
**Plantago lanceolata*	Plantago
**Opuntia stricta*	Prickly Pear
Breynia oblongifolia	Breynia
Lagenophora stipitata	Bottle-daisy
Cotula australis	Carrot Weed
Daviesia ulicifolia	Gorse Bitter Pea
Pomax umbulata	Pomax
**Cerastium glomeratum*	Mouse-ear Chickweed
**Bidens pilosa*	Cobblers Pegs
**Olea europaea* subsp. *cuspidata*	African Olive

Number of species: 28

Transect 3

Community – Lower Hunter Spotted Gum – Ironbark Forest

Date: 30 July 2015
Length: 100m
Aspect: South-West
Location: E – 366387, N – 6373132 to E – 366480, N – 6373106

Species Recorded:

Eucalyptus punctata	Grey Gum
Corymbia maculata	Spotted Gum
**Lantana camara*	Lantana
Bursaria spinosa	Blackthorn
Leucopogon juniperinus	Bearded Heath
Dichondra repens	Kidney Weed
Glycine clandestina	Love Creeper
Eucalyptus fibrosa	Broad-leaved Ironbark
Solanum prinophyllum	Forest Nightshade
**Senecio madagascariensis*	Fireweed
Desmodium varians	Slender tick-trefoil
Pratia purpurascens	White Root
Oxalis perennans	Oxalis
Hardenbergia violacea	Happy Wonderer
Commelina cyanea	Native Wondering Jew
Breynia oblongifolia	Breynia
**Plantago lanceolata*	Plantago
Cheilanthes sieberi	Mulga Fern
Eucalyptus tereticornis	Forest Red Gum
**Hypochaeris radicata*	Flatweed
Lomandra confertifolia	Mat-rush
Goodenia rotundifolia	
Oplismenus imbecllis	Basket Grass
Dianella caerulea var. *caerulea*	Blue Flax Lily
Daviesia ulicifolia	Gorse Bitter Pea
Acacia parvipinnula	Silver-stemmed Wattle
Cymbopogon refractus	Barbed Wire Grass
Themeda triandra	Kangaroo Grass
Panicum effusum	Hairy Panic

Number of species: 29

C2.0 QUADRAT METHODOLOGY

One quadrat-based vegetation survey was undertaken within the site to provide additional detail on the flora assemblages present (Figure D1). The plot was 20 × 20m in area. All species observed within the plot were recorded, with the dominant species in each stratum being duly noted. A modified Braun-Blanquet 6-point scale (Braun-Blanquet 1927, with selected modifications sourced from Poore 1955 and Austin *et al*. 2000) was used to estimate cover-abundances of all plant species within each plot. The cover-abundance categories are shown in Table D1.

Table C1: Modified Braun-Blanquet Crown Cover-abundance Scale

Class	Cover - Abundance	Notes
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: < 5 individuals Shrubs and small trees: 5 or more individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: 5 or more individuals Medium-large over hanging tree
3	5 – < 20% cover	-
4	20 – < 50% cover	-
5	50 – < 75% cover	-
6	75 – 100% cover	-

* - Introduced species

Quadrat 1

Community – Lower Hunter Spotted Gum – Ironbark Forest

Date: 30 July 2015
Plot: 20 × 20m.
Location North-East corner: E – 366580, N – 6373275
Aspect: South-West
Slope: 5°
Geology: Sandy Clay Loam
Litter: 25%
Rock: 0%
Lichen: <5%
Non Vs. Plants: 0%
Dead wood: 5%
Comments: Scats belonging to Eastern-Grey Kangaroo and Cattle were present within the quadrat.
Structural Components:

Canopy	(to 20m)	%coverage = 65%
Mid-storey	(to 10m)	%coverage = 10%
Shrub	(< 2m)	%coverage = 20%
Ground Cover	(< 1m)	%coverage = 70%

Species Recorded:

Upper Stratum Dominants:		
Corymbia maculata	Spotted Gum	3
Mid-storey Dominants:		
Corymbia maculata	Juvenile Spotted Gum	3
Shrub Layer Dominants:		
**Lantana camara*	Lantana	2
Bursaria spinosa	Boxthorn	2
Ground Cover Dominants:		
Entolasia stricta		2
Pratia purpurascens	White Root	2
Dichondra repens	Kidney Weed	2
Additional Species Recorded:		
Eucalyptus fibrosa	Broad-leaved Ironbark	1
Eucalyptus punctata	Grey Gum	1
Leucopogon juniperinus	Bearded Heath	2
Cheilanthes sieberi	Mulga Fern	2
Themeda triandra	Kangaroo Grass	2
Acacia elongata	Swamp Wattle	1
Oxalis perennans	Oxalis	1
Microlaena stipoides	Weeping Grass	2
Hardenbergia violacea	Happy Wonderer	1
Lomandra filiformis	Wattle Mat-rush	1
**Plantago lanceolata*	Plantago	2
Echinopogon caespitosus var. *caespitosus*	Hedgehog Grass	2
Solanum prinophyllum	Forest Nightshade	2
Breynia oblongifolia	Breynia	1
Rytidosperma tenuius	Wallaby Grass	1

Caladenia catenata	White Fingers	2
Daviesia ulicifolia	Gorse Bitter Pea	1
Pterostylis concinna	Trim Greenhood	2
Pandorea pandorana	Wonga Wonga Vine	1
Lagenophora stipitata	Bottle-daisy	1
**Cerastium glomeratum*	Mouse-ear Chickweed	1
Goodenia rotundifolia		2
Glycine clandestina	Glycine	1
Daviesia ulicifolia	Gorse Bitter Pea	1

Number of species: 31

Quadrat 2

Community – Lower Hunter Spotted Gum – Ironbark Forest

Date: 5 August 2015
Plot: 20 × 20m.
Location North-East corner: E – 366450, N – 6373120
Aspect: South-West
Slope: 5°.
Geology: Sandy Clay Loam
Litter: 40%
Rock: <5%
Lichen: 0%
Non Vs. Plants: 0%
Dead Wood: 5%
Comments: Scats belonging to Glider, Eastern-Grey Kangaroo and Cattle were present within the quadrat. White-wash from roosting birds was also present. Just outside of quadrat were specimens of *Eucalyptus punctata* (Grey Gum) and *Eustrephus latifolius* (Wombat Berry). Two Koala feed trees (*Eucalyptus* tereticornis) out of 30 trees were present.
Structural Components:

Canopy	(to 20m)	%coverage = 30%
Mid-storey	(to 10m)	%coverage = 10%
Shrub	(< 2m)	%coverage = 20%
Ground Cover	(< 1m)	%coverage = 40%

Species Recorded:

Upper Stratum Dominants:		
Corymbia maculata	Spotted Gum	4
Mid-storey Dominants:		
Corymbia maculata	Juvenile Spotted Gum	2
Shrub Layer Dominants:		
Bursaria spinosa	Boxthorn	3
Ground Cover Dominants:		
Entolasia stricta		3
Microlaena stipoides	Weeping Grass	3
Additional Species Recorded:		
Eucalyptus siderophloia	Grey Ironbark	2
Eucalyptus tereticornis	Forest Red Gum	1
**Lantana camara*	Lantana	2
Notelaea longifolia	Mock Olive	1
Leucopogon juniperinus	Bearded Heath	1
Breynia oblongifolia	Breynia	2
Acacia parvipinnula	Silver-stemmed Wattle	1
Daviesia ulicifolia	Gorse Bitter Pea	2
Aristida vagans	Threeawn Speargrass	1
Lomandra filiformis	Wattle Mat-rush	2
Dichondra repens	Kidney Weed	3
Lagenophora stipitata	Bottle-daisy	2
Pratia purpurascens	White Root	3

Cheilanthes sieberi	Mulga Fern	2
Dianella caerulea var. *caerulea*	Blue Flax Lily	1
Caladenia catenata	White Fingers	2
Cymbopogon refractus	Barbed Wire Grass	1
**Hypochaeris radicata*	Flatweed	1
Digitaria parviflora	Small-flower Fingergrass	1
Glycine tabacina		
Glycine clandestina	Love Creeper	1
Hardenbergia violacea	Happy Wonderer	1
Solanum prinophyllum	Forest Nightshade	1
**Senecio madagascariensis*	Fireweed	1
Vernonia cinerea var. *cinerea*		1
Epaltes australis		1
Oxalis perennans	Oxalis	1
Acacia elongata	Swamp Wattle	1
Eragrostis brownii	Brown's Lovegrass	2
Lomandra gracilis		1
**Sonchus oleraceus*	Common Sow Thistle	1
Entolasia marginate	Boarded Panic	1
Goodenia rotundifolia		1
**Pennisetum clandestinum*	Kikuyu Grass	1
Glochidion ferdinandi var. *ferdinandi*	Cheese Tree	1

Number of species: 40

Quadrat 3

Community – Lower Hunter Spotted Gum – Ironbark Forest

Date: 5 August 2015
Plot: 20 × 20m.
Location North-East corner: E – 366350, N – 6373267
Aspect: South-West
Slope: 5°.
Geology: Sandy Clay Loam
Litter: 45%
Rock: <5%
Lichen: 0%
Non Vs. Plants: 0%
Dead Wood: 5%
Comments: Scats belonging to Rabbit, Eastern-Grey Kangaroo and Cattle were present within the quadrat. White-wash from roosting birds was also present.
Structural Components:

Canopy	(to 20m)	%coverage = 30%
Mid-storey	(to 10m)	%coverage = 5%
Shrub	(< 2m)	%coverage = 15%
Ground Cover	(< 1m)	%coverage = 30%

Species Recorded:

Upper Stratum Dominants:		
Corymbia maculata	Spotted Gum	3
Mid-storey Dominants:		
Corymbia maculata	Juvenile Spotted Gum	1
Shrub Layer Dominants:		
Bursaria spinosa	Boxthorn	2
Ground Cover Dominants:		
Aristida vagans	Threeawn Speargrass	3
Additional Species Recorded:		
Eucalyptus siderophloia	Grey Ironbark	3
Leucopogon juniperinus	Bearded Heath	1
Daviesia ulicifolia	Gorse Bitter Pea	2
Entolasia stricta		2
Pratia purpurascens	White Root	3
Lomandra filiformis	Wattle Mat-rush	2
Goodenia rotundifolia		2
Lagenophora stipitata	Bottle-daisy	1
Cheilanthes sieberi	Mulga Fern	2
Lomandra multiflora		1
Pomax umbulata	Pomax	1
Solanum prinophyllum	Forest Nightshade	1
Cymbopogon refractus	Barbed Wire Grass	2
Vernonia cinerea var. *cinerea*		1
Acacia falcata		1
Glycine clandestina	Glycine	1

**Lantana camara*	Lantana	2
Solanum prinophyllum	Forest Nightshade	1
Juncus cognatus		1
Hardenbergia violacea	Happy Wonderer	1
**Senecio madagascariensis*	Fireweed	1
Acacia parvipinnula	Silver-stemmed Wattle	1
Pandorea pandorana	Wonga Wonga Vine	1
Lomandra gracilis		1
Calotis cuneata var. *cuneata*		1
Desmodium varians	Slender tick-trefoil	1
Microlaena stipoides	Weeping Grass	2
Oxalis perennans	Oxalis	1
**Plantago lanceolata*	Plantago	1

Number of species: 33

APPENDIX D

DETAILS OF HABITAT TREES

Habitat Tree Data Key for Table D1.

- **DBH** – Diameter at Breast Height. Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape used which assumes a circular cross section.
- **Tree Height** – Estimated with the use of an inclinometer and rangefinder (metres).
- **Coordinates - GDA - 1994**
- **The classification system employed involved four classes:**

  Class 1 – very large sized hollow openings (i.e. >20cm) suitable for species such as Owls

  Class 2 – large sized hollow openings (i.e. 15-20cm) suitable for species such as Owls and Possums

  Class 3 – medium sized hollow-openings (i.e. 5-15cm) suitable for species such as Gliders and Possums

  Class 4 – small sized hollow openings (i.e. <5cm) suitable for species such as microchiropteran bats.

Spout: Hollow opening towards sky offering little protection from the weather.

Table D1: Results of the Habitat Tree Survey.

Tree No.	Species	COORDINATES GDA – 94 E	COORDINATES GDA – 94 N	DBH (m)	Height (m)	Habitat/Hollows
1	*Eucalyptus fibrosa* (Broad-leaved Ironbark)	366467	6373084	0.7	17	3 x Class 3 3 x Class 4
2	*Corymbia maculata* (Spotted Gum)	366454	6373095	0.75	20	2 x Class 3
3	Dead Tree	366457	6373095	0.1	5	1 x Class 3 spout
4	Dead Tree	366451	6373099	0.15	4	1 x Class 3 1 x Class 4
5	*Eucalyptus punctata* (Grey Gum)	366432	6373084	0.3	14	1 x Class 3
6	*C. maculata*	366417	6373097	0.55	18	2 x Class 3 4 x Class 4
7	Dead Tree	366417	6373103	0.1	8	1 x Class 4
8	Dead Tree	366411	6373100	0.2	12	1 x Class 4
9	*C. maculata*	366380	6373088	0.65	19	1 x Class 1 1 x Class 4
10	*E. punctata*	366371	6373094	0.45	20	1 x Class 4
11	*C. maculata*	366391	6373121	0.5	22	1 x Class 3
12	Dead Tree	366397	6373124	0.7	10	2x Class 1 1 x Class 2
13	*E. punctata*	366402	6373131	0.35	16	2 x Class 4
14	*E. punctata*	366404	6373134	1.1	20	3 x Class 2 3 x Class 3
15	Dead Tree	366413	6373135	0.3	6	2 x Class 4
16	*E. punctata*	366418	6373140	0.5	18	2 x Class 4
17	*E. punctata*	366418	6373142	0.2	9	1 x Class 3
18	*E. punctata*	366420	6373157	0.4	15	3 x Class 3 3 x Class 4
19	Dead Tree	366432	6373155	0.6	7	1 x Class 1
20	Dead Tree	366433	6373154	0.2	7	1 x Class 3
21	*E. punctata*	366444	6373150	0.25	11	1 x Class 3 1 x Class 4
22	Dead Tree	366431	6373137	0.15	7	1 x Class 3

Tree No.	Species	COORDINATES GDA – 94 E	COORDINATES GDA – 94 N	DBH (m)	Height (m)	Habitat/Hollows
						2 x Class 4
23	*E. punctata*	366432	6373130	0.3	16	1 x Class 4
24	*C. maculata*	366449	6373115	0.7	18	1 x Class 2 2 x Class 3 2 x Class 4
25	*C. maculata*	366472	6373109	0.6	18	2 x Class 3
26	Dead Tree	366479	6373093	0.4	13	1 x Class 2 1 x Class 3 1 x Class 4
27	*E. fibrosa*	366477	6373066	0.55	10	5 x Class 3 1 x Class 4
28	*C. maculata*	366507	6373092	0.55	15	1 x Class 3 1 x Class 4
29	Dead Tree	366512	6373100	0.45	13	5 x Class 3 4 x Class 4
30	*C. maculata*	366531	6373122	0.65	18	2 x Class 3
31	*E. fibrosa*	366560	6373143	0.8	20	2 x Class 4?
32	*C. maculata*	366574	6373162	0.6	20	1 x Class 2 1 x Class 4
33	*Eucalyptus tereticornis* (Forest Red Gum)	366574	6373175	0.45	16	2 x Class 3 2 x Class 4
34	*C. maculata*	366592	6373183	0.6	21	4 x Class 3
35	*E. fibrosa*	366607	6373202	0.75	18	1 x Class 3 2 x Class 4
36	*E. fibrosa*	366596	6373214	0.7	22	1 x Class 1 spout 1 x Class 4
37	*C. maculata*	366623	6373227	0.8	22	2 x Class 4
38	*E. punctata*	366619	6373247	0.9	18	1 x Class 1 2 x Class 2 3 x Class 3 Old broken duck egg at base of tree
39	*C. maculata*	366635	6373261	0.7	18	2 x Class 3 1 x Class 4
40	*C. maculata*	366641	6373295	0.65	22	2 x Class 3

Tree No.	Species	COORDINATES GDA – 94 E	COORDINATES GDA – 94 N	DBH (m)	Height (m)	Habitat/Hollows
41	*C. maculata*	366633	6373309	0.7	20	1 x Class 1 2 x Class 3
42	Dead Tree	366598	6373282	0.6	15	1 x Class 1 spout 1 x Class 2 1 x Class 3
43	*E. punctata*	366601	6373267	0.8	20	1 x Class 1 2 x Class 2 3 x Class 3
44	*E. punctata*	366600	6373250	0.8	18	2 x Class 1 2 x Class 3
45	*E. fibrosa*	366573	6373257	0.65	22	1 x Class 2 ? 1 x Class 3 1 x class 4
46	*E. fibrosa*	366547	6373262	0.7	21	1 x class 3 1 x Class 4
47	Dead Tree	366521	6373257	0.4	14	3 x Class 4
48	*E. fibrosa*	366532	6373257	0.95	22	2 x Class 3 2 x Class 4
49	*C. maculata*	366563	6373228	0.75	20	1 x Class 3
50	*C. maculata*	366567	6373217	0.6	20	1 x Class 2 2 x Class 3
51	*C. maculata*	366551	6373183	0.7	20	2 x Class 3 1 x Class 4
52	Dead Tree	366536	6373196	0.7	11	1 x Class 1 spout
53	*C. maculata*	366541	6373210	0.5	18	2 x Class 3 1 x Class 4
54	Dead Tree	366544	6373210	0.3 + 0.4	13	4 x Class 4
55	Dead Tree	366525	6373205	0.5	14	2 x Class 2 2 x Class 3 1 x Class 4 Arboreal Termite Nest
56	*C. maculata*	366507	6373213	0.75	15	2 x Class 4
57	Dead Tree	366494	6373170	0.5	4	1 x Class 1
58	*E. fibrosa*	366488	6373160	0.5	17	1 x Class 3

Tree No.	Species	COORDINATES GDA – 94 E	COORDINATES GDA – 94 N	DBH (m)	Height (m)	Habitat/Hollows
						2 x Class 4
59	Dead Tree	366464	6373167	0.45	8	1 x Class 2 1 x Class 3
60	*E. fibrosa*	366454	6373154	0.6 + 0.6	20	2 x Class 3 3 x class 4
61	*E. punctata*	366389	6373206	0.8	16	3 x Class 3 3 x Class 4
62	Dead Tree	366427	6373212	0.35	3	1 x Class 1 spout 1 x Class 1 base
63	Dead Tree	366428	6373239	0.7	18	2 x Class 1 2 x Class 2 3 x Class 3 1 x Class 4
64	Dead Tree	366461	6373244	0.55	16	1 x Class 1
65	*E. fibrosa*	366473	6373253	0.7	20	3 x Class 3 2 x Class 4
66	Dead Tree	366542	6373326	0.7	20	1 x Class 1 1 x Class 2 5 x Class 3 2 x Class 4
67	*C. maculata*	366535	6373328	0.7	20	3 x Class 3
68	*E. fibrosa*	366428	6373374	0.2	14	1 x Class 1 scar from base 2 x Class 1 1 x Class 2
69	Dead Tree	366408	6373338	0.9	6	2 x Class 1
70	*E. punctata*	366323	6373425	1.0	18	2 x Class 1 1 x Class 2
71	*C. maculata*	366311	6373421	0.9	22	1 x Class 1 1 x Class 2 2 x Class 3 1 x Class 4
72	*E. fibrosa*	366199	6373435	0.9	25	1 x Class 3 1 x Class 4
73	*C. maculata*	366171	6373439	1.2	25	1 x Class 1

Tree No.	Species	COORDINATES GDA – 94 E	COORDINATES GDA – 94 N	DBH (m)	Height (m)	Habitat/Hollows
						1 x Class 2 with bees
74	*C. maculata*	365993	6373458	1.3	30	2 x Class 1 2 x Class 2
75	*C. maculata*	365981	6373475	1.1	30	2 x Class 1 1 x Class 2
76	*E. punctata*	365943	6373425	0.9	28	1 x Class 1 spout 2 x Class 3
77	*C. maculata*	365927	6373424	1.0	28	1 x Class 1 1 x Class 2 2 x Class 3 1 x Class 4
78	*E. tereticornis*	366055	6373303	0.7	18	2 x Class 3
79	*C. maculata*	366203	6373297	0.9	30	1 x Class 2 1 x Class 3
80	*C. maculata*	366218	6373229	1.0	30	4 x Class 3 1 x Class 4
81	Dead Tree	366241	6373253	0.5	18	1 x Class 1 1 x Class 2 2 x Class 3
82	*C. maculata*	366287	6373114	0.9	25	1 x Class 1 1 x Class 2 3 x Class 3
83	*E. punctata*	366272	6373115	0.9	25	2 x Class 2 1 x Class 3
84	*E. punctata*	366270	6373127	1.0	30	2 x Class 1 2 x Class 3
85	Dead Tree	366263	6373161	0.8	15	3 x Class 1 1 x Class 2
86	Dead Tree	366263	6373162	0.75	20	2 x Class 2 5 x Class 3 2 x Class 4
87	*C. maculata*	366265	6373195	1.1	30	1 x Class 1 spout 2 x Class 1 2 x Class 2

Tree No.	Species	COORDINATES GDA – 94 E	COORDINATES GDA – 94 N	DBH (m)	Height (m)	Habitat/Hollows
						4 x Class 3
88	*E. fibrosa*	366265	6373289	0.7	30	1 x Class 2 scar 2 x Class 4
89	*C. maculata*	366258	6373303	0.8	30	1 x Class 1 scar 2 x Class 3
90	*C. maculata*	366241	6373341	0.85	30	1 x Class 1 1 x Class 2 2 x Class 3
91	Dead Tree	366292	6373342	1.0	20	1 x Class 1 2 x Class 2 5 x Class 3
92	*E. fibrosa*	366365	6373305	0.8	25	3 x Class 3
93	*E. fibrosa*	366366	6373228	0.75	25	1 x Class 1 ? 3 x Class 3
94	*C. maculata*	366380	6373277	0.3 + 0.7	22	1 x Class 1 spout ? 3 x Class 4
95	Dead Tree	366362	6373240	0.5	4	1 x Class 1 with Lomandra
96	Dead Tree	366364	6373230	0.55	8	1 x Class 1 spout 1 x Class 2 base 1 x Class 3 Hollow throughout
97	*E. punctata*	366340	6373147	0.65	18	2 x Class 1 1 x Class 3

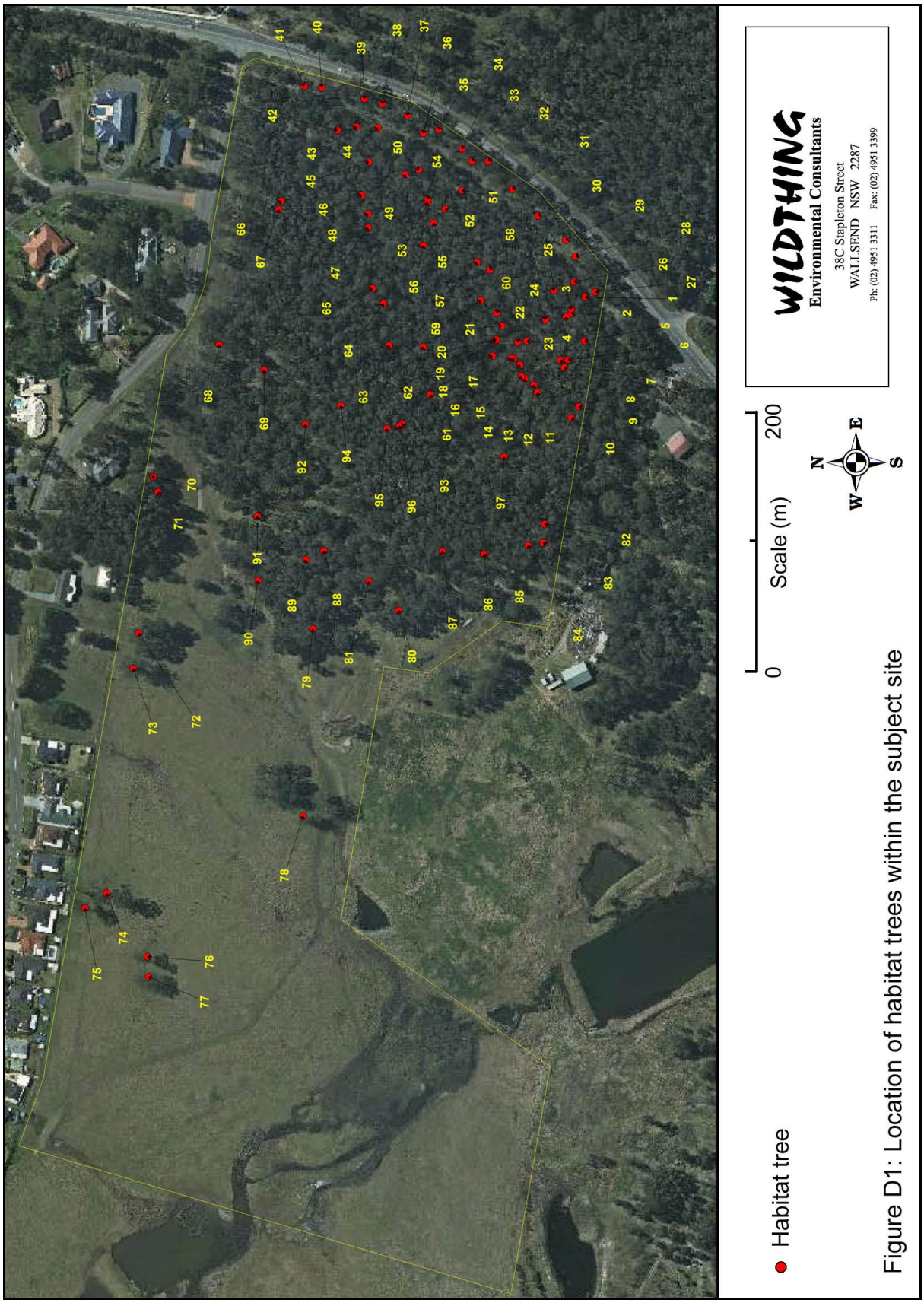

Figure D1: Location of habitat trees within the subject site

APPENDIX E

TOTAL FAUNA LIST

KEY

Family sequencing and taxonomy follow for each fauna class:
Herpetofauna
Cogger (2014).

Birds
Pizzey and Knight (2012)(9th edn).

Mammals - Van Dyck & Strahan (Ed) (2008) and Churchill (2008).

Churchill, S. (2008). *Australian Bats*. (2nd edn.). Allen & Unwin Australia.

Species identified without certainty or to a Genus level only are indicated by a question mark ("?").

Introduced species are indicated by an asterisk ("*").

Species previously identified by Wildthing Environmental Consultants (2009) are indicated by a hashtag ("#").

Species previously identified (Wildthing Environmental Consultants, 2009) and identified in the current fauna surveys are indicated by a hashtag and a caret ("#^").

Threatened species addressed within this assessment appear in **bold** font.

The following standard abbreviations are used to indicate subspecific taxa:

subsp. - subspecies
var.- variety
× - hybrid between the two indicated species

Threatened Species Conservation Act 1995 (TSC Act)

V Vulnerable
E1 Endangered
E2 Endangered Population
E4A Critically Endangered Population

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

V **Vulnerable**
E **Endangered**
CE **Critically Endangered Population**

Regionally Significant Fauna Species.

+ Region includes Gosford, Wyong, Cessnock, Maitland, Lake Macquarie, Newcastle and Port Stephens LGA's. Produced from Stage 1 of the LHCCREMS – Regional Biodiversity Conservation Strategy.

Observation Type

O - Observed (sighted)	**R** – Road Kill	**F** – Tracks, scratching
W - Heard call	**D** – Dog Kill	**Z** – In raptor/owl Pellet
OW – Observed and heard call	**Q** – Camera	**U** – Ultrasonic recording
X - In scat	**C** – Cat Kill	**M** - Miscellaneous
P – Scat	**V** – Fox Kill	**E** – Nest/roost
T - Trapped or netted	**K** – Dead	**B** - Burnt
H – Hair, feathers or skin	**S** – Shot	**Y** – Bones, teeth or shell
A - Stranded/Beached	**I** – Fossil/subfossil	**N** – Not located
G – Crushed cones	**FB** – Burrow	**AR** – Acoustic Recording

Vegetation Community Types within the study area

1. Lower Hunter Spotted Gum – Ironbark Forest
2. Cleared Open Pasture with scattered remnant trees
3. Freshwater Drainage Line Vegetation

Table E1: Table of fauna recorded on site

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
Phylum - Chordata						
Subphylum - Vertebrata						
Class Amphibia - Amphibians						
Order Salientia - Frogs						
Family Myobatrachidae - 'Southern Frogs'						
#^Crinia signifera	Common Eastern Froglet				W	3
#^Limnodynastes peronii	Striped Marsh Frog				O	2
Family Hylidae - Tree Frogs						
#^Litoria fallax	Eastern Dwarf Tree Frog				O	3
#Litoria verreauxii verreauxii	Verreaux's Tree Frog					
Order Squamata – Lizards and Snakes						
Suborder Sauria - Lizards						
Family Agamidae - Dragons						
#Pogona barbata	Eastern Bearded Dragon			+		
Family Varanidae - Monitors						
#Varanus varius	Lace Monitor					
Family Scinidae - Skinks						
#Carlia tetradactyla	Southern Rainbow Skink			+		
#Cryptoblepharus virgatus	Wall Lizard					
#^Lampropholis delicate	Grass Skink				O	1

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
Class Aves - Birds						
Family Anatidae - Ducks, Swans and Geese						
Anas castanea	Chestnut Teal					
#^Anas superciliosa	Pacific Black Duck				O	3
#^Chenonetta jubata	Australian Wood Duck				OW	1, 2, 3
Family Columbidae - Pigeons, Doves						
#Ocyphaps lophotes	Crested Pigeon					
Family Phalacrocoridae - Cormorants						
#Phalacrocorax fuscescens	Pied Cormorant					
Phalacrocorax sulcirostris	Little Black Cormorant					
Family Ardeidae - Herons, Egrets and Bitterns						
#Ardea pacifica	White-necked Heron					
#^Egretta novaehollandiae	White-faced Heron				O	3
Ardea intermedia	Intermediate Egret					
Family Avocet - Stilts						
Himantopus himantopus	Black-winged Stilt				OW	3
Family Threskiornithidae - Ibises and Spoonbills						
#^Threskiornis molucca	Australian Ibis				O	2,3
Threskiornis spinicollis	Straw-necked Ibis					1, 2, 3
Family Accipitridae - Osprey, Hawks, Eagles and Harriers						
Haliastur sphenurus	Whistling Kite				O	1,2
Family Falconidae - Falcons						
#Falco cenchroides	Nankeen Kestrel					
Family Rallidae - Crakes, Rails and Gallinules						

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
#Porphyrio porphyrio	Purple Swamphen					
Family Charadriidae - Plovers, Dotterels and Lapwings						
#^Elseyornis melanops	Black-fronted Dotterel				O	3
#^Vanellus miles	Masked Lapwing				OW	3
Family Cacatuidae - Cockatoos and Corellas						
#^Cacatua galerita	Sulphur-crested Cockatoo				OW	1
#^Cacatua roseicapilla	Galah				OW	1
#^Cacatua sanguinea	Little Corella				OW	2
#^Calyptorhyncus funereus	Yellow-tailed Black-Cockatoo				OW	1
Family Psittacidae - Parrots, Rosellas and Lorikeets						
#Alisterus scapularis	King Parrot					
#Psephotus haematonotus	Red-rumped Parrot					
#^Platycercus eximius	Eastern Rosella				OW	1
#Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet					
#^Trichoglossus haematodus	Rainbow Lorikeet				OW	1
Family Cuculidae - Cuckoos						
#Scythrops novaehollandiae	Channel-billed Cuckoo					
Family Halcyonidae - Tree Kingfishers						
#^Dacelo novaeguineae	Laughing Kookaburra				OW	1
#Todiramphus sanctus	Sacred Kingfisher					
Family Coraciidae - Rollers 'Dollarbirds						
#Eurystomus orientalis	Dollarbird					
Family Maluridae						
#Malurus cyaneus	Superb Fairy-wren					
Family Pardalotidae - Pardalotes, Gerygones,						

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
Scrubwrens, Heathwrens and Thornbills						
#Acanthiza nana	Yellow Thornbill					
#^Gerygone olivacea	White-throated Gerygone				OW	1
#^Pardalotus punctatus	Spotted Pardalote				W	1
#^Pardalotus striatus	Striated Pardalote				W	1
Family Meliphagidae - Honeyeaters						
#^Acanthorhynchus tenuirostris	Eastern Spinebill				OW	1
#^Lichenostomus chrysops	Yellow-faced Honeyeater				OW	1
#^Manorina melanocephala	Noisy Miner				OW	1,2,3
#Philemon corniculatus	Noisy Friarbird					
Family Petroicidae - Robins and Jacky Winter						
#Eopsaltria australis	Eastern Yellow Robin					
#Microeca leucophaea	Jacky Winter (Brown Flycatcher)					
Petroica rosea	Rose Robin				O	1
Family Pachycephalidae - Whistlers, Shrike-tit and Shrike-thrushes						
#^Pachycephala pectoralis	Golden Whistler				OW	1
Family Dicruridae - Monarchs, Flycatchers, Fantails, Drongo and Magpie-Lark						
#^Rhipidura albiscapa	Grey Fantail				OW	1
#^Rhipidura leucophrys	Willie Wagtail				OW	1,2
#^Grallina cyanoleuca	Magpie-lark				OW	1,2
Family Campephagidae - Cuckoo-shrikes and Trillers						
#^Coracina novaehollandiae	Black-faced Cuckoo-shrike				O	1,2
Family Hirundinidae - Swallows and Martins						
#^Hirundo neoxena	Welcome Swallow				OW	3
Family Artamidae - Wood-swallows, Butcherbirds,						

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
Magpie and Currawongs						
#^Cracticus nigrogularis	Pied Butcherbird				O	1
#^ Cracticus tibicen	Australian Magpie				OW	1,2
#Strepera graculina	Pied Currawong					
Family Corcoracidae - Chough						
Corcorax melanorhamphos	White-winged Chough				OW	1
Family Corvidae - Crows, Raven						
#^Corvus coronoides	Australian Raven				OW	1
Family Sylvidae - Old World Warblers						
#Acrocephalus stentoreus	Clamorous Reed-Warbler					
Cisticola exilis	Golden-headed Cisticola				OW	3
Family Sturnidae - Starlings and Mynas						
**#Acridotheres tristis*	Common Myna					
**#Sturnus vulgaris*	Common Starling					
Class Mammalia - Mammals						
Subclass Marsupialia - Marsupials						
Order Diprotodontia						
Suborder Phalangerida						
Superfamily - Petauroidea						
Family Petauridae						
Petaurus breviceps	Sugar Glider			+	T	1
Superfamily - Phalangeroidea						

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
Family Phalangeridae - Brushtail Possums						
#^Trichosurus vulpecula	Common Brushtail Possum				TO	1
Superfamily - Macropodoidae						
Family Macropodidae - Kangaroos, Wallabies						
#^Macropus giganteus	Eastern Grey Kangaroo			**+**	O	1, 2
Suborder Microchiroptera						
Family Molossidae - Freetail-bats						
Austronomus australis syn *Nyctinomus australis, Tadarida australis*	White-striped Freetail Bat					
Family Vespertilionidae - Plain-nosed Bats						
#^Chalinolobus gouldii	Gould's Wattled bat				U	1
#Chalinolobus morio	Chocolate Wattled Bat					
#Falsistrellus tasmaniensis	**Eastern Falsistrelle**	**V**				
Miniopterus australis	**Little Bentwing Bat**	**V**			U	1
#Miniopterus schreibersii oceanensis	**Large Bentwing-bat**	**V**				
Mormopterus norfolkensis	**Eastern Freetail Bat**	**V**			U	1
Mormopterus sp. 2						
#Nyctophilus geoffroyi	Lesser Long-eared Bat					
#?Nyctophilus gouldi	Gould's Long-eared Bat					
Nyctophilus sp.					U	1
#?Vespadelus pumilus	Eastern Forest Bat			**+**		
#?Vespadelus regulus	Southern Forest Bat			**+**		
#?Vespadelus vulturnus	Little Forest Bat					
#?Vespadelus sp.					U	1
?Vespadelus sp. (likely *vulturnus*, possibly *pumilus* or *troughtoni*)					U	1
?Vespadelus sp. (*regulus* or *darlingtoni)*					U	1

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	REGIONALLY SIGNIFICANT	OBSERVATION TYPE	HABITAT TYPE
Order Rodentia						
Family Muridae - Rodents						
**Mus musculus*	House Mouse				H	1
**#Rattus rattus*	Black Rat					
Order Carnivora						
Family Canidae						
*Canis familiaris	Dog				O	2
**#^Vulpes vulpes*	Red Fox				O	1
Order Lagomorpha						
Family Leporidae						
**#^Oryctolagus cuniculus*	European Rabbit				P	1, 2
Order Artiodactyla						
Family Bovidae						
**#^Bos taurus*	Cattle				O, K, P	O, P=2, K, P=1
**Ovis aries*	Sheep				H	1