Flora and fauna survey and assessment of 96 and 106 Leitch Road, Londonderry, New South Wales

by

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1.0. Introduction

During late August to early April 2014, I undertook a detailed flora and fauna survey of 96 and 106 Leitch Road, Londonderry, New South Wales (see Fig.1). The survey was undertaken during the days of 29 August 2014 (1330 - 1530 hrs, Eastern Australian Summer Time, EAST). One night survey was undertaken during the evening of 1 September 2014 (1830-2030 hrs, EAST). The results of the surveys are reported below.

The site is proposed for agriculture and sheds.

2.0. Materials and Methods

Methods for assessing and documenting the flora and fauna follow those listed in my previous environmental reports (viz. Hawkeswood, 2003-2005) and as outlined below. This report follows where applicable the *DECC Threatened Species Assessment Guidelines* (2008). Various horizontal and longitudinal transects were undertaken within the surveyed areas. Plants were listed in note books as the transects were walked and any unidentified or taxonomically difficult species were collected for further study and identification. Important floristic references used to verify/identify plants collected from the study site include the following: Anderson (1936), Auld & Medd (1992), Baker et al. (1985), Beadle et al. (1981), Benson & Howell (1990a), Bishop (1995), Blombery (1955, 1986), Brooker & Kleinig (1990), Burbidge (1966a,b), Burbidge & Gray (1970), Carolin & Tindale (1993), Child (1968), Costermans (1981), Cunningham et al. (1981), Fairley & Moore (1989), Harden (1990,1991,1992,1993), Jones (1988), Jones & Gray (1988), Lamp & Collett (1989), Lamp et al. (1990), Macoboy (1981), Macoboy & Blombery (1975), Nicholls (1969), Parsons (1971), Parsons & Cuthbertson (1992), Robinson (1991) & Rotherham et al. (1975).

Hand searches for reptiles were undertaken in prospective hiding sites, such as under bark, under rocks, fallen branches or refuse such as cardboard or plastic sheets, inside and under logs and up trees. Generally field research and methods followed those reported in my other reports concerning reptile surveys (viz. Hawkeswood, 2003-2005). Reptiles which were caught for identification/verification were identified using the key of Cogger (1996) as well as photographs and other data in the following references: Bustard (1970), Cogger (1996), Frauca (1973), Greer (1990), Griffith (1997), Hoser (1989), Jenkins & Bartell (1980), Schmida (1985), Swan (1990), Wilson & Knowles (1988 and Worrell (1963).

Hand searches of potential frog refuge areas were undertaken during daylight hours. This involved searching through the vegetation alongside any area of water retention, upending large rocks or pieces of building rubble and other refuse (if present), rolling over logs, fallen branches or mats of vegetation and checking under any piece of ground cover which could serve as a frog refuge area. References used to identify/verify frogs included the following references: Anstis (1975), Barker & Grigg (1977), Brooks (1983), Clyne (1969), Cogger (1960, 1962, 1972, 1996), Griffith (1997), Hoser (1989), Kinghorn (1944), Kreft (1865), Moore (1957, 1961), Robinson (1998), Tyler (1982, 1992, 1994).

Birds were observed mostly through binoculars as well as by unaided eye during the day during the observation period. Birds were also spotlighted for at night. Birds were identified/verified using the following references: Cayley (1986), Forshaw (1992), Frith (1982), Macdonald (1980), Rowley (1975), Simpson & Day (1993), Slater (1983a,b).

Mammals were detected by checking for claw marks on smooth-barked trees and by searching for droppings on the ground. Mammals were also spotlighted for at night and a bat detector was used and was set at 30-60 megahertz. References used to check field determinations are as follows: Cronin (1991), Hall & Richards (1979), Ride (1970), Strahan (1983, 1992, 1996) and Triggs (1997).

3.0. Comments on the habitat type, general condition and plant species of the surveyed site

The surveyed area is highly disturbed and weed-infested. Most of the plant species within the surveyed area are weeds. The native shrub layer is totally cleared and native herb layers are very sparse. Most of the trees are 20-30 years old or less and only 2 or 3 trees are more than 50-60 years old. The native trees and some native herbs and shrubs represent remnant regrowth Castlereagh Scribbly Gum Woodland (CSGW), an EEC under the NSW Threatened Species Conservation Act (1996). A 7-part Test of Significance is provided in Appendix 2. There is no Shale SandstoneTransitional Forest (SSTF) or any other EEC within the surveyed area. The site is highly degraded and totally altered from its original condition. Most of the CPW trees within the property are in poor condition, with termites and borers. There are numerous dead trees within the surveyed area.

Table 1. List of the plant species observed within the surveyed site: [* = introduced plant species]

Family and species

Magnoliopsida

Dicotyledonae

Apocynaceae
- **Araujia hortorum*

Asteraceae
- **Bidens pilosa*
- **Cirsium vulgare*
- *Cotula australis*
- *Ozothamnus diosmifolius*
- **Senecio madagascariensis*
- **Soliva sessilis*
- **Taraxacum officinale*

Brassicaceae
- **Brassica rapa*
- **Rorippa pseudo-nasturtium*

Caryophyllaceae
- **Stellaria media*

Caryophyllaceae
- **Cerastium glomeratum*

Convolvulaceae
Dichondra repens

Lobeliaceae
Pratia purpurascens

Malvaceae
**Malvastrum sp.*

Myrtaceae
Angophora bakeri
Angophora floribunda
Eucalyptus crebra
Eucalyptus eugenioides
Eucalyptus fibrosa
Eucalyptus parramattensis
Eucalyptus sclerophylla
Melaleuca linearifolia
Melaleuca sieberi

Pittosporaceae
Bursaria spinosa

Polygonaceae
**Rumex crispus*

Urticaceae
**Urtica incisa*

Monocotyledonae

Cyperaceae
Cyathochaeta diandra
Lepidosperma laterale

Juncaceae
Juncus usitatus

Lomandraceae
Lomandra multiflora

Orchidaceae
Caladenia catenata
Diuris punctata

Poaceae
Aristida vagans
**Briza minor*
**Cynodon dactylon*
Echinopogon caespitosus
**Eragrostis curvula*
**Eragrostis sp.*

**Pennisetum clandestinum*
**Setaria gracilis*
Themeda australis

Xanthorrhoeaceae
Xanthorrhoea media

Comments: None of the flora species detected within the study area are presently listed on any Schedule of the NSW Threatened Species Conservation Act (1995) nor on any Schedule of the Commonwealth Environmental Protection and Biodiversity Conservation Act (2000). A highly degraded and extensively modified and weed-infested woodland of *Eucalyptus parramattensis, E. sclerophylla* and *E. crebra* (Myrtaceae) and some native herbs represent remnant Castlereagh Scribbly Gum Woodland (CSGW), is an EEC under the NSW Threatened Species Conservation Act (1996). A 7-part Test of Significance is provided in Appendix 2.

4.0. Fauna of the surveyed area

4.1. Reptiles and Amphibians

Common Eastern Froglet (*Crinia signifera*, Myobatrachidae) - few heard calling from inundated areas after rainfall.
Yellow-thighed Frog (*Uperoleia laevigata*, Myobatrachidae) - few heard calling from inundated areas after rainfall.
Delicate Skink (*Lampropholis delicata*, Scincidae) - two specimens disturbed from leaf litter etc.

4.2. Birds

During the study times, bird life was found to be relatively abundant. A total of 7 common species of bird were observed within the study area during the observation times, these being the following:

Magpie (*Gymnorhina tibicen*, Corvidae)
Noisy Miner (*Manorina melanocephala*, Meliphagidae)
Grey Teal (*Anas gracilis*, Anatidae)
Eastern Rosella (*Platycercus eximius*, Platycercidae)
Mudlark (*Grallina cyanoleuca*, Grallinidae)
Galah (*Cacatua roseocapilla*, Cacatuidae)
Red-rumped Parrot (*Psephotus haematonotus*, Psittacidae)
Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*, Cacatuidae) - detected by observing damage to trees at bases where cerambycid larvae had been extracted.

4.3. Mammals

*Introduced Fox (*Vulpes vulpes*, Canidae) - detected by droppings and a specimen at night.
*Introduced Hare (*Lepus europaeus*, Leporidae) - detected by burrowings and a live specimen.
Brush-tailed Possum (*Trichosurus vulpecula*, Phalangeridae)

Comments: None of the fauna species detected within the study area are presently listed on any Schedule of the NSW Threatened Species Conservation Act (1995) nor the Commonwealth Environmental Protection and Biodiversity Conservation Act (2000).

5.0. Consideration of potential occurrence of Scheduled Plant and Animal Species on the subject site

There are a number of species of plants of particular conservation concern which are known to occur in the general region of the subject site and I have considered such species in my assessment below.

5.1. Flora

There are at least 3 plant species which were considered to have potential habitat within 1-5 kilometres of the subject property: *Dillwynia tenuifolia, Pultenaea parvifolia* (Fabaceae) and *Grevillea juniperina* (Proteaceae).

All of these species of threatened plants have been listed either under the TSC Act (1995) or regarded as of conservation significance by being listed in ROTAP (see Briggs & Leigh, 1996). Recently most of them have also been listed on the schedules of the new Commonwealth Environment Protection and Biodiversity Conservation Act (2000).

Specific targeted searches were undertaken within the surveyed area in an endeavour to detect these species, but none were located within the surveyed area, possibly due to its degraded and rural nature.

Nevertheless, these species are discussed below:

Dillwynia tenuifolia (Fabaceae) is listed in Schedule 2 of the TSC Act (1995) as Vulnerable and is also classified in ROTAP as 2VCi which indicates that its total geographic range is less than 100 km, is considered vulnerable, with no information available on the size of reserved populations. It was not detected during the survey, nor was any potential habitat for this species present on the subject site.

Pultenaea parvifolia (Fabaceae) is listed in Schedule 2 of the TSC Act (1995) as Vulnerable and is also classified in ROTAP as 2V which indicates that its total geographic range is not known, is considered vulnerable, and with no information available on the size of reserved populations. It was not detected during the survey, nor was any potential habitat for this species present on the subject site.

Grevillea juniperina (Proteaceae) is listed in Schedule 2 of the TSC Act (1995) as Vulnerable. It was not detected during the survey, nor was any potential habitat for this species present on the subject site.

5.2. Fauna

There are at least 25 species of fauna of particular conservation concern that are known to occur or to have occurred in the general region of the subject site (NPWS Wildlife Database) and these are listed below. All have been listed under the TSC Act (1995) as either Vulnerable or Endangered.

Despite the known occurrence of a number of species of threatened fauna from the north-western part of Sydney, none were considered to have any potential habitat on the subject property because of its largely degraded/highly modified nature dominated by weeds and introduced plants. Although none of these species have been recorded on the subject sites, some have been detected within 5-10 km.

Some of these regionally significant species of fauna are discussed below:

Molluscs

The Cumberland Plains Woodland Snail (*Meridolum corneovirens*) has been detected in the hills and valley areas in western Sydney. The following items were examined for the presence of snails: several small branches, base of five trees, various pieces of fallen bark on the ground.

Reptiles

Two species of reptile of conservation significance, being listed on the Schedules of the NSW Threatened Species Conservation Act (1995), are known from the Sydney Bioregion and within several km of the surveyed site, these being the Broad-headed Snake (*Hoplocephalus bungaroides*, Elapidae) and the Heath Monitor (*Varanus rosenbergi kuringai*, Varanidae).

Varanus rosenbergi kuringai (Varanidae)(Heath Monitor) was not detected during the surveys and there is no suitable habitat for this species present on the subject property. Little has been recorded on the biology of this species. It is normally a diurnal and terrestrial species found in heathlands and dry sclerophyll fires and woodlands. It occurs from Wondabyne in the north and east of its range to the Canberra area. It feeds on insects, smaller reptiles, small mammals and birds. Populations are currently protected in Blue Mountains National Park, Dharug National Park, Marramarra National Park, Yengo National Park and Wollemi National Park.

Hoplocephalus bungaroides (Elapidae)(Broad-headed Snake) was not detected on the site, nor was any potential habitat for this species detected on the site. Habitat for this species is currently protected in Marramarra National Park and Dharug National Park. The snake occurs in sandstone habitats in open woodland and dry sclerophyll forest. It lives principally along the ridges and plateaus, where it may be found sheltering beneath flat exfoliations of rock and crevices of boulders during the winter months, or in trees during the summer.

Amphibians

Two species of amphibian of conservation significance, being listed on the Schedules of the NSW Threatened Species Conservation Act (1995), are known from the Sydney Bioregion and within a few km of the surveyed sites, these being the Red-crowned Toadlet (*Pseudophryne australis*, Myobatrachidae) and the Giant Burrowing Frog (*Heleioporus australiacus*, Myobatrachidae).

The Red-crowned Toadlet, *Pseudophryne australis*, was not detected on the site and there is no suitable habitat for this species on the property. Populations are currently protected in Marramarra National Park and Dharug National Park.

Another frog species of conservation concern within the Sydney Bioregion is the Giant Burrowing Frog, *Heleioporus australiacus.* The study site at Londonderry does not possess any suitable habitat for the Giant Burrowing Frog. The habitats in which it has been detected previously do not occur within the study site (e.g. there are no creek or "hanging swamp" habitats associated with suitable forests). In addition, the disturbed and degraded nature of the sites would most certainly preclude the existence of the species there.

Birds

The following bird species which have been listed on the Schedules of the NSW Threatened Species Conservation Act (1995) have been recorded or are known from the north-western Sydney Region: Regent Honeyeater (*Xanthomyza phrygia*, Meliphagidae), Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*, Meliphagidae), Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*, Climacteridae), Diamond Firetail (*Stagonopleura guttata*, Fringillidae), Speckled Warbler (*Pyrrholaemus sagittata,* Pardalotidae), Hooded Robin (south-eastern form)(*Melanodryas cucullata cucullata*, Petroicidae), Black-tailed Godwit (*Limosa limosa*, Scolopacidae), Swift Parrot (*Lathamus discolor,* Psittacidae), Turquoise Parrot (*Neophema pulchella*, Psittacidae), Glossy Black Cockatoo (*Calyptorhynchus lathami*, Cacatuidae), Powerful Owl (*Ninox strenua*, Strigidae), Barking Owl (*Ninox connivens*, Strigidae) and the Masked Owl (*Tyto novaehollandiae*, Strigidae).

None of these species are potential visitors to the subject property and none were found at the time of the investigations. It is unlikely that any would breed on the site due to the lack of suitable habitat. In addition, only a few common species of bird were detected.

Mammals

The following eight mammal species, which have been listed on the Schedules of the NSW Threatened Species Conservation Act (1995) have been recorded or are known from the north-western Sydney Region and within 5 kilometres of the subject site: Squirrel Glider (*Petaurus norfolcensis*, Petauridae), Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*, Emballonuridae), Eastern Freetail Bat (*Mormopterus norfolcensis*, Molossidae), Common Bentwing-bat (*Miniopterus schreibersii*, Vespertilionidae), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*, Vespertilionidae), Greater Broad-nosed Bat (*Scoteanax rueppellii*, Vespertilionidae), Grey-headed Flying Fox (*Pteropus poliocephalus*, Pteropodidae), and Large-footed Myotis (*Myotis adversus*, Vespertilionidae).

Specific targeted searches were undertaken for threatened fauna, but none of these species were detected and it is considered unlikely that any of these species inhabits the property or nearby areas. There is very little suitable habitat within the surveyed property for any of these species to inhabit. The site is highly disturbed and altered.

6.0. Conclusions

6.1. Flora

The surveyed area is highly disturbed and weed-infested. Most of the plant species within the surveyed area are weeds. The native shrub layer is totally cleared and native herb layers are very sparse. The site is therefore highly depauperate in native plant species. Most of the trees are 20-30 years old or less and only 2 or 3 trees are more than 50-60 years old. The native trees and some native herbs and shrubs represent remnant regrowth Castlereagh Scribbly Gum Woodland (CSGW), an EEC under the NSW Threatened Species Conservation Act (1996). A 7-part Test of Significance is provided in Appendix 2. There is no Shale SandstoneTransitional Forest (SSTF) or any other EEC within the surveyed area. The site is highly degraded and totally altered from its original condition. Most of the CPW trees within the property are in poor condition, with termites and borers. There are numerous dead trees within the surveyed area. It is proposed to remove most of the infested trees for agriculture. Trees around the boundaries and any habitat trees will be retained.

The surveyed site does not possess any threatened plant species as presently defined under the New South Wales Threatened Species Conservation Act (1995) nor within any schedule of the Commonwealth Environmental Protection and Biodiversity Conservation Act (2000). There are also no ROTAP plants on the site (as defined by Briggs & Leigh, 1998). No further 7-part tests of Significance or Species Impact Statements are required.

Therefore, in my professional scientific opinion, I see no impediments, based on flora concerns, for the proposal.

6.2. Fauna

Molluscs

No sign of the Cumberland Plains Woodland Snail was detected, it is regarded that the site is too open and hostile for the snail which became extinct a long time ago or was never there in the first place.

Amphibians

From my inspection, it appears that the surveyed area is usually unsuitable for frog species (apart from extended rainy periods), with only two very common species detected. No endangered frog species are likely to occur within the surveyed area given the lack of suitable habitat and the highly disturbed nature of the site.

Reptiles

The surveyed area is also mostly suitable for reptiles, with only one common species being detected. It is possible that the Eastern Blue-tongue (*Tiliqua scincoides*, Scincidae) may occur on the subject land from time to time and that the site may also contain from time to time the Common Bearded Dragon (*Pogona barbata*, Agamidae) but no evidence of these two species on the site were obtained during the surveyed times. The Red-belied Black Snake (*Pseudechis porphyriacus*, Elapidae) may also occur on the site from time to time, but this is also not an endangered species.

Birds

Only a few common and widespread bird species were actually observed on the surveyed property and it could be expected that other common species would move across the landscape quite readily, as these and other species also occur in backyard gardens and cleared paddocks and other types of highly disturbed or converted ecosystems. The subject site and immediate areas do not represent suitable habitat for any threatened bird species though. Additionally, the surveyed site generally represents only limited nesting or resting areas for a few very common birds such as the Red-rumped Parrot which was found nesting on the site.

Mammals

An examination of the surveyed property and environs indicates that all species of native ground-dwelling mammals that would have occupied this area at European settlement are now most likely extinct here. Further, only two species of arboreal mammal, the Brush-tail Possum (*Trichosurus vulpecula*) and the Ring-tailed Possum (*Pseudocheirus peregrinus*), are known from the general area where they maybe moderately common. However, no possums were detected during the night surveys. A few trees were found to have old scratch marks.

The only other native mammals which probably still persist in the general area are a few species of small microbats. A few of the trees remaining on the site have developed hollows that could be regarded as being suitable for roost sites for bats. However, these were occupied mostly by nesting birds, and no evidence for bats or the Koala (*Phascolarctos cinereus*) occurring on the surveyed property was found.

The subject site appears not to contain any endangered species of fauna and does not appear to act as an important corridor for endangered wildlife. The semi-cleared/ highly altered nature of the majority of the site would preclude numerous species of native fauna except for some birds, and the occasional reptile.

In my professional scientific opinion, I see no impediments, based on fauna concerns, to the proposal.

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Hawkeswood, T.J. (2003w). Flora and fauna survey and assessment of Lot 5, DP 233001, Old Stock Route Road, Pitt Town, New South Wales: 1 -26.

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Hawkeswood, T.J. (2003z). Flora and fauna survey and assessment of part of Lot 5, DP 532394, Pellitt Lane, Round Corner, New South Wales: 1-36.

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Hawkeswood, T.J. (2003bb). 8-part test for the Cumberland Plain Woodland remnant at Lot 263, DP 880799, Ross Place, Wetherill Park, New South Wales with comments on and a list of the flora of the site: 1-20.

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Hawkeswood, T.J. (2003ee). 8-part test for the woodland remnant at Lot 2, DP 882674, John Hines Avenue, Minchinbury, New South Wales with comments on and a list of the flora of the site: 1-19.

Hawkeswood, T.J. (2003ff). Flora and fauna survey and assessment of part of Lot 6, DP 5323943, Pellitt Lane, Round Corner, New South Wales: 1-37.

Hawkeswood, T.J. (2003gg). Flora and fauna survey and assessment of Lots 1020 & 1021, DP 876671 & Lot 2, DP 576773, Glen Road, Castle Hill, New South Wales: 1-87.

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Hawkeswood, T.J. (2003kk). Flora and fauna survey of Lot 26, DP 834163, Samantha Riley Drive, Kellyville, New South Wales: 1-23.

Hawkeswood, T.J. (2003ll). Flora and fauna survey and assessment of Lot 22, DP 811254, Bago Road, Wauchope, New South Wales : 1-66.

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Hawkeswood, T.J. (2004d). Tree report for the proposed subdivision of Lot 1 DP 877908, 47-51 Aiken Road, West Pennant Hills, New South Wales: 1-10.

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Hawkeswood T.J. (2004g). Flora and fauna survey of a area for a proposed driveway and house building platform at the end of Addington Road, Hazelbrook, New South Wales: 1-45.

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Hawkeswood, T.J. (2004k). Flora and fauna survey and assessment of part of proposed subdivision of Lot 2, DP 793703, Pitt Town Road, Kenthurst, New South Wales: 1-35.

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Hawkeswood, T.J. (2004ii). Flora and fauna survey and assessment of Lot 1, DP 640641, corner of Bago Road and King Creek Road, Wauchope, New South Wales: 1-50.

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Hawkeswood, T.J. (2004kk). Flora and fauna survey and assessment of part of Lot 41, DP 614720, Grose Road, Faulconbridge, New South Wales with considerations of endangered flora and fauna species: 1-91.

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Master of Metaphysical Humanistic Science (Institute of Metaphysical Humanistic Science, USA, 2014)

Doctor of Philosophy (Honorary)(Cosmopolitan University, USA, 2001)

Doctor of Metaphysics (Bliss-Parsons Institute, USA, 2013)

Author of over 1850 papers, books and scientific reports on the Australian flora and fauna which have been accepted by the Australian and International Scientific Community

Appendix 1. Plan and photographs

Fig. 1. Aerial view of the subject property of 96 and 106 Leitch Road, Londonderry, New South Wales. Area surveyed shown in purple (i.e. all of this site was surveyed). Note: This google image is several years old and the vegetation is denser then.

Fig. 2. View of part of the property looking towards the south showing the oldest tree on the site, *Eucalyptus sclerophylla* (Myrtaceae) which is a habitat tree for parrots. (Photo: T.J. Hawkeswood).

Fig. 3. Photo showing an area where trees are the densest on the property,but note that most are young less than 20-30 years old. (Photo: T.J. Hawkeswood).

Fig. 4. Photo showing a dead tree on the site which has been killed by stem boring cerambycid beetles. (Photo: T.J. Hawkeswood).

Fig. 5. Photograph showing termite trails on a *Eucalyptus sclerophylla* tree on the site. (Photo: T.J. Hawkeswood).

Fig. 6. Another area of the surveyed area showing young weak trees.. (Photo: T.J. Hawkeswood).

Fig. 6. Another area of the surveyed area showing young weak trees. (Photo: T.J. Hawkeswood).

Fig. 8. Base of a tree which is an old termite nest. (Photo: T.J. Hawkeswood).

Fig. 9. Feeding damage to base of *Eucalyptus* from feeding on borers in the trunks by cockatoos. (Photo: T.J. Hawkeswood).

Fig. 10. Feeding damage to base of another *Eucalyptus* from feeding on borers in the trunks by cockatoos. (Photo: T.J. Hawkeswood).

Fig. 11. View within the center of the property showed the cleared nature of this part of the property. (Photo: T.J. Hawkeswood).

Fig. 12. Termites are actively destroying the trees on this property. (Photo: T.J. Hawkeswood).

Fig. 13. Termites are actively destroying the trees on this property. (Photo: T.J. Hawkeswood).

Appendix 2. 7-part Test for Castlereagh Scribbly Gum Woodland (CSGW).

7-part Test of Significance under the NSW Threatened Species Conservation Act (1996) for the Castlereagh Scribbly Gum Woodland (CSGW) (see Figs. 1-13)

(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 entity under review is an ecological community not a species, hence that this part is not relevant.

(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

The entity under investigation is not an endangered population, hence this part is not relevant.

(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 the risk of extinction, or

(ii) is likely to be substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at the risk of extinction

(i) Most of the site will be cleared but habitat trees and healthy trees around the boundaries etc will be retained. Therefore the local occurrence of the community will not become extinct.

(ii) The proposal will substantially modify the existing plant community but its local occurrence is not likely to be placed at the risk of extinction because trees will be retained. The poor condition of the trees and lack of recruitment will ensure the community will become naturally extinct one day in any case.

(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 and a result of the action proposed, and

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

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

(i) Some habitat will be removed but other habitat will be conserved elsewhere on the property.

(ii) No area of habitat will become fragmented as part of the proposal. The site is already isolated and fragmented.

(iii) The habitat that will be removed is not important and is extremely low in biodiversity and conservation value because if its weed infested nature and dead and dying trees infested with termites etc.

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

No critical habitat is listed for this plant community.

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

The proposal as stands may not be consistent with the objectives or actions of a recovery plan or threat abatement 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

No key threatening processes will be or are operating on the subject property.

Flora and Fauna Assessment

Proposed subdivision – 51 McClymonts Road, Maraylya

Prepared for
Stimson Consultant Services

29 October 2013

DOCUMENT TRACKING

Item	Detail
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Project Manager	David Bonjer 8536 8668 PO Box 20529 World Square, NSW 2002
Prepared by	Niels Rueegger, Will Introna
Reviewed by	Meredith Henderson
Approved by	David Bonjer
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Cover photo	Clockwise from top left: Australian Owlet Nightjar; section of Shale/Sandstone Transition Forest; access Road and holiday cabin at the subject site; section of disturbed Shale/Sandstone Transition Forest (managed). Photos taken by Niels Rueegger (9 July 2013).

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Abbreviations

Abbreviation	Description
AW	Alluvial Woodland
CEEC	Critically endangered ecological community
DA	Development Application
ELA	Eco Logical Australia
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
LGA	Local Government Area
NES	Matters of National Significance under the EPBC Act
NW Act	*Noxious Weeds Act 1993*
RFEF	River Flat Eucalypt Foresy
SEPP	State Environmental Planning Policies
SEWPaC	*Department of Sustainability, Environment, Water, Population and Communities*
SSTF	Shale/Sandstone Transition Forest
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995*
VMP	Vegetation Management Plan

Executive summary

This Flora and Fauna Assessment for the McClymonts Road site has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of Stimson Consultant Services. The client is seeking to subdivide Lot 105, DP787509 into four lots. This report will accompany the DA submission and documents the ecological values within the subject lot and provides an assessment of the potential impacts of the development on threatened species and communities.

The flora and fauna assessment included a review of database records and relevant literature pertaining to the ecology of the study area and surrounding area, including previous flora and fauna assessments conducted by John Hancock Consulting (2000). Existing vegetation mapping was also reviewed. An assessment of the likely occurrence was made for threatened and migratory species identified from the database searches or considered to have the potential to occur within the locality.

Field surveys were undertaken by ELA ecologists on 9 July 2013. Surveys included vegetation community and condition mapping, and opportunistic searches for threatened flora considered likely to occur or with potential habitat in the study area. Targeted surveys for threatened fauna were not conducted. Habitat assessment was used to determine which threatened fauna species were likely to occur or that had potential to occur. Chewed *Allocasuarina* cones were identified within the study area, which suggests that *Calyptorhynchus lathami* (Glossy Black-cockatoo) may use the site for foraging.

Five vegetation communities were mapped within the McClymonts Road site, including two threatened ecological communities (TECs):

- Shale/Sandstone Transition Forest (TEC)
- Shale/Sandstone Transition Forest (managed) (TEC)
- Sydney Sandstone Gully Forest
- River Flat Eucalypt Forest (TEC)
- Trees with exotic understorey/cleared

Shale/Sandstone Transition Forest (SSTF) is listed as an EEC under both the NSW *Threatened Species Conservation Act 1997* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), River Flat Eucalypt Forest (RFEF) is listed as an Endangered Ecological Community under the TSC Act, but not the EPBC Act. None of the remaining vegetation communities are listed as threatened.

The condition of vegetation communities varied within the study area, both in terms of weed density and disturbance. Of the communities, RFEF were the most disturbed; however, SSTF was also degraded in parts, with the highest weed densities and modifications to the mid-storey occurring on the edges of this community and in the north of the study area in Shale/Sandstone Transition Forest (managed). Under the proposed actions approximately 0.01 ha of River Flat Eucalypt Forest and 0.15 ha of Shale/Sandstone Transition Forest which have been identified as potential habitat for threatened flora/fauna or TEC will be removed.

The vegetation also provides suitable habitat for the following threatened/migratory fauna species listed under the TSC Act or Environment Protection and Biodiversity Act 1999 (EPBC Act)

An assessment of significance under section 5A of the *Environment Planning and Assessment Act 1979* (EP&A Act) was prepared for the threatened flora, fauna and TECs which will be impacted under the proposed works. Given that only 0.16 ha of vegetation will be removed and 1.28 ha will be modified in

total and extensive vegetation will be retained adjacent to the impact areas, the proposed actions are unlikely to significantly impact the threatened species and TEC listed under the TSC Act. An assessment under the EPBC Act was also prepared for the TEC and threatened species that had potential to be impacted and concluded that the proposed actions are unlikely to have a significant impact on these species.

The impacts of the proposed vegetation clearing could be mitigated by the implementation of a Vegetation Management Plan.

1. Introduction

1.1 Project description

Eco Logical Australia Pty Ltd (ELA) was commissioned by Stimson Consultant Services to undertake a flora and fauna constraints assessment to inform a proposed subdivision of Lot 105 DP787509 at 51 McClymonts Road which requires consent from The Hills Shire Council: As a result of the proposed subdivision the following works would need to occur:

- Clearing of vegetation around proposed dwelling footprint for APZ in two lots;
- Clearing of vegetation around two existing dwellings and four cabins for APZ;
- Construction of a property access road (4m wide plus 1m either side as a verge.

1.2 Study area

The subject site is 51 McClymonts Road (hereafter the 'subject site') and is located in Maraylya, NSW, in the central western part of The Hills Shire Local Government Area (LGA). The lot covers approximately 13 ha. The land currently contains two houses and four cabins that are rented out as holiday retreats. The subject site is bound by Cattai Creek in the north and by rural lots to the east, south and west. A long driveway leads from McClymonts Road in the north into the subject site.

1.3 Key terms

For the purpose of this flora and fauna assessment the following terminology has been adopted:

Locality: 5 km buffer around the subject site (**Figure 1**)

Study area: the area which was surveyed which includes all areas of potential direct or indirect impact from the proposed works (**Figure 2**).

DA construction footprint: the proposed development as assessed under the DA.

Subject site: is the area of direct impact as a result of the proposed works.

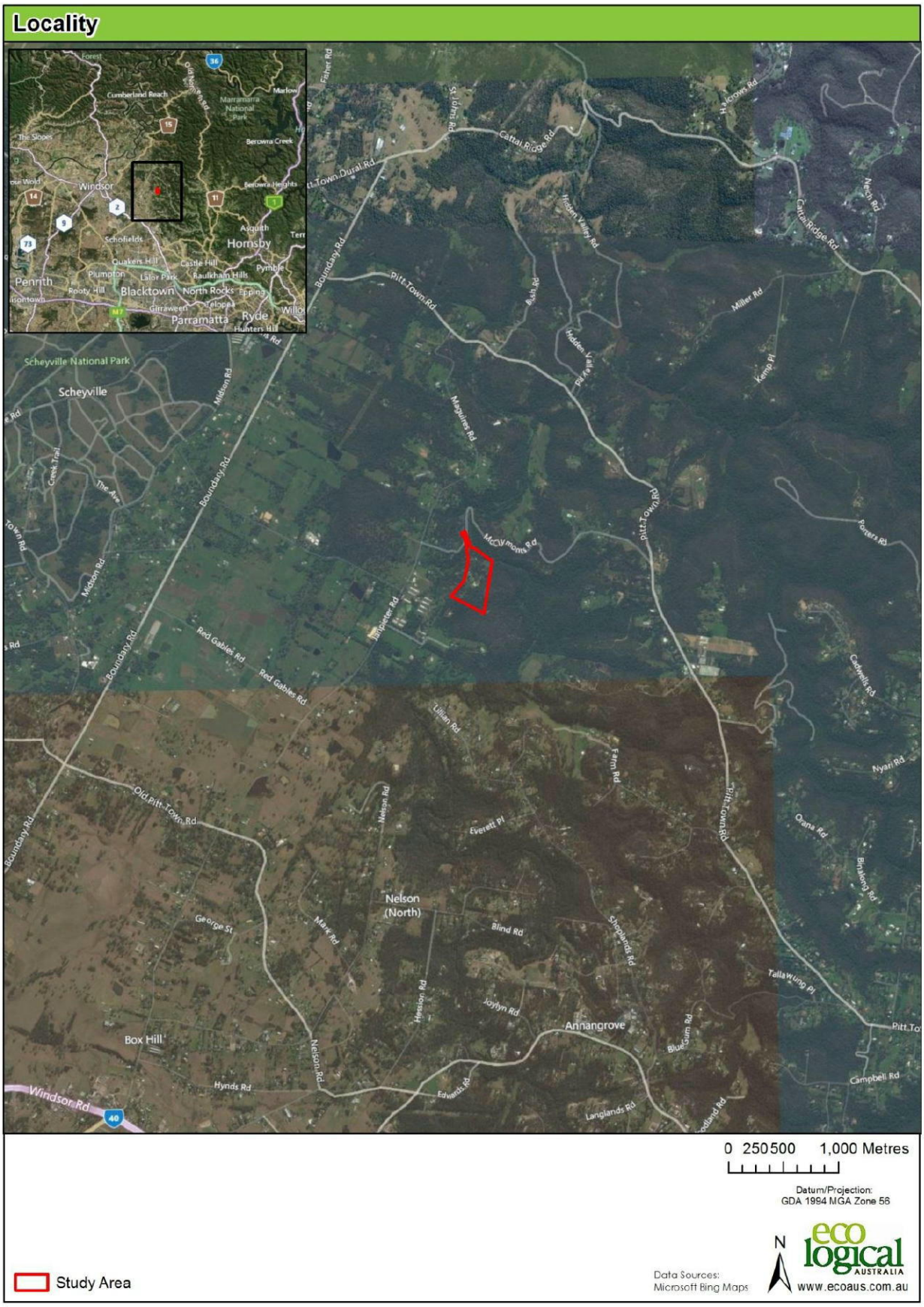

Figure 1: Study area within the general locality

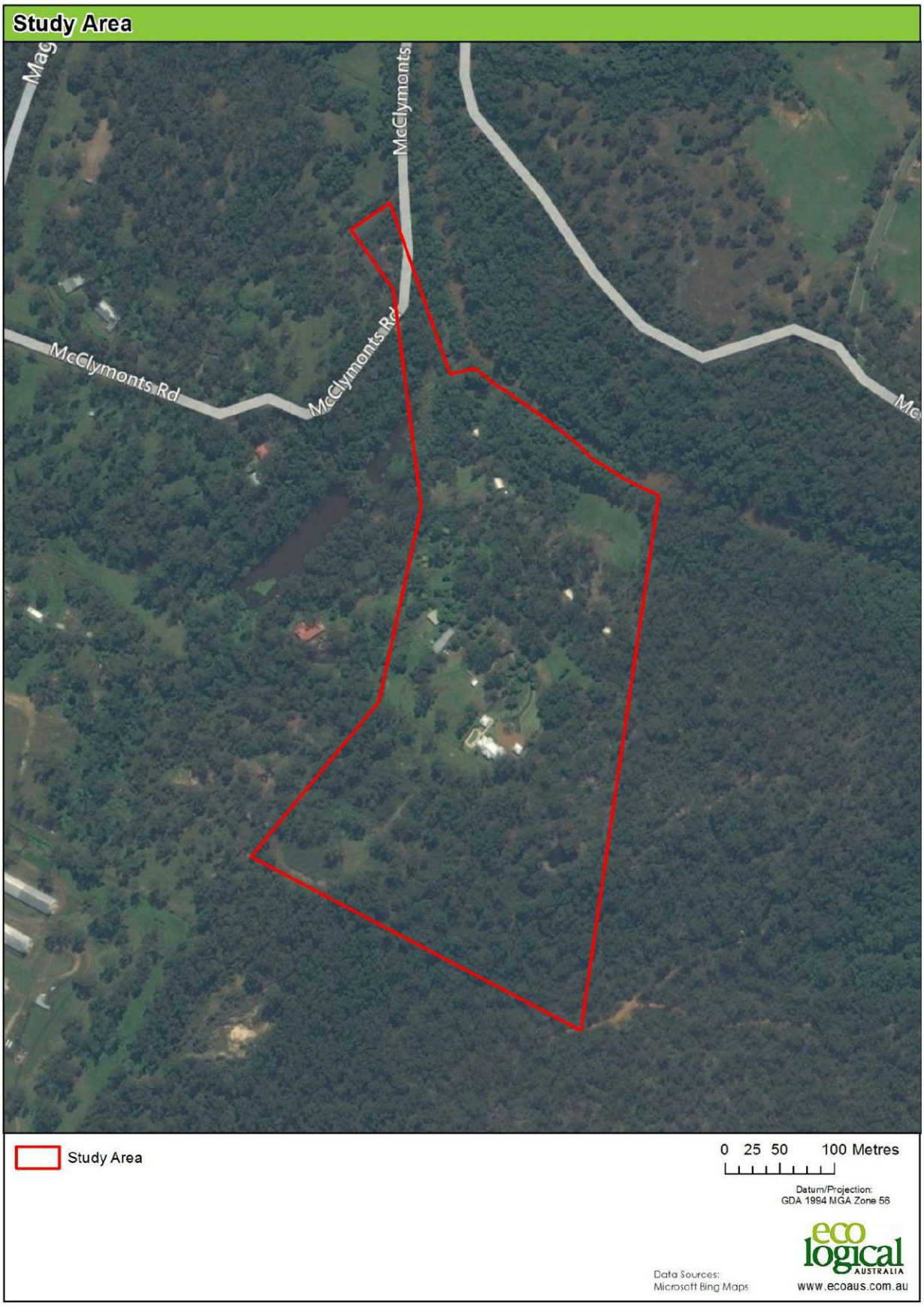

Figure 2: Study area

1.4 Legislative context

1.4.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the State. It provides a framework for the overall environmental planning and assessment of development proposals.

The Development Application for the proposed works is to be assessed under Part 4 of the EP&A Act which identifies issues to be considered in the development assessment process, including environmental impacts. Section 5A of the EP&A Act requires consideration of whether there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats. This Assessment of Significance (AoS; also known as the '7-part test') is undertaken in relation to species, communities, habitat and processes listed under either the *Threatened Species Conservation Act 1995* or the *Fisheries Management Act 1994*. However, due to the certification of the Growth Centres SEPP under the TSC Act (discussed below), the assessment of impact on threatened species, endangered populations and endangered ecological communities listed under the TSC Act is only required on land that is not biodiversity certified.

1.4.2 Threatened Species Conservation Act 1995

The NSW TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The integration of the TSC Act with the EP&A Act requires consideration of whether a development under Part 4 of the EP&A Act is likely to have a significant effect on threatened species, populations, ecological communities or their habitat. The Act requires the submission of a Species Impact Statement where a significant impact is considered likely to occur for threatened species, populations and/or ecological communities listed under the Act.

1.4.3 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is Commonwealth legislation that deals with Matters of National Environmental Significance (NES):

- World Heritage Properties,
- National Heritage Places,
- Wetlands of International Importance,
- Listed threatened species and communities, and
- Listed migratory species.

Where a development or activity has the potential to have a significant impact on a MNES, a referral is made to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). The Department determines whether the activity can proceed with no further assessment by the Commonwealth, or whether it will be a controlled action for which an Environmental Impact Assessment must be supplied regarding their impact on the following matters of NES:

1.4.4 Noxious Weeds Act 1993

The main objectives of this Act are to reduce and monitor the impact of weeds within the NSW state to protect the state from negative impacts on the economy, community and environment from weeds. The Minister for Regional Infrastructure and Services together with the Minister for Primary Industries are responsible for the declaration of noxious weeds, the assignment of an appropriate noxious class and identification of controls and management for all noxious weeds. The Act is also responsible for the prevention of new weeds establishing, restrict the spread of existing significant weeds and reduce the

extent of these weeds. Finally, the Act provides for the effective monitoring and reporting of weed management in NSW.

While only the areas of 'non-certified' land, as defined by the TSC Act, and the riparian areas in the study area were surveyed for noxious weeds, this legislation applies to the entire study area.

2 Methodology

2.1 Literature and database review

Database records and relevant literature pertaining to the ecology of the study area and surrounding area were reviewed. The material reviewed included:

- Office of Environment and Heritage (OEH) Atlas of NSW Wildlife. Search of data supplied July 2013, 5 km search radius) (OEH 2013)
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) Online search for Matters of National Environmental Significance (point search of coordinates with 5km buffer) (Accessed July 2013) (DSEWPAC 2013)
- The Hills Shire Council Vegetation Mapping (THSC 2005)
- DECC Vegetation of the Cumberland Plain, Final Edition – Vegetation and Core Habitat Mapping (DECC 2008);
- NPWS Vegetation of the Cumberland Plain – Vegetation and Core Habitat Mapping (NPWS 2002a)
- Native Vegetation Interpretation Guidelines for Western Sydney Vegetation (NPWS 2002b);
- Royal Botanic Garden (RBG) Online database, PlantNET (RBG 2012)
- *Flora and Fauna Report: Lot 105, DP787509* (John Hancock Consulting, 2000)
- Local plans including:
    - *Baulkham Hills Local Environmental Plan 2005* http://www.thehills.nsw.gov.au/Local-Environment-Plan.html
    - *Baulkham Hills Development Control Plan* http://www.thehills.nsw.gov.au/Development-Control-Plans.html
    - Draft *The Hills Local Environmental Plan 2010* http://www.thehills.nsw.gov.au/Draft-LEP-2010.html

Threatened species, populations and migratory species that have been recorded within the study area have been assessed for their likelihood of occurrence within the study area (**Appendix A**). Note that assessments for the likelihood of occurrence were made both prior to field survey and following field survey. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which sorts of habitat to look for during field survey. The post-survey assessments to determine final "affected species" were made after observing the available habitat in the study area first hand and this is what is shown in **Appendix A**.

2.2 Field survey

2.2.1 Vegetation communities and flora

The ecological assessment was undertaken by two ELA ecologists over one day (9 July 2013). Survey effort was approximately 16 person hours. Site inspection was conducted to validate vegetation mapping, to determine whether any of the vegetation communities on the site meet the criteria for threatened ecological communities, to determine the condition of vegetation communities, to determine the potential for threatened flora and fauna species to occur, and to identify habitat features for threatened flora and fauna species within the study area.

Vegetation mapping was validated using a number of methods:

- Through comparisons of dominant canopy, mid-stratum and ground cover species present on the ground with those typical of the mapped vegetation communities (provided in NPWS 2002b)
- Through comparison of descriptions of vegetation communities and their occurrence in the landscape and on soils as provided in NPWS (2002b) with the vegetation, landscape position and soils observed on the ground
- Via traverses confirming the boundaries of vegetation communities and species assemblages. Where the boundaries of vegetation communities differed from existing vegetation mapping, these were modified on hard copy maps and marked with a hand-held GPS.

The condition of the vegetation was determined by inspecting the proportion of exotics to natives in the vegetation strata and assigning a condition class to the different vegetation patches within the subject area. This combined with an interpretation of the 'intactness' of the various structural layers within the vegetation communities assisted in confirming the different condition classes.

2.2.2 Flora

Flora species were recorded during the traverse of the study area. Targeted searches for threatened plant species that may have potential to occur were undertaken during the traverses of the study area.

2.2.3 Fauna and habitats

An assessment of the available fauna habitat was undertaken during the field survey. Potential habitat attributes and all opportunistic fauna observations were recorded during traverse of the study area. No targeted fauna surveys were undertaken as part of this ecological assessment.

Fauna habitat attributes include specific foraging or nesting resources for fauna groups in particular threatened fauna species. Habitat features include:

- Foraging requirements
- Connectivity of vegetation across landscape
- Presence of hollow-bearing trees (HBT)
- Watercourse or standing water

2.3 Limitations

Although an extensive traverse of the study area was undertaken it was not possible to record all flora or fauna species known within the study area. Additionally flora species may be cryptic or exhibit a period of dormancy especially during the cooler months. Similarly some fauna species have seasonal or migratory changes in habitats or display seasonal dormancy which may influence the ability to identify these species. The survey was conducted in winter which coincides with a reduction in the activity of many amphibians, reptiles, birds and microbat species, including threatened species.

According to the *Vertebrate Fauna Survey* conducted for the NSW Comprehensive Regional Assessment (NPWS, 1998) an integration of survey methods over varying climatic and seasonal conditions are required to produce an extensive census of fauna and flora species utilising the subject area. Therefore, for the purposes of impact assessment, an assessment of the likelihood of occurrence of flora and fauna species on site was made and was based on the presence of potential habitat (see likelihood table in **Appendix A**).

The field survey was undertaken using hand-held GPS units, which were used to take GPS point locations of flora and fauna observed in the field. It is noted that these units can have errors in the accuracy of the locations taken of approximately 20 m (subject to availability of satellites on the day).

3 Existing Environment

3.1 Literature and database results

3.1.1 Landscape context

The site is located adjacent to Cattai Creek in the transition zone between within the Hornsby Plateau and the Cumberland Plain in the Sydney Basin Bioregion. The surrounding landscape includes sandstone ridgetops, relatively steep-sided sandstone/shale gullies to the east and more flatter, gently undulating sandstone/shale land to the west.

A vegetation map was provided in Attachment 8 of the Pre DA Meeting notes date 28 February 2013, showing the following four native vegetation communities as advised by The Hills Shire Council:

- Shale Transition Forest (Endangered Ecological Community)
- Sandstone Transition Forest (Endangered Ecological Community)
- Sandstone Gully Forest (rainforest understorey)
- River Flat Eucalypt Forest (Endangered Ecological Community)

This map is The Hills Shire Council's draft (2012) vegetation mapping which was being at that time. This vegetation mapping is indicative only, since The Hills Shire Council had not surveyed the subject site on the ground. This report updates the vegetation map in the study area, which is shown in **Figure 3** and discussed below.

3.2 Flora and vegetation communities

3.2.1 Flora species

Field survey identified 286 flora species within the subject site, including 174 native species, 102 exotic species and an additional ten species that are native plants but have been planted are not indigenous to the area (**Appendix B**). No threatened plant species were detected during the site inspection.

A high number of exotic species were also recorded within the study area. A total of 102 exotic species which includes eight species declared as noxious under the *Noxious Weeds Act* (NW Act) *1993* in The Hills Shire. The majority of noxious weeds found were listed as Class 4, requiring that the growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction. Four exotic species were listed under the Weeds of National Significance (WoNS) and these included:

- *Asparagus asparagoides* (Bridal Creeper)
- *Lantana camara* (Lantana)
- *Opuntia stricta* (Prickly Pear)
- *Senecio madagascariensis* (Fireweed).

3.2.2 Vegetation communities

As a result of field surveys and a review of the vegetation data collected and past vegetation mapping an updated vegetation map of the study areas was made (**Figure 3**). The following five vegetation types were mapped in the study area:

- Shale/Sandstone Transition Forest
- Shale/Sandstone Transition Forest (managed)

- Sydney Sandstone Gully Forest
- River Flat Eucalypt Forest
- Trees with exotic understorey/cleared

Shale/Sandstone Transition Forest

This is the largest vegetation community within the study area and the majority is located on the ridgetop and gently sloping land in the south of the study area. This community also occurs along a small cliff line as well as scattered patches on sandstone in the north of the study area. Overall, this vegetation has undergone relatively less historical or recent disturbance than other vegetation types in the study area the site and supports a canopy, mid-storey and ground layer dominated by native species.

Within the south of the study area, on the ridgetop and slopes, the dominant canopy species include *Eucalyptus punctata* (Grey Gum), *Angophora floribunda* (Rough-barked Apple) and *Allocasuarina littoralis* (Black She-oak). In this area the mid-storey is dense, probably as a result of historical disturbance. Dominant midstory species include *Kunzea ambigua* (Tick Bush). The ground layer is absent although there are some scattered individuals of *Eragrostis brownii* (Brown's Love Grass), *Entolasia stricta* and *Pratia purpurascens*.

On the cliff line and scattered locations on sandstone in the north of the study area this community contains more species typical of sandstone vegetation and has and a more diverse and open mid-storey and a more diverse and dense ground layer. The dominant canopy species remain similar. Additional dominant mid-storey species include *Banksia serrata* (Old Man Banksia), *Leucopogon* sp. *Leptospermum trinervium* and *Platyscae lanceolata*. The ground layer was more dense and diverse and dominated species included *Lomandra* sp., *Themeda australis* (Kangaroo Grass) and *Goodenia* sp.

This vegetation community meets the criteria for listing under the TSC and EPBC Acts.

Shale/Sandstone Transition Forest (managed)

This vegetation type was located in the middle of the study area on flat land and consisted of forest without a mid-storey and with a mown ground layer. The dominated canopy species was *E. punctata*. The ground layer was dense and dominant species included the native *T. australis*, *Austrodanthonia* sp. *Aristida ramosa* (Purple Wiregrass) *Goodenia* sp. while the introduced *C. dactylon* was also present, but not dominant.

This vegetation community meets the criteria for listing under the TSC and EPBC Acts.

Sydney Sandstone Gully Forest

This vegetation type was located on the lower slopes in the southern corner of the study area and includes a creekline. It has been relatively undisturbed and supports a canopy, mid-storey and ground layer of native species. Dominant canopy species include *E. punctata* and *Eucalyptus piperita* (Sydney Peppermint). Dominant mid-storey species include *A. littoralis*, *Angophora bakeri* (Narrow-leaved Apple), and *E. punctata*. Lower shrubs include *Banksia spinulosa*, *Lambertia formosa* (Mountain Devil) and *Persoonia linearis*.The ground layer is dense and dominant species include *Lomandra longifolia*, *Pteridium esculentum* (Bracken Fern), *Microlaena stipoides* (Weeping Grass). In the creekline the dominate ground layer species include *Gahnia clarkei* (Tall Saw-sedge), *Schoenus melanostachys* and *Hibbertia* sp.

River Flat Eucalypt Forest

This vegetation type was located along Cattai Creek in the north of the study area. The canopy was dominated by native tree species but the mid-storey and ground layers were dominated by introduced species along the creek and north of the existing cabins and north or the existing access road. Other areas of this vegetation type had a mown understorey dominated by introduced grasses and herbs. Dominant canopy trees include *Angophora floribunda* (Rough-barked Apple) and *Melaleuca decora.* Dominant understorey species include the introduced *Ligustrum lucidum* (Large-leaved Privet), *Ligustrum sinense* (Small-leaved Privet) and *Lonicera japonica*. Some native shrubs were also present in scattered locations and included *Acacia paramattensis* and *Notelaea* sp. In shrubby areas the ground layer was sparse but included a mix of introduced and native spices including native *Microlaena stipoides* and introduced *Ehrharta erecta*. In the mown areas dominant ground layer species included the introduced *Paspalum* sp, *Cynodon dactyon* (Common Couch), *Tradescantia albiflora* (Tradescanita) and *Cirsium vulgare* (Spear Thistle).

This vegetation community meets the criteria of the community listed under the TSC Act.

Cleared or trees with exotic understorey/cleared

This vegetation type consisted of developed and highly disturbed areas with a canopy of either remnant or regrowth native trees or exotic trees that had been planted as part of landscaping. The areas in the centre of the subject site consisted mostly of exotic plantings surrounding existing dwelling and roads and lawns and paddocks dominated by introduced grasses and herbs.

The areas to the north of the existing cabins consisted of remnant trees in a paddock that had been disturbed by clearing and grazing. Dominant tree species included *Eucalyptus fibrosa* (Broad-leaved Ironbark), *E. punctata* and *A. bakeri*. There was not understorey in this area and the ground layer was dominated by the introduced *C. dactylon*, *Pennisetum clandestinum* (Kikuyu Grass) and *Chloris gayana* (Rhodes Grass). Native species were scarce and included *T. australis*.

This vegetation community does not meet the criteria under the TSC or EPBC Acts.

3.3 Fauna species and habitats

A full list of fauna species recorded within the study area is provided in **Appendix B**.

The study area provides habitat for both sedentary and more mobile bird species and facilitates the movement of bird species to adjacent habitats and additional foraging resources. Cattai Creek also forms a habitat corridor through the surround landscape and may be used by some bird species more than others, such as water birds. However, no stags and hollow-bearing trees (HBTs) were recorded in this area which may limit the presence of hollow-dependant fauna along the creek.

The study area contained a relatively high diversity of aves species, in particular small birds. Twenty-seven bird species were heard or observed within the study area. One nocturnal bird *Aegotheles cristatus* (Australian Owlet Nightjar) was observed in a hollow next to the dam in the south of the site. Chewed cones of *A. littoralis* were also observed in the Shale/Sandstone Transition Forest in the south of the study areas which suggests that Glossy Black-cockatoos may forage in the study area. Three hollow-bearing trees were recorded and there is likely to be more hollows that were not recorded within the better quality bushland to the south.

No amphibians were heard calling during the surveys, which were undertaken during the day and during cold weather conditions. However, it is likely that common species of amphibians used the study area since potential habitats such as permanent water, rock outcrops and creeks were present in the study

area. The better quality vegetation also provides potential habitat for the typical range of reptile species in sandstone landscapes.

Domesticated fauna species were present in study area including *Rusa timorensis* (Rusa Deer). The less disturbed vegetation in the study area is also likely to be used by bandicoots and wallabies. Indirect evidence (scats) of *Vulpes vulpes* (European Red Fox) and *Oryctolagus cuniculus* (European Rabbit) were recorded inside the study area.

No surveys for microbats were undertaken. However, foraging habitat for microbats is present within the subject site in the form of native vegetation, and potential roosting habitat is present for some species in the form of hollow-bearing trees.

3.4 Threatened species, populations and community and migratory species

An assessment of the likelihood of occurrence has been prepared for each threatened species identified during database search (**Appendix A**). Those species considered likely to occur require further assessment in accordance with Section 5A of the EP&A Act (**Appendix C**).

TSC Act

No threatened fauna species were recorded during the surveys. The following species listed under the TSC Act have potential or are likely to occur in the study area and require 7 part tests:

- Shale/Sandstone Transition Forest
- Riverflat Eucalypt Forest
- *Pimelea curviflora* var. *curviflora*
- *Calyptorhynchus lathami* (Glossy Black-cockatoo)
- *Daphoenositta chrysoptera* (Varied Sitella)
- *Hieraaetus morphnoides* (Little Eagle)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

EPBC Act

No threatened species, populations or communities or migratory species listed under the EPBC Act were recorded within the study area. The study area provides potential habitat for the following species listed under the EPBC Act:

- Shale/Sandstone Transition Forest
- *Pimelea curviflora* var. *curviflora*
- *Chalinolobus dwyeri* (Large-eared Pied-bat) – potential roosting and foraging habitat
- *Rhipidura rufifrons* (Rufous Fantail)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Ardea alba* (Great Egret)

- *Aedea ibis* (Cattle Egret)

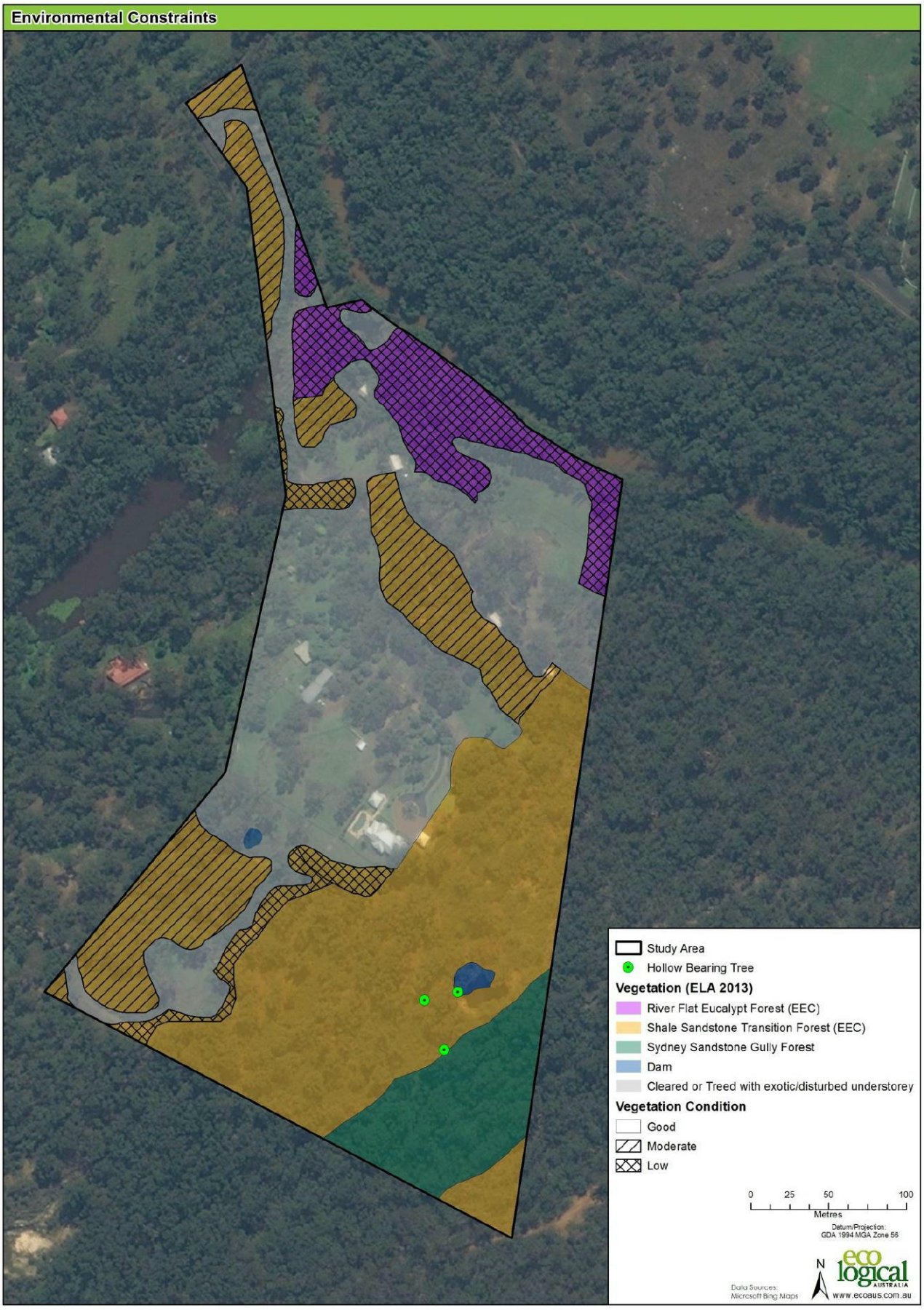

Figure 3: Updated mapping of native vegetation communities and threatened flora

4 Impact Assessment

This section of the report identifies the potential impacts of the project on flora and fauna in the study area. The following subsections discuss the potential direct and indirect impacts on general flora and fauna and also on vegetation communities and flora and fauna species listed under the TSC Act and EPBC Act.

4.1 Potential Impacts

The proposed subdivision and construction of appropriate APZ will result in clearance or modification of native vegetation. Some vegetation will be cleared for construction of dwellings and infrastructure while some vegetation will only be modified for the purposes of an APZ, which would include removal of only some trees and shrubs. The estimates of areas in hectares of each vegetation type that would be removed and modified within the study area are provided in **Table 1.**

Table 1 Areas of each vegetation type to be impacted

Vegetation type	Condition	Total vegetation on site (ha)	Clearing for infrastructure and dwellings (ha)	Clearing / thinning for APZ (ha)	Total impact (ha)	% of vegetation on site impacted
Shale / Sandstone Transition Forest (EEC)	Low	0.34	0.02	0.12	0.14	41
	Moderate	1.74	0.13	0.88	1.01	58
	Good	3.65	0	0.27	0.27	7
	Total	**5.73**	**0.15**	**1.27**	**1.42**	**25**
Sydney Sandstone Gully Forest	Good	0.95	0	0	0	0
	Total	**0.95**	**0**	**0**	**0**	**0**
River Flat Eucalypt Forest (EEC)	Low	1.00	0.01	0.01	0.02	2
	Total	**1.00**	**0.01**	**0.01**	**0.02**	**2**
Sub-total for native vegetation		**7.68**	**0.16**	**1.28**	**1.44**	**18**
Cleared or managed with exotic understorey	**Total**	**4.97**	**0.38**	**1.75**	**2.13**	**42**

4.1.1 Flora

Impacts on flora within the study area include the removal of Shale/Sandstone Transition Forest, Shale/ Sandstone Transition Forest (managed), River Flat Eucalypt Forest and Trees with exotic understorey/cleared. The approximate size of each area to be removed is provided in **Table 1**.

Shale/Sandstone Transition Forest

This vegetation type is located in the south and middle of the study area and continues east, south and west of the study. This vegetation is relatively intact in the south but is fragmented in the middle and north. The proposal would only result in clearance or modification of a relatively small percentage of this vegetation type within the study area. This would slightly increase the fragmentation of this vegetation type in the north of the study area where is currently occurs on small cliff-lines and adjacent to the existing road. However, vegetation in the south would remain mostly intact and would retain its structural components and ecological function (such as plant breeding and dispersal).

This vegetation type is listed as an EEC under the TSC Act and a 7 part test has been undertaken and is provided in Appendix C.

Shale/Sandstone Transition Forest (managed) (EEC)

This vegetation type is located just south of the existing dwelling in Lot 2. It is currently maintained as an APZ and consists of a canopy of *E. punctata* and a mown understorey. This area will be continued to be mown and therefore impacts would not significantly change this vegetation community.

This vegetation type is listed as an EEC under the TSC Act and a 7 part test has been undertaken and is provided in Appendix C.

Sydney Sandstone Gully Forest

This vegetation type occurs within the southern corner of the study area and would not be directly impacted by the proposal. In addition, it is unlikely that there would be any indirect impacts on this community. This is because the remaining vegetation within the study area is proposed to be managed in accordance with a Vegetation Management Plan (VMP). The aim of the VMP will be to mitigate any potential indirect impacts such as erosion, sedimentation and weed invasion.

River Flat Eucalypt Forest (EEC)

This vegetation type occurs in the north of the study area along Cattai Creek. It is largely degraded but retains a native canopy and some scattered native species in the understorey and ground layer. Only a relatively small percentage of this vegetation within the study area would be impacted by development of an APZ. This would include the removal of the shrub layer, which is mostly exotic species such as *L. sinense* and maintenance of the ground layer for low fuel levels.

The remainder of this community would be managed for biodiversity according to the proposed VMP and this is likely to result in an improvement in the condition and ecological function of this vegetation type due to the removal of weeds, maintenance of native species and mitigation of degrading processes such as erosion, impact on vegetation by exotic and domestic animals.

This vegetation type is listed as an EEC under the TSC Act and a 7 part test has been undertaken and is provided in Appendix C.

Trees with exotic understorey/cleared

This vegetation type occurs within the centre and the north of the study area. This vegetation type will be impacted by construction of dwellings and associated infrastructure such as roads as well as clearing for APZ. This vegetation provides low condition habitat for native flora and impacts to this vegetation is not expected to result in the loss of any flora species from the study area.

4.1.2 Fauna

No hollow-bearing trees would be removed and this resource would remain within the study area. Impacts on fauna and their habitat include:

- The removal of 0.16 ha of vegetation for construction
- Modification of 1.28 ha for APZs

Removal and modification of habitat is not likely to result in the loss of any fauna species from the study area because the majority of the higher quality vegetation and fauna habitat within the study area would be retained. In addition, implementation of a VMP would increase the habitat quality of a range of fauna species that either have their home ranges within the study area or that use the study area from time to time. This is because the VMP would result in the removal of weeds and encourage the establishment of native flora species which is likely to increase the potential foraging and nesting resources for fauna.

However, the modification of Shale/Sandstone Transition Forest in the area directly east of thte proposed dwelling in Lot 4 for the purposes of an APZ is likely to increase the gap between this vegetation type and the vegetation outside of the study area to the west. This may reduce the effectiveness of this strip of vegetation to act as a corridor for fauna species. However, the vegetated corridor along Cattai Creek that would be managed as part of the VMP would ensure that an east - west corridor for fauna mobility would remain within the study area.

The modification of vegetation in Lot 1 would not result in fragmentation but would increase the gap between this vegetation type in the south-east and the woodland to the west of Lot 1. However, this is not expected to result in the loss of any fauna species from the study area because the woodland to the west of the study area is currently disturbed (mostly a cleared understorey) and the better quality habitat would be retained within the south east of the study area.

4.2 TSC Act assessments of significance

Two endangered ecological communities listed under the TSC Act, Shale Sandstone Transition Forest and River-flat Eucalypt Forest, were recorded within the subject site. No threatened flora or fauna species listed under the TSC Act were recoded within the study area during surveys for this project. However, this does not mean that other threatened flora or fauna do not have the potential to occur.

Based on the habitat within the study area and the records of threatened fauna in the locality there is potential for some threatened fauna species to occur within the study area and this likelihood is provided in **Appendix A**. The likelihood table also indicates whether any species or community would be impacted by the proposal and identifies the following species as subject to the Assessment of Significance (7 part test):

- Shale/Sandstone Transition Forest
- River Flat Eucalypt Forest
- *Pimelea curviflora* var. *curviflora*
- *Calyptorhynchus lathami* (Glossy Black-cockatoo)
- *Daphoenositta chrysoptera* (Varied Sitella)
- *Hieraaetus morphnoides* (Little Eagle)

- *Glossopsitta pusilla* (Little Lorikeet)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

The 7 part tests for these species are provided in **Appendix C**. The results of the 7 part tests indicate that the proposed works are unlikely to have a significant impact on threatened species listed under the TSC Act and, therefore, a Species Impact Statement (SIS) is not required. However, this is contingent on the undertaking of mitigation measures outlined in **Section 5.2.**

4.3 EPBC Act significance assessments

One threatened ecological community listed under the EPBC Act, Shale/Sandstone Transition Forest, was recorded in the study area. No flora or fauna species listed under the EPBC Act were recorded within the study area. Based on the habitat within the subject site and the records of threatened fauna in the locality there is potential for some threatened fauna species to occur within the study area and this likelihood is provided in **Appendix A**.

The likelihood table also indicates whether any species or community would be impacted by the proposal and identifies the following species as requiring application of the significant impact criteria to determine whether a referral should be made to the Commonwealth Department of the Environment (formerly the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC):

- Shale/Sandstone Transition Forest
- *Pimelea curviflora* var. *curviflora*
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Rhipidura rufifrons* (Rufous Fantail)
- *Ardea alba* (Great Egret)
- *Aedea ibis* (Cattle Egret)

The significant impact criteria have been applied to these species and are provided in **Appendix D**. The results of these indicate that the proposed works are unlikely to have a significant impact on species listed under the EPBC Act and, therefore, a Referral to DSEWPC is not deemed necessary.

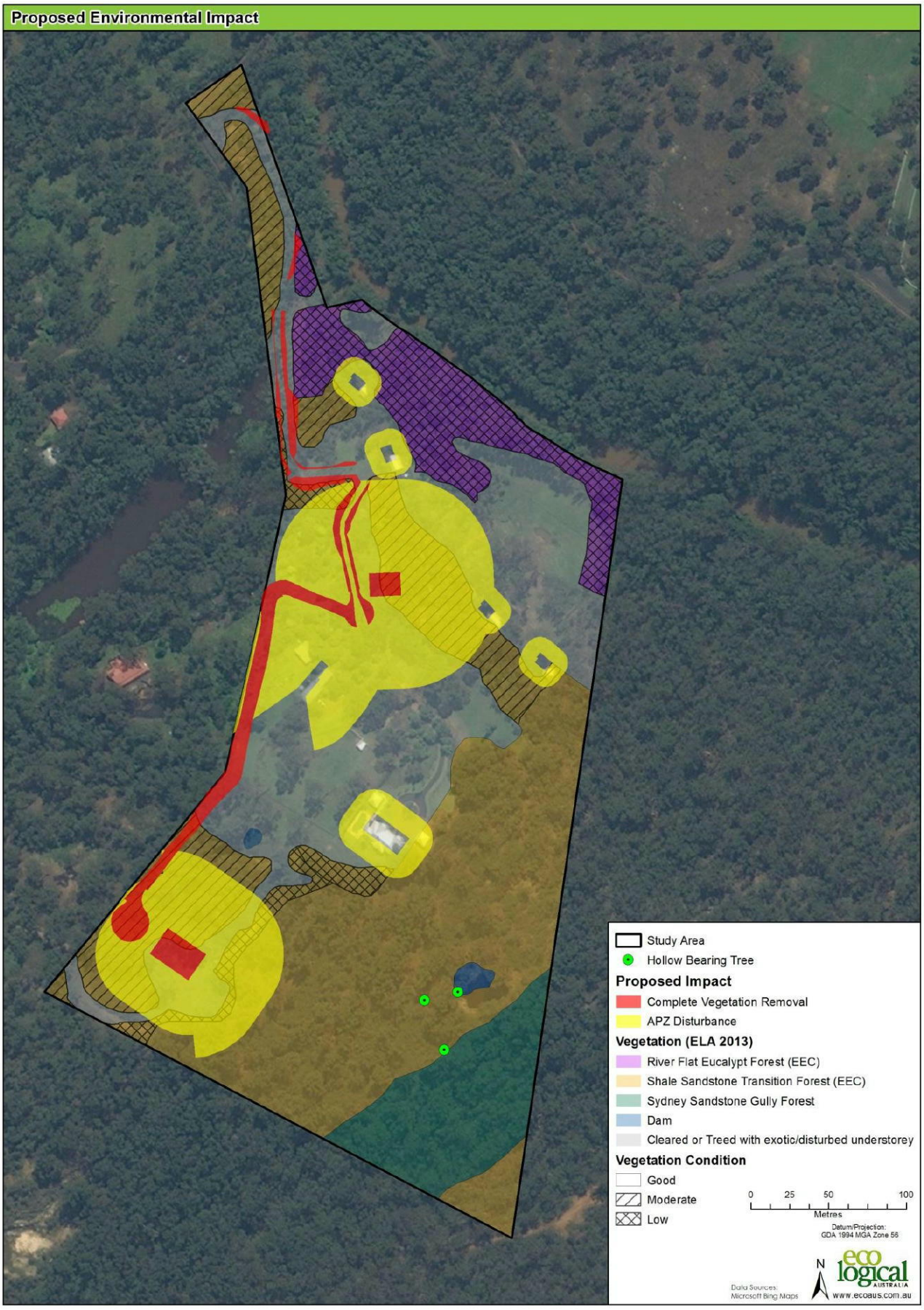

Figure 4: Proposed Environmental Impact Areas

5 Conclusion and Recommendations

5.1 Conclusions

The study area has been previously disturbed through past construction and rural/urban use. Flora and fauna habitats include good quality bushland in gullies and slopes and some disturbed and fragmented forest on the upper slopes and cliff lines in the north which provide habitat for a ranged of native flora and fauna species.

The proposed project would result in the following impacts to flora and fauna within the subject site:

- Removal of approximately 0.15 ha of Shale/Sandstone Transition Forest for dwellings and infrastructure
- Modification of approximately 1.27 ha of Shale/Sandstone Transition Forest for APZ
- Removal of approximately 0.01 ha of River Flat Eucalypt Forest for dwellings and infrastructure
- Modification of approximately 0.01 ha of River Flat Eucalypt Forest for APZ

Removal of habitat would occur as a result of clearing for construction dwellings and infrastructure such as roads.

No common flora or fauna species are likely to be lost from the study area as a result of the proposed works. Only a relatively small amount of clearing of Shale/Sandstone Transition Forest will occur for dwelling and roads and the majority of the modification for APZs will occur in areas of this vegetation type that are already impacted by weeds and edge effects. It is likely that all flora species to be cleared are present in other habitats within the study area and are likely to persist, especially since the retained vegetation is proposed to be managed in accordance with a VMP.

Two threatened ecological communities, Shale/Sandstone Transition Forest, listed under the TSC Act and EPBC Act and River Flat Eucalypt Forest, listed under the TSC Act, were recorded in the study area. A number of threatened species listed under the TSC Act and EPBC Act that were not recorded have potential to occur in the study area.

The potential impact to threatened species, populations or communities listed under the TSC Act and the EPBC Act were considered by applying 7 part tests and significant impact criteria, respectively. It was concluded that there would be no significant impact on threatened species and that an SIS or a referral were not required.

5.2 Recommendations

The following recommendations should be undertaken to avoid and minimise impacts on flora and fauna, including threatened species.

Table 2: Mitigation measures

ITEM	MITIGATION MEASURE	TIMING
Site-specific environmental induction	Ensure that all staff working on the project undertakes a site-specific environmental induction for the work site. The induction should include items such as: • Sensitivity of threatened fauna species (reptiles, birds and bats) • Site environmental procedures (vegetation management, sediment and erosion control, protective fencing, weed control) • What to do in case of emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency e.g. WIRES	Pre-construction and during construction for new staff
Identification of clearing limits (construction footprint edges) and protective fencing	Clearly mark out the limits of clearing (i.e. edge of construction site footprint). Where native vegetation is to be retained adjacent, or close to construction sites, protection fencing and signage is to be installed in accordance with Australian Standard 4970 – 2009 Protection of Trees.	Pre- and during construction
Vegetation clearance procedure	"Slow drop" techniques are to be used to fell trees. This involves nudging and shaking the tree, followed by a controlled lowering of the tree to the ground. Practical execution of this method involves using the bull dozer blade to push the tree mid-trunk to initiate felling, followed by lowering the blade to the base of the tree trunk, with the blade securing, and slowly lowering, the tree via the tree base. This should be supervised a suitable qualified ecologist.	Construction
Reuse of top soil and habitat elements	Harvest, store, and reuse topsoil from areas that have few weed species. Consider the reuse of logs and felled trees. First preference should be given to the reuse of logs and felled trees for ecological habitat enhancement within the study area, but alternatives may also be considered.	Construction
Erosion and sediment control	Provide appropriate stormwater runoff controls to manage stockpiles and prevent sediment discharge into waterways and native vegetation. Commence rehabilitation of bare soil as soon as practicable to minimise the risks of erosion.	Pre- and during, construction

ITEM	MITIGATION MEASURE	TIMING
Vegetation Management Plan	A vegetation management plan would be prepared which would outline strategies and actions to manage the vegetation that is retained within the study area for the purposes of conserving biodiversity. This will include measures to control threatening processes such as weed invasion, erosion and sedimentation and grazing and competition from feral animals.	

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Appendix A: Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened species identified from the NSW Wildlife Atlas and the EPBC Protected Matters Search Tool database searches. A 10 km radial search of the EPBC database was conducted on the 12 august 2013 and a 10 km buffer zone search of the Wildlife Atlas data was conducted around the study area on 7 October 2011.

Five terms for the likelihood of occurrence of species are used in this table. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal study area, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- Yes = the species was or has been observed within the study area
- Likely = likely; a medium to high probability that a species uses the study area
- Potential = suitable habitat for a species occurs on the study area, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- Unlikely = a very low to low probability that a species uses the study area
- No = no habitat within the study area and in the vicinity is unsuitable for the species.

TSC Status	Listing under the NSW Threatened Species Conservation Act 1995
EPBC Status	Listing under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999
CE	Critically Endangered
E	Endangered
E2	Endangered Population
V	Vulnerable
M	Migratory

ECOLOGICAL COMMUNITIES

Scientific name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Cumberland Plain Woodland	CEEC	CEEC	Occurs on soils derived from Wianamatta Shale, and throughout the driest part of the Sydney Basin. Good examples can be seen at Scheyville National Park and Mulgoa Nature Reserve. The dominant canopy trees of Cumberland Plain Woodland are *Eucalyptus moluccana* (Grey Box) and *E. tereticornis (*Forest Red Gum), with *E. crebra (*Narrow-leaved Ironbark), *Corymbia maculata* (Spotted Gum) and *E. eugenioides* (Thin-leaved Stringybark) occurring less frequently. The shrub layer is dominated by *Bursaria spinosa* (Blackthorn), and it is common to find abundant grasses such as *Themeda australis* (Kangaroo Grass) and *Microlaena stipoides* var. *stipoides (*Weeping Meadow Grass) (DECC 2005).	No. Not recorded and no habitat – soils are not derived from Wianamatta Shale.
Shale/sandstone Transition Forest	EEC	EEC	Open forest, with dominant canopy trees including *Syncarpia glomulifera* (Turpentine), *Eucalyptus punctata* (Grey Gum), *Eucalyptus paniculata* (Grey Ironbark) and *E. eugenoides* (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) *E. saligna* (Sydney Blue Gum) is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Polyscias sambucifolia* (Elderberry Panax). Occurs close to the shale/sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaus. A transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.	Yes, recorded on the subject site.
Moist Shale Woodland in the Sydney Basin Bioregion	EEC	CEEC	Similar to Cumberland Plain Woodland. It differs in having a shrub understorey that contains plants from moist habitats. Dominant canopy trees include Forest Red Gum *Eucalyptus tereticornis*, Grey Box *E. moluccana*, Narrow-leaved Ironbark *E. crebra* and Spotted Gum *Corymbia maculata*. Small trees, such as Hickory Wattle *Acacia implexa* and Sydney Green Wattle *A. parramattensis subsp. parramattensis* are also common. This community is listed as Critically Endangered under the "Western Sydney Dry Rainforest and Moist Woodland on Shale" in the EPBC Act (OEH, 2013)	No. Not recorded and no habitat – soils are not derived from Wianamatta Shale.

Scientific name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
River-flat Eucalypt Forest	E	-	River Flat Eucalypt Forest (RFEF) (referred to as Alluvial Woodland in this report) occurs on the river flats of the coastal floodplains of the NSW North Coast, the Sydney Basin, and the South East Corner Bioregions. It has a tall open tree layer of eucalypts, which may exceed 40m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (Forest red gum), *E. amplifolia* (Cabbage gum), *Angophora floribunda* (Rough-barked Apple), and *A. subvelutina* (Broad-leaved Apple). *Eucalyptus baueriana* (Blue Box), E. botryoides (Bangalay), and *E. elata* (River Peppermint) may be common south from Sydney, *E. ovata* (Swamp Gum) occurs on the far south coast, *E. saligna* (Sydney Blue Gum) and *E. grandis* (Flooded Gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain (DECC 2005). A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (Prickly-leaved Teatree), *Backhousia myrtifolia* (Grey Myrtle), *Melia azedarach* (White Cedar), *Casuarina cunninghamiana* (River Oak), *and C. glauca* (Swamp Oak). Scattered shrubs include *Bursaria spinosa, Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia, Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda*, and *Phyllanthus gunnii*. The groundcover is composed of abundant forbs, scramblers and grasses, including *Microlaena stipoides, Dichondra repens, Glycine clandestina, Oplismenus aemulus, Desmodium gunnii, Pratia purpurascens, Entolasia marginata, Oxalis perennans*, and *Veronica plebeia*. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity, and other disturbance, and may have a substantial component of exotic shrubs, grasses, vines and forbs (DECC 2005).	Yes. Present on Cattai Creek.

FLORA SPECIES

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Acacia bynoeana	Bynoe's Wattle	E	V	*Acacia bynoeana* is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains, and has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels (OEH 2013).	Unlikely. Not recorded.
Acacia gordonii		E	E	*Acacia gordonii* is restricted to the north-west of Sydney, occurring in the lower Blue Mountains in the west, and in the Maroota/Glenorie area in the east, within the Hawkesbury, Blue Mountains and Baulkham Hills local government areas. Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops (OEH 2013).	Unlikely. Not recorded.
Acacia pubescens	Downy Wattle	V	V	*Acacia pubescens* occurs on the NSW Central Coast in Western Sydney, mainly in the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. It is associated with Cumberland Plains Woodlands, Shale / Gravel Forest and Shale / Sandstone Transition Forest growing on clay soils, often with ironstone gravel (NPWS 1997; Benson and McDougall 1994).	No. Unsuitable habitat.
Allocasuarina glareicola	*Allocasuarina glareicola*	E	E	*Allocasuarina glareicola* is primarily restricted to the Richmond district on the north-west Cumberland Plain, with an outlier population found at Voyager Point. It grows in Castlereagh woodland on lateritic soil (DEC 2005).	No. Unsuitable habitat.
Asterolasia elegans	*Asterolasia elegans*	E	E	*Asterolasia elegans* is restricted to a few localities on the NSW Central Coast north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs. It is found in sheltered forests on mid- to lower slopes and valleys, in or adjacent to gullies (OEH 2013).	No. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	*Cryptostylis hunteriana* is known from a range of vegetation communities including swamp-heath and woodland (OEH 2013). The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*) (OEH 2013). Bell (2001) has identified Coastal Plains Scribbly Gum Woodland and Coastal Plains Smoothed-barked Apple Woodland as potential habitat on the Central Coast. Flowers between November and February, although may not flower regularly (OEH 2013; Bell 2001).	Unlikely. Unsuitable habitat.
Darwinia biflora	*Darwinia biflora*	V	V	*Darwinia biflora* is an erect or spreading shrub to 80cm high associated with habitats where weathered shale capped ridges intergrade with Hawkesbury Sandstone, where soils have a high clay content (NPWS 1997).	No. Unsuitable habitat.
Dillwynia tenuifolia	*Dillwynia tenuifolia*	V	V	*Dillwynia tenuifolia* has a core distribution within the Cumberland Plain, where it may be locally abundant within scrubby, dry heath areas within Castlereagh Ironbark Forest and Shale/Gravel Transition Forest on tertiary alluvium or laterised clays (OEH 2013). It may also be common in the ecotone between these areas and Castlereagh Scribbly Gum Woodland (OEH 2013).	No. Unsuitable habitat.
Epacris purpurascens var. *purpurascens*	*Epacris purpurascens* var. *purpurascens*	V		*Epacris purpurascens* var. *purpurascens* has been recorded between Gosford in the north to Avon Dam in the south, in a range of habitats, but most have a strong shale soil influence (OEH 2013).	Unlikely. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Eucalyptus sp. Cattai	*Eucalyptus* sp. Cattai	E		*Eucalyptus* sp. Cattai occurs in the area between Colo Heights and Castle Hill, north western Sydney. It occurs as a rare emergent in scrub, heath and low woodland on sandy soils, usually as isolated individuals or occasionally in small groups. The sites at which it occurs are generally flat and on ridge tops and associated soils are laterised clays overlying sandstone (OEH 2013).	No. Not recorded.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	V		*Grevillea juniperina* subsp. *juniperina* is endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. It grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium, typically containing lateritic gravels (OEH 2013).	No. Unsuitable habitat.
Hibbertia superans	*Hibbertia superans*	E		*Hibbertia superans* mainly occurs in the north west Sydney region between Baulkham Hills and Wisemans Ferry, with a disjunct occurrence near Mt Boss (inland from Kempsey) on the Mid North Coast of NSW. In the Sydney region it occurs in dry sclerophyll forest on sandstone ridgetops while the northern occurrence is on granite (OEH 2013).	No. Not recorded.
Lasiopetalum joyceae	*Lasiopetalum joyceae*	V	V	*Lasiopetalum joyceae* grows in ridgetop woodland, heath, woodland or open scrub, often with a clay influence (NPWS 1997).	No. Unsuitable habitat.
Leucopogon fletcheri subsp. *fletcheri*	*Leucopogon fletcheri* subsp. *fletcheri*	E		*Leucopogon fletcheri* subsp. *fletcheri* is restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains. It occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs (OEH 2013).	No. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Melaleuca deanei	Deane's Paperbark	V	V	Found in heath on sandstone (OEH 2013), and also associated with woodland on broad ridge tops and slopes on sandy loam and lateritic soils (Benson and McDougall 1998).	No. Unsuitable habitat.
Olearia cordata	*Olearia cordata*	V	V	The species' habitat is woodland on exposed Hawkesbury Sandstone ridges (OEH 2013). Soils are shallow or skeletal and are usually neutral to slightly acidic (OEH 2013). Shale-influence may be a habitat attribute (Benson and McDougall 1994). Associated soil landscapes are Gymea and Hawkesbury. The species tends to prefer the more sheltered easterly aspects (OEH 2013). Associated flora includes *Angophora costata*, *A. bakeri*, *Eucalyptus punctata* and *Corymbia eximia* with understorey species including *Allocasuarina torulosa*, *Acacia linifolia*, *Persoonia linearis* and *Leucopogon muticus* along with various grasses (Maryott-Brown & Wilks 1993). There have also been listings of *E. eugenioides* as an associate; and *E. oblonga*, *E. notabilis* and *Leptospermum trinervium* as dominant species near Wollombi. Recent observation have noted *C. gummifera* and in northern areas, *Angophora euryphylla* as common canopy species (OEH 2013).	No. Not recorded.
Pelargonium sp. (G.W. Carr 10345)		E		In NSW, Pelargonium sp. (G.W. Carr 10345) is known from the Southern Tablelands (PlantNet 2011). Otherwise, only known from the shores of Lake Omeo near Benambra in Victoria where it grows in cracking clay soil that is probably occasionally flooded (Walsh & Entwisle 1999).	No. Unsuitable habitat.
Persoonia hirsuta	Hairy Geebung	E	E	*Persoonia hirsuta* occurs from Singleton in the north, south to Bargo and the Blue Mountains to the west (OEH 2013). It grows in dry sclerophyll eucalypt woodland and forest on sandstone	No. Not recorded.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Pimelea curviflora var. *curviflora*	*Pimelea curviflora* var. *curviflora*	V	V	*Pimelea curviflora* var. *curviflora* is confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. It grows on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands (OEH 2013). Associated with the Duffys Forest Community, shale lenses on ridges in Hawkesbury sandstone geology.	Potential. Known location to the north across Cattai Creek.
Pimelea spicata	Spiked Rice-flower	E	E	In western Sydney, *Pimelea spicata* occurs on an undulating topography of well-structured clay soils, derived from Wianamatta shale (DEC 2004). It is associated with Cumberland Plains Woodland (CPW), in open woodland and grassland often in moist depressions or near creek lines (Ibid.). Has been located in disturbed areas that would have previously supported CPW (Ibid.).	No. Unsuitable habitat.
Pterostylis gibbosa	Illawarra Greenhood	E	E	Known from a small number of populations in the upper Hunter Valley (Milbrodale), the Illawarra region (Albion Park and Yallah) and near Nowra (OEH 2013). Plants grow in a variety of woodland and open forest communities with shallow rocky soils.	No. Unsuitable habitat.
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Terrestrial orchid predominantly found in Hawkesbury Sandstone Gully Forest growing in small pockets of soil that have formed in depressions in sandstone rock shelves (NPWS 1997). Known from Georges River National Park, Ingleburn, Holsworthy, Peter Meadows Creek, St Marys Tower (NSW Scientific Committee 1999).	No. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Pultenaea parviflora	*Pultenaea parviflora*	E	V	May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays (OEH 2013). May also be common in ecotone between these communities and Castlereagh Scribbly Gum Woodland (ibid.). *Eucalyptus fibrosa* is usually the dominant canopy species (ibid.). *E. globoidea*, *E. longifolia*, *E. parramattensis*, *E. sclerophylla* and *E. sideroxylon* may also be present or co-dominant, with Melaleuca decora frequently forming a secondary canopy layer (ibid.). Associated species may include *Allocasuarina littoralis*, *Angophora bakeri*, *Aristida* spp. *Banksia spinulosa*, *Cryptandra* spp., *Daviesia ulicifolia*, *Entolasia stricta*, *Hakea sericea*, *Lissanthe strigosa*, *M. nodosa*, *Ozothamnus diosmifolius* and *Themeda australis* (ibid.). Often found in association with other threatened species such as *Dillwynia tenuifolia*, *Dodonaea falcata*, *Grevillea juniperina*, *Micromyrtus minutiflora*, *Persoonia nutans* and *Styphelia laeta* (ibid.). Flowering may occur between August and November (ibid.).	No. Unsuitable habitat.
Streblus pendulinus	Siah's Backbone		E	Siah’s Backbone is found in warmr rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800 m above sea level. The species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest (ATRP 2010).	No. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Syzygium paniculatum	Magenta Lilly Pilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities (Payne 1997). In the Ourimbah Creek valley, *S. paniculatum* occurs within gallery rainforest with *Alphitonia excelsa*, *Acmena smithii*, *Cryptocarya glaucescens*, *Toona ciliata*, *Syzygium oleosum* with emergent *Eucalyptus saligna*. At Wyrrabalong NP, S. paniculatum occurs in littoral rainforest as a co-dominant with *Ficus fraseri*, *Syzygium oleosum*, *Acmena smithii*, *Cassine australe*, and *Endiandra sieberi*. Payne (1991) reports that the species appears absent from Terrigal formation shales, on which the gully rainforests occur. *S. paniculatum* is summer flowering (November-February), with the fruits maturing in May (OEH 2013).	No. Not recorded.
Tetratheca glandulosa	*Tetratheca glandulosa*	V	V	Associated with ridgetop woodland habits on yellow earths, also in sandy or rocky heath and scrub (NPWS 1997). Often associated with sandstone / shale interface where soils have a stronger clay influence (NPWS 1997). Flowers July to November.	No. Unsuitable habitat.
Zieria involucrata	*Zieria involucrata*	E	V	*Zieria involucrata* has a disjunct distribution north and west of Sydney, in the Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains local government areas (OEH 2013). Associated with Sydney Sandstone Gully Forest on sheltered slopes and among gullies (NPWS 1997).	No. Not recorded.

FAUNA SPECIES

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
FISH					
Macquarie australasica	Macquarie Perch	E (under FM Act)	E	Habitat for the Macquarie perch is bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	Unlikely. Unsuitable habitat.
Prototroctes maraena	Australian Grayling	-	V	Historically, this species occurred in coastal streams from the Grose River southwards through NSW, VIC and TAS. On mainland Australia, this species has been recorded from rivers flowing east and south of the main dividing ranges. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops but has also been found in muddy-bottomed, heavily silted habitat. Grayling migrate between freshwater streams and the ocean and as such it is generally accepted to be a diadromous (migratory between fresh and salt waters) species.	Unlikely. Unsuitable habitat.
AMPHIBIANS					
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock based streams (Ehmann 1997), where the soil is soft and sandy so that burrows can be constructed (Environment Australia 2000).	Unlikely. Unsuitable habitat.
Litoria aurea	Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke and White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (OEH 2013). Fast flowing streams are not utilised for breeding purposes by this species (Mahony 1999). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (OEH 2013). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–*Typha* sp. and spikerushes–*Eleocharis* sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1993). Ponds that are typically inhabited tend to be free from predatory fish such as *Gambusia holbrooki* (Mosquito Fish) (OEH 2013).	Unlikely. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	V	V	Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria (OEH 2013). It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude (NSW Scientific Committee 2000). It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer (NSW Scientific Committee 2000). It hunts either in shrubs or on the ground. Breeding is triggered by heavy rain and can occur from late winter to autumn, but is most likely to occur in spring when conditions are favourable. Males call from low vegetation close to slow flowing pools. Eggs and tadpoles are mostly found in slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools (OEH 2013).	Unlikely. Unsuitable habitat.
Mixophyes balbus	Stuttering Frog	E	V	A variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest (OEH 2013) that are generally characterised by deep leaf litter or thick cover from understorey vegetation (Ehmann 1997). Breeding habitats are streams and occasionally springs. Not known from streams disturbed by humans (Ehmann 1997) or still water environments (NSW Scientific Committee 2002).	No. Unsuitable habitat.
Mixophyes iteratus	Giant Barred Frog	E	E	Found on forested slopes of the escarpment and adjacent ranges in riparian vegetation, subtropical and dry rainforest, wet sclerophyll forests and swamp sclerophyll forest (OEH 2013; Ehmann 1997). This species is associated with flowing streams with high water quality, though habitats may contain weed species (Ehmann 1997). This species is not known from riparian vegetation disturbed by humans (NSW Scientific Committee 1999). During breeding eggs are kicked up onto an overhanging bank or the streams edge (OEH 2013).	No. Unsuitable habitat.
REPTILES					

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Typical sites consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin (OEH 2013). They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (Webb and Shine 1998). Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia, C. gummifera, Eucalyptus sieberi, E. punctata* and *E.piperita* (OEH 2013).	No. Unsuitable habitat.
BIRDS					
Anthochaera Phrygia (aka Xanthomyza phrygia)	Regent Honeyeater	E	E and M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (*Casuarina cunninghamiana*) (Garnett 1993). Areas containing Swamp Mahogany (*Eucalyptus robusta*) in coastal areas have been observed to be utilised (NPWS 1997). The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (NPWS 1995). As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar (Environment Australia 2000).	Unlikely. Unsuitable habitat.
Botaurus poiciloptilus	Australasian Bittern	V	-	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats (Marchant and Higgins 1993). Reedbeds, swamps, streams, estuaries (Simpson and Day 1999).	Unlikely. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Callocephalon fimbriatum	Gang-gang Cockatoo (population in Hornsby and Ku-ring-gai LGAs)	V-E2	-	During summer in dense, tall, wet forests of mountains and gullies, alpine woodlands (Morcombe 2004). In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages (Shields and Chrome 1992). They sometimes inhabit woodland, farms and suburbs in autumn/winter (Simpson and Day 2004).	No. Study area is not in the Hornsby or Ku-ring-gai LGAs.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Associated with a variety of forest types containing Allocasuarina species, usually reflecting the poor nutrient status of underlying soils (Environment Australia 2000; NPWS 1997; OEH 2013). Intact drier forest types with less rugged landscapes are preferred (OEH 2013). Nests in large trees with large hollows (Environment Australia 2000).	Potential. Chewed cones present.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	- -	Distributed through central NSW on the western side of the Great Dividing Range and sparsely scattered to the east of the Divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys. The Brown Treecreeper occupies eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories. (NSW Scientific Committee 2001).	Unlikely. Unsuitable habitat.
Daphoenositta chrysoptera	Varied Sittella	V	-	Distribution includes most of mainland Australia except deserts and open grasslands. Prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods from bark, dead branches, or small branches and twigs.	Potential. Potential habitat available.
Dasyornis brachypterus	Eastern Bristlebird	E	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; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species; Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, in the northern NSW population a lack of fire in grassy forest may be detrimental as grassy tussock nesting habitat becomes unsuitable after long periods without fire; northern NSW birds are usually found in habitats burnt five to 10 years previously.	No. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Associated with tropical and warm temperate terrestrial wetlands, estuarine and littoral habitats, and occasionally woodlands and grasslands floodplains (Marchant and Higgins 1993). Forages in fresh or saline waters up to 0.5m deep, mainly in open fresh waters, extensive sheets of shallow water over grasslands or sedgeland, mangroves, mudflats, shallow swamps with short emergent vegetation and permanent billabongs and pools on floodplains (Marchant and Higgins 1993; OEH 2013).	Unlikely. Unsuitable habitat.
Epthianura albifrons	White-fronted Chat	V		Regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Current estimates suggest this population consists of 8 individuals. Regularly observed in the saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve. This population is estimated to comprise 19-50 individuals. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground (OEH 2013).	No. Unsuitable habitat.
Erythrotriorchis radiatus	Red Goshawk	CE	V	Associated with forests and woodlands with a mosaic of vegetation types, an abundance of birds and permanent water. In NSW, this species is thought to favour mixed subtropical rainforest, Melaleuca Swamp Forest, and open eucalypt forest along rivers, often in rugged terrain (Marchant & Higgins 1993; DECC 2005). Across northern Australian south through eastern Queensland to far north-east NSW. The species is very rare in NSW. Most records are from the Clarence River Catchment, with a few about the lower Richmond and Tweed Rivers. (DECC 2005, Threatened Species Website Profiles. NSW Dept. of Environment and Climate Change (www.threatenedspecies.nsw.gov.au))	Unlikely. Unsuitable habitat.
Hieraaetus morphnoides	Little Eagle	V	-	Utilises open eucalypt, sheoak and acacia forest, woodland or open woodland. Uses tall trees for nesting, with a large stick nest being built. Lays eggs in spring, and young fledge in early summer. Preys on birds, reptiles and mammals, and occasionally feeds on large insects or carrion.	Potential. Potential foraging habitat available.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Glossopsitta pusilla	Little Lorikeet	V	-	In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively.	Potential. Potential foraging habitat available.
Irediparra gallinacea	Comb-crested Jacana	V	-	Freshwater wetlands, such as lagoons, billabongs, swamps, lakes and reservoirs, generally with abundant floating aquatic vegetation (Marchant and Higgins 1993).	Unlikely. Unsuitable habitat.
Ixobrychus flavicollis	Black Bittern	V	-	Occurs in both terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation (OEH 2013). In areas with permanent water it may occur in flooded grassland, forest, woodland, rainforest and mangroves (OEH 2013).	Unlikely. Unsuitable habitat.
Lathamus discolor	Swift Parrot	E	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts (Blakers *et al*. 1984; Schodde and Tidemann 1986). Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*) (OEH 2013).	Unlikely. Unsuitable habitat.
Melanodryas cucullata *Melanodryas cucullata cucullata*	Hooded Robin Hooded Robin (southeastern subspecies)	V	-	Associated with a wide range of Eucalypt woodlands, Acacia shrubland and open forests (Blakers *et al*. 1984). In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (NSW Scientific Committee 2001). Hooded Robin home ranges are relatively large, averaging 18ha for birds from the New England Tableland (NSW Scientific Committee 2001).	Unlikely. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Predominantly associated with box-ironbark association woodlands and River Red Gum (NSW Scientific Committee 2001). Also associated with drier coastal woodlands of the Cumberland Plain and the Hunter, Richmond and Clarence Valleys (NSW Scientific Committee 2001).	Unlikely. Unsuitable habitat.
Petroica boodang	Scarlet Robin	V	-	Occurs from the coast to the inland slopes in NSW. After breeding (July-Jan), some disperse to the lower valleys and plains of the tablelands and slopes, and may appear as far west as the eastern edges of the inland plains in autumn and winter. Primarily resides in dry eucalypt forests and woodlands, with usually open and grassy understory, with scattered shrubs. Abundant logs and fallen timber are important habitat components. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees, and may join mixed flocks of other small insectivorous birds.	Unlikely. Unsuitable habitat.
Petroica phoenicea	Flame Robin	V	-	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes, often on ridges and slopes, in NSW. Prefers clearings or areas with open understoreys, and grassy groundlayer for breeding habitat. Will often occur in recently burnt areas. Shrub density does not appear to be an important habitat factor. Many birds move to the inland slopes and plains in winter, or to drier more open habitats in the lowlands.	Unlikely. Unsuitable habitat.
Rostratula australis (a.k.a. R. benghalensis)	Painted Snipe (Australian subspecies)	E	V	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber (OEH 2013). Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (ibid.). Breeding is often in response to local conditions; generally occurs from September to December (OEH 2013). Roosts during the day in dense vegetation (NSW Scientific Committee 2004). Forages nocturnally on mud-flats and in shallow water (OEH 2013). Feeds on worms, molluscs, insects and some plant-matter (ibid.).	Unlikely. Unsuitable habitat.
NOCTURNAL BIRDS					

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Ninox connivens	Barking Owl	V	-	Associated with a variety of habitats such as savanna woodland, open eucalypt forests, wetland and riverine forest. The habitat is typically dominated by Eucalypts (often Redgum species), however often dominated by Melaleuca species in the tropics (OEH 2013). It usually roosts in dense foliage in large trees such as River She-oak (*Allocasuarina cunninghamiana*), other Casuarina and Allocasuarina, eucalypts, Angophora, Acacia and rainforest species from streamside gallery forests. It usually nests near watercourses or wetlands in large tree hollows with entrances averaging 2-29 metres above ground, depending on the forest or woodland structure and the canopy height (Debus 1997).	Unlikely. Unsuitable habitat. No suitable hollows.
Ninox strenua	Powerful Owl	V	-	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes (Environment Australia 2000, Debus and Chafer 1994). Large trees with hollows at least 0.5m deep are required for shelter and breeding (Environment Australia 2000).	Unlikely. Unsuitable habitat. No suitable hollows.
Tyto novaehollandiae	Masked Owl	V	-	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland (OEH 2013) and especially the ecotone between wet and dry forest, and non forest habitat (Environment Australia 2000). Known to utilise forest margins and isolated stands of trees within agricultural land (Hyem 1979) and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (Kavanagh and Peake 1993).	Unlikely. Unsuitable habitat. No suitable hollows.
Tyto tenebricosa	Sooty Owl	V	-	Sooty Owls are associated with tall wet old growth forest on fertile soil with a dense understorey and emergent tall Eucalyptus species (Environment Australia 2000, Debus 1994). Pairs roost in the daytime amongst dense vegetation, in tree hollows and sometimes in caves. The Sooty Owl is typically associated with an abundant and diverse supply of prey items and a selection of large tree hollows (Debus 1994, Garnett 1993, Hyem 1979).	Unlikely. Unsuitable habitat. No suitable hollows.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
MAMMALS					
Dasyurus maculatus *Dasyurus maculatus maculatus*	Spotted-tailed Quoll Spotted-tailed Quoll (SE Mainland Population)	V -	- E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; OEH 2013), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (OEH 2013). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).	Unlikely. Unsuitable habitat.
Petaurus australis	Yellow-bellied Glider	V	-	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter (Environment Australia 2000, Braithwaite 1984, Davey 1984, Kavanagh 1984; OEH 2013). Large hollows within mature trees are required for shelter, nesting and breeding (Henry and Craig 1984; OEH 2013).	Unlikely. Unsuitable habitat. No suitable mature trees with hollows
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices (Strahan 1998).	Unlikely. Unsuitable habitat.
Phascolarctos cinereus	Koala	V-E2	-	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed *et al.* 1990), with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: *Eucalyptus tereticornis*, *E. punctata*, *E. cypellocarpa*, *E. viminalis*	Unlikely. Only one record within 5 km of the study area.
Potorous tridactylus *Potorous tridactylus tridactylus*	Long-nosed Potoroo Long-nosed Potoroo (SE Mainland Population)	V -	- V	Associated with dry coastal heath and dry and wet sclerophyll forests (Strahan 1998) with dense cover for shelter and adjacent more open areas for foraging (Menkhorst and Knight 2004).	Unlikely. Unsuitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Pseudomys novaehollandiae	New Holland Mouse	-	V	A small burrowing native rodent with a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. A social animal, living predominantly in burrows shared with other individuals. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha and the species peaks in abundance during early to mid stages of vegetation succession typically induced by fire	Unlikely. Unsuitable habitat.
FLYING MAMMALS					
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests (Churchill 1998; OEH 2013). This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; OEH 2013).	Potential. Potential foraging habitat available.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Prefers moist habitats with trees taller than 20m (OEH 2013). Roosts in tree hollows but has also been found roosting in buildings or under loose bark (OEH 2013).	Potential. Potential foraging and roosting habitat available.
Miniopterus australis	Little Bent-wing Bat	V	-	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests (Churchill 1998). This species shelter in a range of structures including culverts, drains, mines and caves (Environment Australia 2000). Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found (OEH 2013). Breeding occurs in caves, usually in association with M. schreibersii (Environment Australia 2000, OEH 2013).	Potential. Potential foraging habitat available.
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1981, 1995). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).	Potential. Potential foraging habitat available.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Mormopterus norfolkensis	East Coast Freetail Bat	V	-	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison and Hoye 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison and Hoye 1998).	Potential. Potential foraging and roosting habitat available.
Myotis macropus (formerly *M. adversus*)	Southern Myotis, Large-footed Myotis	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water (Churchill 1998). While roosting (in groups of 10-15) is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains (Churchill 1998). However the species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and culverts are used (Richards 1998). Forages over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December (OEH 2013)	Potential. Potential foraging habitat available.
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).	Potential. Potential foraging habitat available.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Found in almost all habitats, from wet and dry sclerophyll forest, open woodland (Churchill 1998), open country, mallee, rainforests, heathland and waterbodies. Roosts in tree hollows; may also use caves; has also been recorded in a tree hollow in a paddock (Environment Australia 2000) and in abandoned sugar glider nests (Churchill 1998). The Yellow-bellied Sheathtail-bat is dependent on suitable hollow-bearing trees to provide roost sites, which may be a limiting factor on populations in cleared or fragmented habitats (Environment Australia 2000).	Potential. Potential foraging and roosting habitat available.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill 1998), tending to be more frequently located in more productive forests (Hoye and Richards 1998). Within denser vegetation types use is made of natural and man-made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (Hoye and Richards 1998).	Potential. Potential foraging and roosting habitat available.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
INVERTEBRATES					
Meridolum corneovirens	Cumberland (Large) Land Snail	E	-	Associated with open eucalypt forests, particularly Cumberland Plain Woodland. Found under fallen logs, debris and in bark and leaf litter around the trunk of gum trees or burrowing in loose soil around clumps of grass (NPWS 1997). Urban waste may also form suitable habitat (NSW NPWS 1997).	No. No suitable habitat.
MIGRATORY TERRESTRIAL SPECIES LISTED UNDER EPBC ACT					
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas (Marchant and Higgins 1993, Simpson and Day 1999). Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (Marchant and Higgins 1993).	Unlikely. No suitable habitat.
Hirundapus caudacutus	White-throated Needletail	-	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Marchant and Higgins 1993; Simpson and Day 1999). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Marchant and Higgins 1993).	Unlikely. No suitable habitat.
Merops ornatus	Rainbow Bee-eater	-	M	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May. Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs (ibid). Nest is a chamber a the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting.	Unlikely. No suitable habitat.
Monarcha melanopsis	Black-faced Monarch	-	M	Rainforest and eucalypt forests, feeding in tangled understorey (Blakers *et al*. 1984).	Unlikely. No suitable habitat.
Myiagra cyanoleuca	Satin Flycatcher	-	M	Wetter, denser forest, often at high elevations (Simpson and Day 2004).	Unlikely. No suitable habitat.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Rhipidura rufifrons	Rufous Fantail	-	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe 2004). Open country may be used by the Rufous Fantail during migration (Morcombe 2004).	Potential. Potential riverside vegetation on Cattai Creek.
Xanthomyza phrygia	Regent Honeyeater	E	E, M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE
MIGRATORY WETLAND SPECIES LISTED UNDER EPBC ACT					
Ardea alba	Great Egret	-	M	The Great Egret is common and widespread in Australia (McKilligan 2005). The Eastern Great Egret has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial). These include swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (Kushlan and Hancock 2005; Marchant and Higgins 1993; Martínez-Vilalta and Motis 1992). The species usually frequents shallow waters. It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats (McKilligan 2005).	Potential. Potential foraging habitat available.
Ardea ibis	Cattle Egret	-	M	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments (McKilligan 2005). Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (McKilligan 2005).	Potential. Potential foraging habitat available.

Scientific name	Common name	TSC Act	EPBC Act	Habitat associations	Likelihood of occurrence
Gallinago hardwickii	Latham's Snipe	-	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover (Marchant and Higgins 1993). Occupies a variety of vegetation around wetlands (Marchant and Higgins 1993) including wetland grasses and open wooded swamps (Simpson and Day 1999). Latham's Snipe sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers (Frith *et al*. 1977; Naarding 1983; Patterson 1991). These habitats are most commonly used when the birds are on migration (Frith *et al*. 1977). They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches, ricefields, orchards, saltworks, and sewage and dairy farms (Fielding 1979; Frith *et al*. 1977; Lane and Jessop 1985; Naarding 1982, 1983). They can also occur in various sites close to humans or human activity (e.g. near roads, railways, airfields, commercial or industrial complexes) (Frith *et al.* 1977; Naarding 1983).	Potential. Potential foraging habitat available.

Appendix B: Species list

Flora species recorded in the study area

Family	Scientific name	Common Name
Acanthaceae	*Brunoniella pumilio*	Dwarf Brunoniella
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower
Adiantaceae	*Cheilanthes sieberi subsp. sieberi*	Poison Rock Fern
Aizoaceae	*#Tetragonia tetragonioides*	New Zealand Spinach
Alliaceae	*^Agapanthus sp.*	
Alliaceae	*^Nothoscordum borbonicum*	Onion Weed
Anthericaceae	*^Chlorophytum comosum*	Spider Plant
Anthericaceae	*Arthropodium milleflorum*	Pale Vanilla-lily
Anthericaceae	*Dichopogon fimbriatus*	Nodding Chocolate Lily
Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily
Apiaceae	*Actinotus helianthi*	Flannel Flower
Apiaceae	*^Foeniculum vulgare*	Fennel
Apiaceae	*Centella asiatica*	Indian Pennywort
Apiaceae	*Hydrocotyle sp*	
Apiaceae	*Platysace lanceolata*	Shrubby Platysace
Apiaceae	*Xanthosia pilosa*	Woolly Xanthosia
Apiaceae	*Xanthosia tridentata*	Rock Xanthosia
Apocynaceae	*^Araujia sericifera*	Moth Vine
Apocynaceae	*^Vinca major*	Blue Periwinkle
Apocynaceae	*Parsonsia* sp.	
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Apocynaceae	*Tylophora barbata*	Bearded Tylophora
Araceae	*^Monstera deliciosa*	Fruit Salad Plant
Araliaceae	*^Hedera helix*	
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Arecaceae	*Livistona australis*	Cabbage Fan Palm
Arecaceae	*^Phoenix canariensis*	Canary Island Date Palm
Asparagaceae	*^Asparagus aethiopicus*	Aparagus Fern
Asparagaceae	*^Asparagus asparagoides*	Bridal Creeper
Asparagaceae	*^Asparagus plumosus*	Climbing Asparagus Fern
Asphodelaceae	*^Aloe sp*	
Asteliaceae	*Cordyline sp*	
Asteraceae	*^Arctotheca calendula*	Cape Weed
Asteraceae	*^Bidens pilosa*	Cobblers Pegs
Asteraceae	*Cassinia uncata*	Sticky Cassinia
Asteraceae	*^Cirsium vulgare*	Spear Thistle
Asteraceae	*^Conyza bonariensis*	Flaxleaf Fleabane
Asteraceae	*^Conyza sp*	
Asteraceae	*^Erigeron Karvinskianus*	Seaside Daisy

Family	Scientific name	Common Name
Asteraceae	^*Gamochaeta calviceps*	Cudweed
Asteraceae	^*Hypochaeris radicata*	Catsear
Asteraceae	^*Senecio angulatus*	
Asteraceae	^*Senecio madagascariensis*	Fireweed
Asteraceae	^*Senecio sp*	
Asteraceae	^*Sonchus asper*	Prickly Sowthistle
Asteraceae	^*Sonchus oleraceus*	Common Sowthistle
Asteraceae	^*Sonchus sp*	
Asteraceae	^*Taraxacum officinale*	Dandelion
Asteraceae	^*Xanthium spinosum*	Bathurst Burr
Asteraceae	*Calotis cuneifolia*	Burr Daisy
Asteraceae	*Euchiton sp*	
Asteraceae	*Euchiton sphaericus*	
Asteraceae	*Ozothamnus diosmifolius*	Rice Flower
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Basellaceae	^*Anredera cordifolia*	Madeira Vine
Bignoniaceae	^*Jacaranda mimosifolia*	Jacaranda
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine
Bignoniaceae	*Pandorea pandorana subsp. pandorana*	Wonga Wonga Vine
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern
Brassicaceae	^*Brassica sp*	
Brassicaceae	^*Cardamine sp*	
Cactaceae	^*Opuntia stricta*	Common Prickly Pear
Campanulaceae	*Wahlenbergia gracilis*	Sprawling Bluebell
Caprifoliaceae	^*Lonicera japonica*	Japenese Honeysuckle
Caryophyllaceae	^*Paronychia brasiliana*	Chilean Whitlow Wort
Caryophyllaceae	^*Stellaria media*	Common Chickweed
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak
Casuarinaceae	*Casuarina cunninghamiana*	River Oak
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Celastraceae	*Maytenus silvestris*	Narrow-leaved Orangebark
Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Clusiaceae	*Hypericum gramineum*	Small St. John's Wort
Commelinaceae	^*Tradescantia fluminensis*	Wandering Jew
Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Convolvulaceae	**Ipomoea indica*	Morning Glory
Convolvulaceae	*Convolvulus erubescens*	Blushing Bindweed
Convolvulaceae	*Dichondra repens*	Kidney Weed
Cunoniaceae	*Callicoma serratifolia*	Black Wattle
Cunoniaceae	*Ceratopetalum gummiferum*	New South Wales Christmas-bush
Cyperaceae	^*Carex sp*	

Family	Scientific name	Common Name
Cyperaceae	*Caustis flexuosa*	Curly Wig
Cyperaceae	^*Cyperus sp*	
Cyperaceae	*Cyathochaeta diandra*	
Cyperaceae	*Gahnia aspera*	Rough Saw-sedge
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Cyperaceae	*Lepidosperma filiforme*	
Cyperaceae	*Lepidosperma gunnii*	
Cyperaceae	*Lepidosperma laterale*	
Cyperaceae	*Ptilothrix deusta*	
Cyperaceae	*Schoenus melanostyachys*	Black Bog-rush
Davalliaceae	^*Nephrolepis cordifolia*	Fishbone Fern
Dennstaedtiacea	*Pteridium esculentum*	Common Bracken
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern
Dicksoniaceae	*Calochlaena sp.*	
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia aspera* subsp. *aspera*	
Dilleniaceae	*Hibbertia sp*	
Droseraceae	*Drosera peltata*	
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Ericaceae - Styphelioideae	*Epacris pulchella*	Wallum Heath
Ericaceae - Styphelioideae	*Leucopogon juniperinus*	Prickly Beard-heath
Ericaceae - Styphelioideae	*Leucopogon lanceolatus*	
Ericaceae - Styphelioideae	*Leucopogon muticus*	Blunt Beard-heath
Ericaceae - Styphelioideae	*Lissanthe strigosa*	Peach Heath
Euphorbiaceae	^*Euphorbia peplus*	Petty Spurge
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart
Fabaceae - Caesalpinioideae	**Senna pendula*	Bird-of-Paradise Shrub
Fabaceae - Caesalpinioideae	**Senna sp.*	
Fabaceae - Faboideae	^*Lotus sp*	
Fabaceae - Faboideae	^*Medicago sp*	
Fabaceae - Faboideae	^*Trifolium sp*	
Fabaceae - Faboideae	^*Vicia sp*	
Fabaceae - Faboideae	*Bossiaea obcordata*	Spiny Bossiaea
Fabaceae - Faboideae	*Bossiaea sp.*	
Fabaceae - Faboideae	*Desmodium brachypodum*	Large Tick-trefoil
Fabaceae - Faboideae	*Desmodium sp*	
Fabaceae - Faboideae	*Desmodium varians*	Slender Tick-trefoil
Fabaceae - Faboideae	*Dillwynia retorta*	
Fabaceae - Faboideae	*Glycine clandestina*	
Fabaceae - Faboideae	*Glycine microphylla*	Small-leaf glycine
Fabaceae - Faboideae	*Glycine sp*	
Fabaceae - Faboideae	*Glycine tabacina*	

Family	Scientific name	Common Name
Fabaceae - Faboideae	*Hardenbergia violacea*	*Hardenbergia violacea*
Fabaceae - Faboideae	*Hovea linearis*	
Fabaceae - Faboideae	*Kennedia rubicunda*	Dusky Coral Pea
Fabaceae - Faboideae	*Platylobium formosum*	Handsome Flat Pea
Fabaceae - Faboideae	*Zornia sp*	
Fabaceae - Mimosoideae	*#Acacia sp*	
Fabaceae - Mimosoideae	*Acacia binervia*	Coast Myall
Fabaceae - Mimosoideae	*Acacia brownii*	Heath Wattle
Fabaceae - Mimosoideae	*Acacia decurrens*	Black Wattle
Fabaceae - Mimosoideae	*Acacia floribunda*	White Sally Wattle
Fabaceae - Mimosoideae	*Acacia linearifolia*	Narrow-leaved Wattle
Fabaceae - Mimosoideae	*Acacia linifolia*	
Fabaceae - Mimosoideae	*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle
Fabaceae - Mimosoideae	*Acacia parramattensis*	Parramatta Wattle
Fabaceae - Mimosoideae	*Acacia suaveolens*	
Fabaceae - Mimosoideae	*Acacia ulicifolia*	Prickly Moses
Gentianaceae	*^Centaurium sp*	
Geraniaceae	*Geranium solanderi*	Native Geranium
Geraniaceae	*Geranium sp*	
Geraniaceae	*Goodenia hederacea*	Forest Goodenia
Goodeniaceae	*Goodenia sp*	
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Iridaceae	*^Watsonia meriana var. bulbillifera*	Bulbil Watsonia
Iridaceae	*Patersonia glabrata*	Leafy Purple-flag
Juncaceae	*Juncus continuus*	
Juncaceae	*^Juncus sp*	
Juncaceae	*Juncus usitatus*	
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower
Lauraceae	*^Cinnamomum camphora*	Camphor Laurel
Lauraceae	*Cassytha glabella*	
Lauraceae	*Cassytha pubescens*	
Liliaceae	*^Lilium formosanum*	Formosan Lily
Lindsaeaceae	*Lindsaea linearis*	Screw Fern
Lindsaeaceae	*Lindsaea microphylla*	Lacy Wedge Fern
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Loganiaceae	*Logania albiflora*	
Lomandraceae	*#Lomandra longifolia*	Spiny-headed Mat-rush
Lomandraceae	*Lomandra cylindrica*	Needle Mat-Rush
Lomandraceae	*Lomandra filiformis subsp. coriacea*	
Lomandraceae	*Lomandra filiformis subsp. filiformis*	Wattle Mat-rush
Lomandraceae	*Lomandra glauca*	Pale Mat-rush
Lomandraceae	*Lomandra gracilis*	
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush

Family	Scientific name	Common Name
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush
Lomandraceae	*Lomandra obliqua*	
Lomandraceae	*Lomandra sp*	
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Malaceae	*^Cotoneaster glaucophyllus*	Cotoneaster
Malaceae	*^Rhaphiolepis indica*	Indian Hawthorn
Malvaceae	*Lasiopetalum ferrugineum*	
Malvaceae	*^Modiola caroliniana*	Red-flowered Mallow
Malvaceae	*^Modiola sp.*	
Malvaceae	*^Sida rhombifolia*	Paddy's Lucerne
Meliaceae	*Melia azedarach*	White Cedar
Meliaceae	*Synoum glandulosum*	Scentless Rosewood
Moraceae	*Ficus rubiginosa*	Port Jackson Fig
Myrsinaceae	*^Anagallis arvensis*	Scarlet Pimpernel
Myrsinaceae	*Myrsine variabilis*	
Myrtaceae	*#Callistemon sp*	
Myrtaceae	*#Eucalyptus sp*	
Myrtaceae	*#Melaleuca sp*	
Myrtaceae	*#Tristania neriifolia*	Water Gum
Myrtaceae	*Acmena smithii*	Lilly Pilly
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple
Myrtaceae	*Angophora costata*	Sydney Red Gum
Myrtaceae	*Angophora floribunda*	Rough-barked Apple
Myrtaceae	*Angophora subvelutina*	Broad-leaved Apple
Myrtaceae	*Corymbia gummifera*	
Myrtaceae	*Corymbia maculata*	Spotted Gum
Myrtaceae	*Eucalyptus amplifolia*	Cabbage Gum
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark
Myrtaceae	*Eucalyptus fibrosa*	Red Ironbark
Myrtaceae	*Eucalyptus globoidea*	White Stringybark
Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint
Myrtaceae	*Eucalyptus punctata*	Grey Gum
Myrtaceae	*Eucalyptus racemosa*	Narrow-leaved Scribbly Gum
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany
Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum
Myrtaceae	*Eucalyptus sclerophylla*	Hard-leaved Scribbly Gum
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Myrtaceae	*Kunzea ambigua*	Tick Bush
Myrtaceae	*Leptospermum polyanthum*	

Family	Scientific name	Common Name
Myrtaceae	*Leptospermum trinervium*	
Myrtaceae	*Melaleuca decora*	
Myrtaceae	*Melaleuca erubescens*	
Myrtaceae	*Syncarpia glomulifera*	Turpentine
Myrtaceae	*Tristaniopsis sp.*	
Nandinaceae	*^Nandina domestica*	Japanese Sacred Bamboo
Ochnaceae	*^Ochna serrulata*	Mickey Mouse Plant
Oleaceae	*^Jasminum sp*	
Oleaceae	*^Ligustrum lucidum*	Large Leaved Privet
Oleaceae	*^Ligustrum sinense*	Small Leaved Privet
Oleaceae	*^Olea europaea subsp. cuspidata*	African Olive
Oleaceae	*Notelaea longifolia*	Large Mock-olive
Oleaceae	*Notelaea sp.*	
Orchidaceae	*Acianthus sp*	
Orchidaceae	*Caladenia sp*	
Orchidaceae	*Calochilus sp*	
Orchidaceae	*Corybas sp*	
Orchidaceae	*Cryptostylis sp*	
Orchidaceae	*Pterostylis longifolia*	Tall Greenhood
Orchidaceae	*Pterostylis sp.*	
Oxalidaceae	*^Oxalis sp*	
Oxalidaceae	*Oxalis perennans*	
Passifloraceae	*^Passiflora edulis*	Common Passionfruit
Passifloraceae	*^Passiflora sp*	
Phormiaceae	*Dianella caerulea var. caerulea*	Blue Flax Lily
Phormiaceae	*Dianella longifolia var. longifolia*	
Phormiaceae	*Dianella revoluta*	Blueberry Lily
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree
Phyllanthaceae	*Phyllanthus hirtellus*	Thyme Spurge
Phyllanthaceae	*Phyllanthus sp*	
Phyllanthaceae	*Poranthera microphylla*	
Pinaceae	*Poranthera microphylla*	
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry
Pittosporaceae	*Bursaria spinosa*	Blackthorn
Pittosporaceae	*Pittosporum revolutum*	Wild Yellow Jasmine
Pittosporaceae	*Pittosporum undulatum*	Native Daphne
Plantaginaceae	*^Plantago lanceolata*	Lamb's Tongues
Poaceae	*^Aira sp*	
Poaceae	*^Avena fatua*	Wild Oats
Poaceae	*^Briza maxima*	Quaking Grass
Poaceae	*^Briza minor*	Shivery Grass
Poaceae	*^Briza subaristata*	

Family	Scientific name	Common Name
Poaceae	^*Bromus catharticus*	Prairie Grass
Poaceae	^*Bromus sp*	
Poaceae	^*Ehrharta erecta*	Panic Veldtgrass
Poaceae	^*Eragrostis curvula*	African Lovegrass
Poaceae	^*Lolium perenne*	Perennial Ryegrass
Poaceae	^*Paspalum dilatatum*	Paspalum
Poaceae	^*Pennisetum clandestinum*	Kikuyu
Poaceae	^*Pennisetum villosum*	Feathertop
Poaceae	^*Phalaris aquatica*	Phalaris
Poaceae	^*Setaria sp.*	
Poaceae	^*Sporobolus sp*	
Poaceae	^*Vulpia myuros*	
Poaceae	*Anisopogon avenaceus*	Oat Speargrass
Poaceae	*Aristida ramosa*	Purple Wiregrass
Poaceae	*Aristida vagans*	Threeawn Speargrass
Poaceae	*Austrodanthonia sp*	
Poaceae	*Austrostipa pubescens*	
Poaceae	*Austrostipa sp.*	
Poaceae	*Austrostipa verticillata*	Slender Bamboo Grass
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass
Poaceae	*Cymbopogon* sp.	
Poaceae	*Cynodon dactylon*	Couch
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass
Poaceae	*Dichelachne sp*	
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass
Poaceae	*Echinopogon caespitosus*	
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass
Poaceae	*Echinopogon sp*	
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Entolasia stricta*	
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Poaceae	*Eragrostis sp*	
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Oplismenus aemulus*	Australian Basket Grass
Poaceae	*Oplismenus imbecillis*	Creeping Beard Grass
Poaceae	*Oplismenus sp*	
Poaceae	*Paspalidium distans*	
Poaceae	*Phragmites australis*	Common Reed
Poaceae	*Poa affinis*	
Poaceae	*Poa* sp.	
Poaceae	*Sporobolus sp*	
Poaceae	*Stenotaphrum sp*	Buffalo Grass

Family	Scientific name	Common Name
Poaceae	*Themeda australis*	Kangaroo Grass
Polygonaceae	^*Rumex sp*	
Polygonaceae	*Persicaria sp*	
Polygonaceae	*Rumex brownii*	Swamp Dock
Proteaceae	#*Grevillea robusta*	Silky Oak
Proteaceae	*Banksia serrata*	Old-man Banksia
Proteaceae	*Banksia spinulosa*	Hairpin Banksia
Proteaceae	*Grevillea linearifolia*	Linear-leaf Grevillea
Proteaceae	*Hakea dactyloides*	Broad-leaved Hakea
Proteaceae	*Hakea sericea*	Needlebush
Proteaceae	*Isopogon anemonifolius*	Broad-leaf Drumsticks
Proteaceae	*Lambertia formosa*	Mountain Devil
Proteaceae	*Lomatia silaifolia*	Crinkle Bush
Proteaceae	*Persoonia laurina*	Laurel Geebung
Proteaceae	*Persoonia laurina subsp. laurina*	
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung
Proteaceae	*Petrophile pulchella*	Conesticks
Pteridaceae	*Adiantum aethiopicum*	Common Maidenhair
Pteridaceae	*Adiantum formosum*	Black stem Maidenhair
Ranunculaceae	^*Ranunculus sp*	
Ranunculaceae	*Clematis aristata*	Old Man's Beard
Ranunculaceae	*Clematis glycinoides*	Headache Vine
Ranunculaceae	*Clematis sp.*	
Rosaceae	^*Rubus sp*	Blackberry
Rosaceae	*Rubus parvifolius*	
Rubiaceae	^*Galium aparine*	Goosegrass
Rubiaceae	*Asperula conferta*	Common Woodruff
Rubiaceae	*Morinda jasminoides*	Sweet Morinda
Rubiaceae	*Opercularia diphylla*	
Rubiaceae	*Pomax umbellata*	
Rutaceae	*Crowea saligna*	
Rutaceae	*Zieria smithii*	Sandfly Zieria
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart
Santalaceae	*Exocarpus sp.*	
Santalaceae	*Leptomeria acida*	Native Currant
Sapindaceae	^*Acer negundo*	Box-elder Maple
Sapindaceae	^*Cardiospermum grandiflorum*	Balloon Vine
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush
Sapindaceae	*Guioa semiglauca*	Guioa
Schizaeaceae	*Schizaea bifida*	Forked Comb Fern
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell
Smilacaceae	*Smilax glyciphylla*	Sweet Sarsaparilla

Family	Scientific name	Common Name
Solanaceae	^*Cestrum parqui*	Green Cestrum
Solanaceae	^*Solanum chenopodioides*	Whitetip Nightshade
Solanaceae	^*Solanum mauritianum*	Wild Tobacco Bush
Solanaceae	^*Solanum nigrum*	Black-berry Nightshade
Solanaceae	^*Solanum pseudocapsicum*	Madeira Winter
Solanaceae	^*Solanum sp*	
Solanaceae	*Solanum prinophyllum*	Forest Nightshade
Sterculiaceae	#*Brachychiton acerifolius*	Flame Tree
Stylidiaceae	*Stylidium lineare*	Narrow-leaved Triggerplant
Thymelaeaceae	*Pimelea linifolia*	Slender Eice Flower
Typhaceae	*Typha sp.*	
Ulmaceae	^*Celtis sinensis*	Japenese Hackberry
Ulmaceae	*Trema tomentosa*	Native Peach
Urticaceae	#*Urtica incisa*	Stinging Nettle
Verbenaceae	^*Lantana camara*	Lantana
Verbenaceae	^*Verbena bonariensis*	Purpletop
Violaceae	^*Viola odorata*	Sweet Violet
Violaceae	^*Viola sp*	
Vitaceae	*Cissus hypoglauca*	Water Vine
Xanthorrhoeaceae	*Xanthorrhoea arborea*	
Xanthorrhoeaceae	*Xanthorrhoea minor*	
Xanthorrhoeaceae	*Xanthorrhoea sp*	
Zingiberaceae	^*Hedychium gardnerianum*	Ginger Lily

^ denotes exotic species

# denotes native planted or non-indigenous to the area

Fauna species recorded in the study area

Common Name	Scientific Name
Acanthiza nana	Yellow Thornbill
Aegotheles cristatus	Australian Owlet-nightjar
Anas superciliosa	Pacific Black Duck
Cacomantis flabelliformis	Fan-tailed Cuckoo
Calyptorhynchus lathami	Glossy Black Cockatoo
Colluricincla harmonica	Grey-Shrike Thrush
Coracina novaehollandiae	Black-faced Cuckoo-Shrike
Cormobates leucophaea	White-throated Treecreeper
Corvus coronoides	Australian Raven
Crallina cyanoleuca	Magpie-lark
Eopsaltria australis	Eastern Yellow Robin
Geopelia striata	Peaceful Dove
Lichenostomus chrysops	Yellow-faced Honeyeater
Lichenostomus melanops	Yellow-tufted Honeyeater
Malurus cyaneus	Superb Fairy Wren
Manorina melanophrys	Bell Miner
Myiagra sp.	Flycatcher
Neochmia temporalis	Red-browed Finch
Pardalotus punctatus	Spotted Pardalote
Pardalotus striatus	Striated Pardalote
Phaps chalcoptera	Bronzewing
Platycercus elegans	Crimson Rosella
Platycercus eximus	Eastern Rosella
Psophodes olivaceus	Eastern Whipbird
Rhipidura albiscapa	Grey Fantail

Common Name	Scientific Name
Rhipidura leucophrys	Willie Wagtail
Taeniopygia bichenovii	Double-barred Finch
Trichoglossus haematodus	Rainbow Lorikeet

Appendix C: Assessment of Significance

EP&A Act Assessment of Significance (7 part test)

The Assessment of Significance (7-part test) is applied to species, populations and ecological communities listed on Schedules 1, 1A and 2 of the TSC Act and Schedules 4, 4A and 5 of the FM Act. The assessment sets out 7 factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). All factors must be considered and an overall conclusion made based on all factors in combination. An SIS is required if, through application of the 7-part test, an action is considered likely to have a significant impact on a threatened species, population or ecological community.

Only those species, populations or communities which have potential to be affected by the proposed project require assessment with a 7-part test. Those species or communities in Appendix A that do not occur within the study area or for which there is no likelihood of occurrence within the study area, will not be affected by the proposed project. Therefore, a 7-part test is not required for those species.

Threatened species which have potential to occur or that are known to occur within the study area and which therefore could be affected by the proposal are assessed with a 7-part test, and these species include:

- Shale/Sandstone Transition Forest
- Riverflat Eucalypt Forest
- *Pimelea curviflora* var. *curviflora*
- *Calyptorhynchus lathami* (Glossy Black-cockatoo)
- *Daphoenositta chrysoptera* (Varied Sitella)
- *Hieraaetus morphnoides* (Little Eagle)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

Shale/Sandstone Transition Forest

Open forest, with dominant canopy trees including *Syncarpia glomulifera* (Turpentine), *Eucalyptus punctata* (Grey Gum), *Eucalyptus paniculata* (Grey Ironbark) and *E. eugenoides* (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) *E. saligna* (Sydney Blue Gum) is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Polyscias sambucifolia* (Elderberry Panax). It occurs close to the shale/sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaus. It can also occur as a transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.

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 is not a threatened 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.

This species is not an endangered population.

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

The local occurrence of this community includes the extent of this community within the study area and the adjoining vegetation of the same type to the east and south of the study area. The proposed action would result in the removal of 0.15ha and the modification of 1.27 ha of Shale/Sandstone Transition Forest in the study area. This is a relatively small area of loss/disturbance, which occurs on the edges of this community within the study area. Therefore, it is likely that the local occurrence of Shale/Sandstone Transition Forest would not be placed at risk of extinction.

i. 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 Shale/Sandstone Transition Forest that will remain within the study area will be managed for biodiversity as part of a VMP which would manageme threatening processes such as weeds and grazing. This would result in a more ecologically resilient ecological community because plants will be more able to set seed and undertake their full life-cycle with a lower pressure from weeds and grazing by feral animals. The composition of the ecological community is therefore likely to be positively affected and the local occurrence would not be placed at risk of extinction.

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

The proposal will result in the removal of 0.15 ha and the modification (for APZs) of 1.27 ha of Shale/Sandstone Transition Forest within the study area.

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

The proposed project would not introduce fragmentation to the area, but rather widen the gap between currently fragmented patches to the east and west.

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 habitat of Shale/Sandstone Transition Forest to be removed or modified is located on the edges of the large patches of this community within the subject site. It has been previously affected by clearing, weed invasion and road construction. Due to its location and relatively degraded condition, and the fact that a VMP will manage the vegetation to the retained, the area to be removed or modified is not essential to the ongoing survival of this community in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this community.

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

No recovery plan has been prepared for this community.

g. 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.

One KTP is relevant to this community is:

- Clearing of native vegetation

Only 0.15ha of a small area of this community would be removed and only 1.27 ha would be modified as a result of this project. Given that the majority of this community would be retained within the study area and would be managed as part of a VMP, it is considered unlikely that the proposal would significantly exacerbate this KTP.

Conclusions

The proposal is unlikely to constitute a significant impact on Shale/Sandstone Transition Forest given that:

- The Shale/Sandstone Transition Forest to be removed or modified is not essential to the long term survival of this community in the locality.
- The majority of Shale/Sandstone Transition Forest that is of good quality will remain within the subject site and the local occurrence of this community would not be placed at risk of extinction
- The Shale/Sandstone Transition Forest that will be retained will be managed as part of a VMP

River-flat Eucalypt Forest (Alluvial Woodland)

River Flat Eucalypt Forest (RFEF) (referred to as Alluvial Woodland in this report) occurs on the river flats of the coastal floodplains of the NSW North Coast, the Sydney Basin, and the South East Corner Bioregions. It has a tall open tree layer of eucalypts, which may exceed 40m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (Forest red gum), *E. amplifolia* (Cabbage gum), *Angophora floribunda* (Rough-barked Apple), and *A. subvelutina* (Broad-leaved Apple). *Eucalyptus baueriana* (Blue Box), E. botryoides (Bangalay), and *E. elata* (River Peppermint) may be common south from Sydney, *E. ovata* (Swamp Gum) occurs on the far south coast, *E. saligna* (Sydney Blue Gum) and *E. grandis* (Flooded Gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain (DECC 2005). A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (Prickly-leaved Teatree), *Backhousia myrtifolia* (Grey Myrtle), *Melia azedarach* (White Cedar), *Casuarina cunninghamiana* (River Oak), *and C. glauca* (Swamp Oak). Scattered shrubs include *Bursaria spinosa, Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia, Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda*, and *Phyllanthus gunnii*. The groundcover is composed of abundant forbs, scramblers and grasses including *Microlaena stipoides, Dichondra repens, Glycine clandestina, Oplismenus aemulus, Desmodium gunnii, Pratia purpurascens, Entolasia marginata, Oxalis perennans*, and *Veronica plebeia*. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity, and other disturbance, and may have a substantial component of exotic shrubs, grasses, vines and forbs (DECC 2005).

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 is not a threatened 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.

This species is not an endangered population.

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

The local occurrence of this community includes the extent of this community within the study area and the adjoining vegetation of the same type to the east and west along Cattai Creek. The community will not be subject to any clearing and therefore the action proposed is not likely to place it at risk of extinction.

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

The River-flat Eucalypt Forest that will remain within the study area will be managed for biodiversity as part of a VMP which would manageme threatening processes such as weeds and grazing. The majority of this community is badly degraded by weed invasion, particularly *L. sinense* (Small-leaved Privet).

This would result in a more ecologically resilient ecological community because plants will be more able to set seed and undertake their full life-cycle with a lower pressure from weeds and grazing by feral animals. The composition of the ecological community is therefore likely to be positively affected and the local occurrence would not be placed at risk of extinction.

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

Clearing or modification of this community is not proposed.

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

The proposed project would not introduce fragmentation to the area nor isolate areas of this community because only relatively small areas on the edges of this community would be affected and the corridor along Cattai Creek would be retained and managed for biodiversity.

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;

Clearing or modification of this community is not proposed. Implementation of the VMP would help manage the River-flat Eucalypt Forest within the study area, thereby increasing the value of this patch of the community and contributing to the long-term survival of this community within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this community.

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

No recovery plan has been prepared for this community.

g. 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.

One KTP is relevant to this community is:

- Clearing of native vegetation

No clearing or modification is proposed for this community, therefore it is considered unlikely that the proposal would significantly exacerbate this KTP.

Conclusions

The proposal is unlikely to constitute a significant impact on Shale/Sandstone Transition Forest given that:

- No River-flat Eucalypt Forest is to be removed or modified
- The River-flat Eucalypt Forest will remain within the subject site and the local occurrence of this community would not be placed at risk of extinction

- The River-flat Eucalypt Forest that will be retained will be managed as part of a VMP resulting in a better biodiversity outcome than what currently exists within the study area

Pimelea curviflora* var. *curviflora

Pimelea curviflora var. *curviflora* is listed as a Vulnerable species under the TSC Act. This species is currently known from about 20 locations from the coastal area of northern Sydney to Maroota in the north-west. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville. Its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. *P. curviflora* var. *curviflora* has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots (OEH 2013). It grows on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands (OEH 2013). Associated with the Duffys Forest Community, shale lenses on ridges in Hawkesbury sandstone geology.

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 in the study area but has been previously recorded north of the study area north of McClymonts Road. The full life-cycle of this species is currently not known, however, it is thought to be a fire-tolerant species capable of re-sprouting after fire.

Since the pollination of this plant is not known, the precautionary principle is used – which assumes that the plants occurring on McClymonts Road across Cattai Creek would not be unlikely to pollinate with any plants that may occur within the study area. Therefore, any viable local population within the study area would be defined as plants occurring in suitable habitat to the west of Cattai Creek.

The proposed works will involve removal or modification of potential *P. curviflora* var. *curviflora* habitat within Shale/Sandstone Transition Forest within the south of the study area which contains ridgetops and upper slopes of this community. However, the majority of this type of potential habitat would be retained in a large continuous patch, which is more likely to benefit pollination by wind, water or insects than fragmented or isolated areas of habitat. Any viable local population that occurs within the study area is likely to also occur in suitable habitat to the east and south of the study area.

The proposed action is not likely to place such a population at risk of extinction because potential habitat will be managed and retained within the study area and ecological processes in potential habitat would be encouraged and threatening process such as grazing by feral animals and weed invasions would be managed.

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.

This species is not an endangered population.

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

This is not an endangered ecological community.

iii. 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

This is not an endangered ecological community.

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

The proposal will result in the removal of 0.15 ha and the modification (for APZs) of 1.27 ha of Shale/Sandstone Transition Forest, which is potential habitat for this species.

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

The proposed project would not introduce fragmentation to the area nor isolate areas of potential habitat for this species because only relatively small areas on the edges of Shale/Sandstone Transition Forest would be affected and the majority of potential habitat would be retained and managed for biodiversity.

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 areas of potential habitat that would be removed or modified are unlikely to be critical to the survival of this species in the locality because they are located on the edge of a large patch of Shale/Sandstone Transition Forest and have been disturbed in the past. Implementation of the VMP would help manage such potential habitat within the study area, thereby increasing the value of this habitat and contributing to the long-term survival of this species within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this species.

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

No recovery plan has been prepared for this species.

g. 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.

One KTP is relevant to this community is:

- Invasion and establishment of exotic vines and scramblers (*Cardiospermum grandiflorum* Balloon Vine, *Asparagus asparagoides* Bridal Creeper and *Rubus fruticosus* sp. agg. Blackberry)
- Invasion of native plant communities by exotic perennial grasses (*Eragrostis curvula* African Lovegrass and *Pennisetum clandestinum* Kikuyu)
- Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)

Only 0.15 ha of potential would be removed and only 1.27 ha would be modified as a result of this project. Given that the majority of this habitat would be retained within the study area and would be

managed as part of a VMP, it is considered unlikely that the proposal would significantly exacerbate these KTP.

Conclusions

The proposal is unlikely to constitute a significant impact on *Pimelea curviflora* var. *curviflora* given that:

- The potential habitat to be removed or modified is relatively degraded and is unlikely to be essential to the long term survival of this species within the locality.
- The majority of potential habitat for this species will remain within the subject site and any viable local population of this species is not likely to be placed at risk of extinction
- The potential habitat that will be retained will be managed as part of a VMP resulting in a better biodiversity outcome than what currently exists within the study area

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

The Glossy Black-cockatoo is listed as a vulnerable species under Schedule 2 of the TSC Act. It inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly *Allocasuarina littoralis* (Black She-oak), *A. torulosa* (Forest She-oak) or *A. verticillata* (Drooping She-oak), occur. It feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with its bill. The species is dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August (OEH 2013).

The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia (OEH 2013).

In the Riverina area, again usually associated with woodlands containing Drooping She-oak but also recorded in open woodlands dominated by *Casuarina cristata* (Belah). Glossy Black-cockatoo was not recorded during the field survey however this species is known from 19 records within 5km of the study site.

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.

Factors likely to have an adverse effect on the life cycle of Glossy Black-Cockatoo would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat. A local viable population of this wide-ranging species is expected to have a home range that covers extensive areas within the Hills Shire Council LGA.

No hollow-bearing trees would be removed and therefore the project would not impact on breeding habitat. The proposed works will result in the removal or modification of some vegetation that could provide potential sheltering or foraging habitat. However, this habitat is relatively degraded by disturbance and weed invasion and is located on the edges of a large patch of Shale/Sandstone Transition Forest.

The area of habitat that supports *A. littoralis* plants where chewed cones were found will be retained and managed and therefore, it is likely that potential foraging habitat for this species would be retained and continue to be accessible for this species. Consequently the proposed works would be unlikely to place a viable local population of this species at risk of extinction since foraging and breeding habitat would remain within the study area and also in adjacent areas.

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. The Glossy Black-cockatoo is not an endangered population.

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. The Glossy Black-cockatoo is not an endangered ecological community.

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

The proposed works will result in the removal and/or modification of a relatively small area of vegetation that provides potential foraging or shelter habitat for this species, compared to the potential habitat adjacent to the study area. *A. littoralis* trees where the chewed cones were found would not be removed and their habitat would not be modified.

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

The proposed works will involve clearing or modification of potential habitat for this species. However, potential habitat consisting of *A. littoralis* with chewed cones beneath them will be retained and managed. In addition, this species is highly mobile. No area of habitat is likely to become isolated or fragmented.

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 works will result in the removal and modification of marginal foraging habitat for this species which is not likely to important for the long-term survival of this species within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared by the Director-General of the NPWS for the Glossy Black-cockatoo.

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

No recovery plan or threat abatement plan has yet been prepared for Glossy Black-Cockatoo.

g. 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 proposed works constitutes one key threatening processes of relevance to the Glossy Black-Cockatoo, clearing of native vegetation, which would result in a small loss of marginal foraging habitat but no loss of breeding habitat for this species.

Conclusion

The proposed works are unlikely to significantly impact upon Glossy Black-cockatoo given that the proposed works:

- would only remove a small area of potential habitat within the study area, especially considering the areas of potential habitat within adjacent lands

- would not remove any hollow-bearing trees
- retain habitat within the study area which consists of potential foraging habitat for this species
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this species

On the basis of the above considerations, it is not likely that the proposed works will result in a significant effect on the Glossy Black-cockatoo. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

***Daphoenositta chrysoptera* (Varied Sittella)**

Distribution includes most of mainland Australia except deserts and open grasslands. Prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods from bark, dead branches, or small branches and twigs.

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.

Factors likely to have an adverse effect on the life cycle of Varied Sittella would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat. A local viable population of this wide-ranging species is expected to have a home range that covers extensive areas within the Hills Shire Council LGA.

No hollow-bearing trees would be removed and therefore the project would not impact on breeding habitat. The proposed works will result in the removal or modification of some potential foraging habitat foraging. However, this habitat is relatively degraded by disturbance and weed invasion and is located on the edges of a large patch of Shale/Sandstone Transition Forest.

Better quality habitat will be retained and managed and therefore, it is likely that potential habitat would continue to be accessible for this species. Consequently the proposed works would be unlikely to place a viable local population of this species at risk of extinction since foraging and breeding habitat would remain within the study area as well as in adjacent areas.

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. The Varied Sittella is not an endangered population.

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. The Varied Sittella is not an endangered ecological community.

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

The proposed works will result in the removal and/or modification of a relatively small area of vegetation that provides potential foraging or shelter habitat for this species, compared to the potential habitat adjacent to the study area.

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

The proposed works will involve clearing or modification of potential habitat for this species. However, better quality potential habitat will be retained and managed. In addition, this species is highly mobile. No area of habitat is likely to become isolated or fragmented.

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 works will result in the removal and modification of marginal foraging habitat for this species which is not likely to important for the long-term survival of this species within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared by the Director-General of the NPWS for the Varied Sitella.

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

No recovery plan or threat abatement plan has yet been prepared for Varied Sittella.

g. 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 proposed works constitutes one key threatening process of relevance to the Varied Sittella, that is clearing of native vegetation, which would result in a small loss of marginal foraging habitat but no loss of breeding habitat for this species.

Conclusion

The proposed works are unlikely to significantly impact upon Varied Sitella given that the proposed works:

- would only remove a small area of potential habitat within the study area, especially considering the areas of potential habitat within adjacent lands
- would not remove any hollow-bearing trees
- retain habitat within the study area which consists of potential foraging habitat for this species
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this species

On the basis of the above considerations, it is not likely that the proposed works will result in a significant effect on the Varied Sittella. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

***Hieraaetus morphnoides* (Little Eagle)**

Utilises open eucalypt, sheoak and acacia forest, woodland or open woodland. Uses tall trees for nesting, with a large stick nest being built. Lays eggs in spring, and young fledge in early summer. Preys on birds, reptiles and mammals, and occasionally feeds on large insects or carrion.

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.

Factors likely to have an adverse effect on the life cycle of Little Eagle would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat. A local viable population of this wide-ranging species is expected to have a home range that covers extensive areas within the Hills Shire Council LGA.

No nests were recorded in the study area and therefore not current nesting habitat would be affected. The proposed works will result in the removal or modification of some potential foraging habitat foraging. However, this habitat is relatively degraded by disturbance and weed invasion and is located on the edges of a large patch of Shale/Sandstone Transition Forest.

Better quality habitat will be retained and managed and therefore, it is likely that potential habitat would continue to be accessible for this species. Consequently the proposed works would be unlikely to place a viable local population of this species at risk of extinction since foraging and breeding habitat would remain within the study area as well as in adjacent areas.

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. The Little Eagle is not an endangered population.

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. The Little Eagle is not an endangered ecological community.

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

The proposed works will result in the removal and/or modification of a relatively small area of vegetation that provides potential foraging or shelter habitat for this species, compared to the potential habitat adjacent to the study area.

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

The proposed works will involve clearing or modification of potential habitat for this species. However, better quality potential habitat will be retained and managed. In addition, this species is highly mobile. No area of habitat is likely to become isolated or fragmented.

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 works will result in the removal and modification of marginal foraging habitat for this species which is not likely to important for the long-term survival of this species within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared by the Director-General of the NPWS for the Little Eagle.

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

No recovery plan or threat abatement plan has yet been prepared for Little Eagle.

g. 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 proposed works constitutes one key threatening processes of relevance to the Little Eagle, clearing of native vegetation, which would result in a small loss of marginal foraging habitat but no loss of breeding habitat for this species.

Conclusion

The proposed works are unlikely to significantly impact upon Little Eagle given that the proposed works:

- would only remove a small area of potential habitat within the study area, especially considering the areas of potential habitat within adjacent lands
- would not remove any trees with Little Eagle nests in them
- retain habitat within the study area which consists of potential foraging habitat for this species
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this species

On the basis of the above considerations, it is not likely that the proposed works will result in a significant effect on the Little Eagle. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

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

In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively.

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.

Factors likely to have an adverse effect on the life cycle of Little Lorikeet would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat. A local viable population of this wide-ranging species is expected to have a home range that covers extensive areas within the Hills Shire Council LGA.

No hollow-bearing trees would be removed and therefore the project would not impact on breeding habitat. The proposed works will result in the removal or modification of some vegetation that could provide potential sheltering or foraging habitat. However, this habitat is relatively degraded by disturbance and weed invasion and is located on the edges of a large patch of Shale/Sandstone Transition Forest.

Potential foraging habitat for this species would be retained and continue to be accessible for this species. Consequently the proposed works would be unlikely to place a viable local population of this species at risk of extinction since foraging and breeding habitat would remain within the study area and also in adjacent areas.

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. The Little Lorikeet is not an endangered population.

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. The Little Lorikeet is not an endangered ecological community.

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

The proposed works will result in the removal and/or modification of a relatively small area of vegetation that provides potential foraging or shelter habitat for this species, compared to the potential habitat adjacent to the study area.

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

The proposed works will involve clearing or modification of potential habitat for this species. However, potential habitat will be retained and managed. In addition, this species is highly mobile. No area of habitat is likely to become isolated or fragmented.

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 works will result in the removal and modification of marginal foraging habitat for this species which is not likely to important for the long-term survival of this species within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared by the Director-General of the NPWS for the Little Lorikeet.

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

No recovery plan or threat abatement plan has yet been prepared for Little Lorikeet.

g. 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 proposed works constitutes one key threatening processes of relevance to the Little Lorikeet, clearing of native vegetation, which would result in a small loss of marginal foraging habitat but no loss of breeding habitat for this species.

Conclusion

The proposed works are unlikely to significantly impact upon Little Lorikeet given that the proposed works:

- would only remove a small area of potential habitat within the study area, especially considering the areas of potential habitat within adjacent lands
- would not remove any hollow-bearing trees
- retain habitat within the study area which consists of potential foraging habitat for this species
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this species

On the basis of the above considerations, it is not likely that the proposed works will result in a significant effect on the Little Lorikeet. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Insectivorous bats

Insectivorous bats are known to roost in caves and manmade structures such as mines/tunnels/culverts/abandoned buildings as well as tree hollows. Since none of these roosting/breeding habitat is going to be affected by the proposed prject the following species are addressed within one 7-part test:

- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Southern Myotis)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

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

The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests (Churchill 1998; OEH 2013). This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; OEH 2013).

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

Prefers moist habitats with trees taller than 20m (OEH 2013). Roosts in tree hollows but has also been found roosting in buildings or under loose bark (OEH 2013).

***Miniopterus australis* (Little Bent-wing Bat)**

Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests (Churchill 1998). This species shelter in a range of structures including culverts, drains, mines and caves (Environment Australia 2000). Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found (OEH 2013). Breeding occurs in caves, usually in association with M. schreibersii (Environment Australia 2000, OEH 2013).

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

Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1981, 1995). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).

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

Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison and Hoye 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison and Hoye 1998).

***Myotis macropus* (Southern Myotis)**

The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water (Churchill 1998). While roosting (in groups of 10-15) is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains (Churchill 1998). However the species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and culverts are used (Richards 1998). Forages over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December (OEH 2013)

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

Found in almost all habitats, from wet and dry sclerophyll forest, open woodland (Churchill 1998), open country, mallee, rainforests, heathland and waterbodies. Roosts in tree hollows; may also use caves; has also been recorded in a tree hollow in a paddock (Environment Australia 2000) and in abandoned sugar glider nests (Churchill 1998). The Yellow-bellied Sheathtail-bat is dependent on suitable hollow-bearing trees to provide roost sites, which may be a limiting factor on populations in cleared or fragmented habitats (Environment Australia 2000).

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

Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill 1998), tending to be more frequently located in more productive forests (Hoye and Richards 1998). Within denser vegetation types use is made of natural and man-made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (Hoye and Richards 1998).

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.

Factors likely to have an adverse effect on the life cycle of insectivorous bats would include loss of roosting/breeding habitat (caves/mines/culverts/abandoned houses/hollows) and/or a substantial loss and/or fragmentation of foraging habitat. The only type of roosting/breeding habitat that is present within the study area consists of hollow-bearing trees. However, no hollow-bearing trees would be removed as a result of this project. Therefore, no known or potential breeding habitat would be affected.

In addition, foraging habitat for the Southern Myotis (damns and Cattai Creek) would be retained and adjoining vegetation would be managed for biodiversity which would benefit this species by encouraging native plants and insects.

Any viable local population of any of these species that may forage on the subject site is expected to have a home range that covers extensive areas within the Hills Shire Council LGA. The proposed works will result in the removal or modification of some vegetation that could provide potential foraging habitat. However, this habitat is relatively degraded by disturbance and weed invasion and is located on the edges of a large patch of Shale/Sandstone Transition Forest.

Potential foraging habitat for all of these species would be retained and continue to be accessible for these species. Consequently the proposed works would be unlikely to place a viable local population of any of these species at risk of extinction since breeding habitat would not be affected and foraging habitat would remain within the study area and also in adjacent areas.

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. These species are 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,

Not applicable. These species are endangered ecological communities.

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

The proposed works will result in the removal and/or modification of a relatively small area of vegetation that provides potential foraging habitat for these species, compared to the potential habitat adjacent to the study area.

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

The proposed works will involve clearing or modification of potential foraging habitat for these species. However, potential habitat will be retained and managed. In addition, all of these species are highly mobile. No area of habitat is likely to become isolated or fragmented.

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 works will result in the removal and modification of marginal foraging habitat for these species which is not likely to important for the long-term survival of these species within the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared by the Director-General of the NPWS for these species.

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

A national recovery plan has been prepared for the Large-eared Pied Bat. The overall objectives include:

- Identify priority roost and maternity sites for protection
- Implement conservation and management strategies for priority sites
- Educate the community and industry to understand and participate in the conservation of the large-eared pied bat
- Research the large-eared pied bat to augment biological and ecological data to enable conservation management
- Determine the meta-population dynamics throughout the distribution of the large-eared pied bat

The proposed project is not inconsistent with these objectives.

g. 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 proposed works constitutes one key threatening processes of relevance to these species, clearing of native vegetation, which would result in a small loss of marginal foraging habitat but no loss of breeding habitat for this species.

Conclusion

The proposed works are unlikely to significantly impact upon any species of threatened insectivorous bats given that the proposed works:

- would only remove a small area of potential habitat within the study area, especially considering the areas of potential habitat within adjacent lands
- would not remove any hollow-bearing trees
- retain habitat within the study area which consists of potential foraging habitat for this species
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this species

On the basis of the above considerations, it is not likely that the proposed works will result in a significant effect on any insectivorous bats. Consequently, a Species Impact Statement is not required for the proposed works with respect to these species.

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

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as vulnerable under the TSC Act and EPBC Act. The species is endemic to the east coast of Australia with a distribution from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast (OEH, 2013).

The Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources. The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and occurs in rainforest, woodlands, paperbark swamps and *Banksia* woodlands. This species feeds in particular on the nectar and pollen of native trees, especially *Eucalyptus* spp., *Melaleuca* spp. and *Banksia* spp., and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-Headed Flying-foxes forage on fruit crops and cultivated gardens (DECC, 2007).

Roosting camps are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, *Melaleuca* woodland, *Casuarina* forest or mangroves (OEH 2013). These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as diurnal refuge from predators. Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species

This species is threatened by a number of processes including loss of foraging habitat, disturbance of roosting sites, unregulated shooting, and electrocution on powerlines (OEH, 2013).

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.

Factors likely to have an adverse effect on the life cycle of Grey-headed Flying-fox would include a substantial loss and/or fragmentation of foraging habitat, disturbance to maternity bat 'camp' or mortality from electrocution or entanglement in fruit netting. If this species occurred within the study area it would form part of a viable local population that is probably centred on the colony located at Parramatta Park or at Gordon.

No loss of vegetation would occur within 500 m of any maternity colony and therefore the proposed project would not affect breeding habitat. Removal of the marginal foraging vegetation would not represent a substantial loss and/or fragmentation of foraging habitat for this species because it is unlikely to be reliant solely on these resources and it would be able to use other areas due to its highly mobile nature.

Therefore, it is unlikely that the loss of vegetation/potential foraging habitat would significantly disrupt the foraging habitat or life cycle of this species such that a viable local population would be placed at risk of extinction.

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

Not applicable. The Grey-headed Flying-fox is not an endangered population.

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. The Grey-headed Flying Fox is not an endangered ecological community

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

The proposed project would result in the removal or modification of a relatively small amount of marginal foraging habitat for the Grey-headed Flying-fox.

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

The proposed works is unlikely to further fragment potential foraging habitat for this species as the proposed works will include removal or medication of potential habitat on the edges of larger patches. Due to the small scale of the proposed works and the highly mobile nature of this species it is unlikely that the proposed works would fragment or isolate, or increase the fragmentation or isolation of Grey-headed Flying-fox habitat.

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 habitat of the Grey-headed Flying-fox that is to be removed is unlikely to be important to the species given that no potential breeding habitat will be impacted and given the availability of large areas of potential foraging habitat available in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Grey-headed Flying-fox.

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

A Draft National Recovery Plan for the Grey-headed Flying-fox was created in 2009 (DECCW 2009a). The current proposal is not in conflict with any recovery actions from the recovery plan.

g. 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.

One key threatening process (KTP) is relevant to this proposal with respect to Grey-headed Flying-fox: 'Clearing of Native Vegetation'. Whilst the proposal would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size and nature of the vegetation to be removed.

Conclusion

The proposed project is unlikely to impose a significant effect on Grey-headed Flying-fox given that the proposed works:

- would only remove a very small area (0.15 ha of Shale/Sandstone Transition Forest to be cleared and 1.27ha mofified for APZs) of marginal potential foraging habitat within the study area, which is not likely to impact on the life cycle of the species
- would not place a viable local population at risk of extinction
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this species
- would not remove or disturb any campsites

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant effect on the Grey-headed Flying-fox. Consequently, a Species Impact Statement is not required for the proposed development with respect to this species.

Appendix D – EPBC Act significant assessments

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World heritage properties
- National heritage places
- Nuclear actions

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Assessment against the significant impact criteria was undertaken for the following:

- Shale/Sandstone Transition Forest
- *Pimelea curviflora* var. *curviflora*
- *Chalinolobus dwyeri* (Large-eared Pied-bat) – potential roosting and foraging habitat
- *Rhipidura rufifrons* (Rufous Fantail)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Ardea alba* (Great Egret)
- *Aedea ibis* (Cattle Egret)

EPBC Significance Assessments

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
(a) any environmental impact on a World Heritage Property;	No. There are no World Heritage Areas within the subject site.
(b) any environmental impact on Wetlands of International Importance;	No. There are no Wetlands of International Importance within the subject site.
(c) any environmental impact on Commonwealth Listed Threatened Species and Ecological Communities;	Yes. The listed species that have the potential to be impacted by the proposed works include; • Shale/Sandstone Transition Forest • *Pimelea curviflora* var. *curviflora* • *Chalinolobus dwyeri* (Large-eared Pied-bat) – potential roosting and foraging habitat • *Rhipidura rufifrons* (Rufous Fantail) • *Pteropus poliocephalus* (Grey-headed Flying-fox) • *Ardea alba* (Great Egret) • *Aedea ibis* (Cattle Egret) **Shale/Sandstone Transition Forest** Open forest, with dominant canopy trees including *Syncarpia glomulifera* (Turpentine), *Eucalyptus punctata* (Grey Gum), *Eucalyptus paniculata* (Grey Ironbark) and *E. eugenoides* (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) *E. saligna* (Sydney Blue Gum) is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Polyscias sambucifolia* (Elderberry Panax). It occurs close to the shale/sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaus. It can also occur as a transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges. EPBC Act status: Endangered **An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:** • **reduce the extent of an ecological community** The proposed project would include the clearing of 0.15 ha and the modification of 1.27 ha of this community. However, the remaining habitat for this community will be retained and managed within the study area through the implementation of a vegetation management plan. • **fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission**

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
	lines The proposed project is not likely to increase the fragmentation of this community because only the edges of a large patch would be cleared and this community would retain connections with similar habiat to the south and east outside of the study area. • **adversely affect habitat critical to the survival of an ecological community** The study area is not considered habitat critical to the survival of this community. Nonetheless, the majority of the better quality Shale/Sandstone Transition Forest will be retained and managed within the study area. • **modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns** The proposed project would not destroy abiotic factors necessary for the survival of this community and the majority of this community and associated abiotic factors would be retained within the study area. The vegetation management plan will include measures to managed drainage to maintain these factors for this community within the study area. • **cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting** The project would not result in a substantial change in this community since the majority would be retained and managed as part of a vegetation management plant. • **cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:** o **assisting invasive species, that are harmful to the listed ecological community, to become established, or** Invasive species will be managed as part of a vegetation management plan. o **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or** Chemical and pollutants will be managed as part of a vegetation management plan.

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)

- **• interfere with the recovery of an ecological community.**

The vegetation management plan will result in the management of this community and aid in its recovery within the study area.

Conclusion

It is unlikely that the impact of the proposed project on Shale/Sandstone Transition Forest would be significant.

Pimelea curviflora* var. *curviflora

Pimelea curviflora var*. curviflora* is listed as a Vulnerable species under the TSC Act. This species is currently known from about 20 locations from the coastal area of northern Sydney to Maroota in the north-west. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville. Its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. *P. curviflora* var*. curviflora* has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots (OEH 2013). It grows on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands (OEH 2013). Associated with the Duffys Forest Community, shale lenses on ridges in Hawkesbury sandstone geology.

EPBC Act status: Vulnerable

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

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

No known population of this species occurs in the study area. Potential habitat will be retained and managed as part of a vegetation management plan. Therefore, any population that may occur in the study area is likely to be maintained and the project is unlikely to result in the long-term decrease in the size of such a population.

- **reduce the area of occupancy of an important population**

The action is not likely to reduce the known areas of occupancy of an important population of this species because the study area provides a small extent of potential habitat for this species, compared to the potential and known habitat within the locality.

- **fragment an existing important population into two or more populations**

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
	This action would not fragment two important populations since a vegetation management plan would managed the vegetation to be retained within the study area which would help maintain ecological process between the study area and any adjacent areas. • **adversely affect habitat critical to the survival of a species** The study area is unlikely to consist of habitat critical to the survival of this species. Therefore, no habitat critical to its survival would be adversely affected. • **disrupt the breeding cycle of an important population** The habitat within the study area is unlikely to be significant for an important population, given the large extent of adjacent habitat available. While little is know about the breeding cycle of this species the vegetation management plan will help maintain ecological processes within the study area which is expected to benefit natural breeding cycles. • **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The project would not affect breeding habitat for this species such that it would declines because no known breeding habitat would be affected and a relatively large extent of potential habitat would remain within the study area. • **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** Proposed weed control measures a part of the vegetation management plan will ensure that weeds do not spread into the study area and affect potential habitat for this species. • **introduce disease that may cause the species to decline, or** The action is not likely to introduce any diseases to the study area. • **interfere substantially with the recovery of the species.** The action would not interfere with the recovery of this species if it occurs in the study area since the likely potential habitat would be maintained and managed as part of a vegetation management plan. **Conclusion** It is unlikely that the impact of the proposed project on *Pimelea curviflora* var. *curviflora* would be significant **Large-eared Pied Bat (*Chalinolobus dwyeri*)** EPBC Act Status: Vulnerable

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests. This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; OEH 2012b). **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** • **lead to a long-term decrease in the size of an important population of a species** There is unlikely to be an important population within the subject site since there is unlikely to be breeding habitat within the subject site or study area. Therefore, the action is not likely to result in the long-term decrease of an important population of this species. • **reduce the area of occupancy of an important population** The action is not likely to reduce the areas of occupancy, since this species would only use the subject site for foraging and similar foraging habitat would remain within the study area. • **fragment an existing important population into two or more populations** This action would not fragment two important populations since this species is highly mobile. • **adversely affect habitat critical to the survival of a species** There is no breeding habitat for this species and, therefore, no habitat critical to its survival would be adversely affected. • **disrupt the breeding cycle of an important population** There is no breeding habitat for this species in the study area and, therefore, the breeding cycle would not be affected. • **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The project would not affect breeding habitat for this species and it is, therefore, unlikely to result in a decline in this species. • **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** Proposed weed control measures will ensure that weeds do not spread into the study area and affect potential foraging habitat for this species.

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)

- **introduce disease that may cause the species to decline, or**

The action is not likely to introduce any diseases to this population as hygiene protocols will be observed during construction.

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

The action would not interfere with the recovery of this species if it occurs in the study area since no breeding habitat would be affected.

Conclusion

It is unlikely that the impact of the proposed project on the Large-eared Pied Bat would be significant

***Rhipidura rufifrons* (Rufous Fantail)**

The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe 2004). Open country may be used by the Rufous Fantail during migration (Morcombe 2004).

EPBC Act status: Migratory

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**

This species is unlikely to be breeding on the subject site and, therefore, the proposed project would not affect an area of important habitat for this 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**

The project would not result in the establishment of a harmful species in an area of important habitat for the Rufous Fantail.

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

This species is highly unlikely to breed in the study area and the project would, therefore, be unlikely to disrupt the breeding of an ecologically significant proportion of the population of this species.

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)

Conclusion

It is unlikely that the impact of the proposed project on the Rufous Fantail would be significant.

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

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as vulnerable under the TSC Act and EPBC Act. The species is endemic to the east coast of Australia with a distribution from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast (OEH, 2013).

The Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources. The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and occurs in rainforest, woodlands, paperbark swamps and *Banksia* woodlands. This species feeds in particular on the nectar and pollen of native trees, especially *Eucalyptus* spp., *Melaleuca* spp. and *Banksia* spp., and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-Headed Flying-foxes forage on fruit crops and cultivated gardens (DECC, 2007).

Roosting camps are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, *Melaleuca* woodland, *Casuarina* forest or mangroves (OEH 2013). These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as diurnal refuge from predators. Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species

This species is threatened by a number of processes including loss of foraging habitat, disturbance of roosting sites, unregulated shooting, and electrocution on powerlines (OEH, 2013).

EPBC Act Status: Vulnerable

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

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

There is unlikely to be an important population within the subject site since there is no breeding habitat within the subject site or study area. Therefore, the action is not likely to result in the long-term decrease of an important population of this species.

- **reduce the area of occupancy of an important population**

The action is not likely to reduce the areas of occupancy, since this species

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
	would only use the subject site for foraging and similar foraging habitat would remain within the study area. • **fragment an existing important population into two or more populations** This action would not fragment two important populations since this species is highly mobile. • **adversely affect habitat critical to the survival of a species** There is no breeding habitat for this species and, therefore, no habitat critical to its survival would be adversely affected. • **disrupt the breeding cycle of an important population** There is no breeding habitat for this species in the study area and, therefore, the breeding cycle would not be affected. • **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The project would not affect breeding habitat for this species and it is, therefore, unlikely to result in a decline in this species. • **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** Proposed weed control measures will ensure that weeds do not spread into the study area and affect potential foraging habitat for this species. • **introduce disease that may cause the species to decline, or** The action is not likely to introduce any diseases to this population as hygiene protocols will be observed during construction. • **interfere substantially with the recovery of the species.** The action would not interfere with the recovery of this species if it occurs in the study area since no breeding habitat would be affected. **Conclusion** It is unlikely that the impact of the proposed project on the Grey-headed Flying Fox would be significant **Great Egret (*Ardea alba*) and Cattle Egret (*Ardea ibis*)** The Great Egret is common and widespread in Australia. It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats (Morcombe 2004). Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
	croplands, but not usually in the open water of streams or lakes and they avoid marine environments. Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (Morcombe 2004). EPBC Act status: Migratory **An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:** • **substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species** The proposed project would not affect an area of important habitat for this species because the project is not likely to significant aquatic or riparian habitats in the subject site and these species are highly mobile. • **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or** The project would not result in the establishment of a harmful species in an area of important habitat for the Great Egret or Cattle Egret. • **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.** This species is highly unlikely to breed in the study area and the project would, therefore, be unlikely to disrupt the breeding of an ecologically significant proportion of the population of this species. **Conclusion** It is unlikely that the impact of the proposed project on the Great Egret or Cattle Egret would be significant
(c) does any part of the Proposal involve a Nuclear Action;	No. The project does not include a Nuclear Action.
(d) any environmental impact on a Commonwealth Marine Area;	No. There are no Commonwealth Marine Areas within the subject site.
In addition, any direct or indirect effect on	No. The project does not directly or indirectly affect Commonwealth land.

MATTERS TO BE ADDRESSED	Impact (Commonwealth Legislation)
Commonwealth land.	

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Statement of Environmental Effects for proposed clearing of 96 and 106 Leitch Road, Londonderry, New South Wales

by

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Contents

1.0. Introduction

The proposal is to clear most of the area shown in Fig. 1 of termite infested trees for farming. Some habitat trees will be retained as well as some other trees (see Fig. 1).

This report addresses all matters required to be addressed within the Penrith City Council Matrix of Information required in DA applications.

2.0. Site plan

This has been provided as Fig. 1 of this SEE.

3.0. Floor plan, Elevation Plan, Section Plan, Specifications

As there are no buildings proposed to be erected in this DA, these issues are not relevant.

4.0. Streetscape and design

There will be no major modifications to the streetscape which at this stage consists of cleared footpaths (not paved) and adjacent trees. As there will be no buildings erected along the streetscape, external finishes, materials and colour will not be issues.

5.0. Energy rating

As there are no buildings to be erected or modified in this DA, a NatHERS rating certificate is not required.

6.0. Shadow diagrams

These are not required as no buildings are being erected, only trees to be cleared.

7.0. Landscaping information

No landscaping will be undertaken as part of this DA.

8.0. Erosion and sediment controls

Sediment fences will be erected before any tree removal occurs as per the construction notes in Fig. 1. The site is relatively flat with good drainage so in the advent of heavy rain there is unlikely to be much sediment remove from the site in any case.

9.0. Drainage plan

As this DA is for tree removal only there will be no buildings or roads proposed such that these will require an extensive drainage plan. Stormwater drains, pits and other structures such as on-site detention areas will not be required.

10.0. Waste management plan

The only waste derived from this proposal will be the trees which will be mulched and stockpiled on the site and will thereby remain on the site as fertiliser for the intended crops

and ground enhancement. Therefore the DA does not require a detailed waste management plan.

11.0. Access and traffic

The proposal will be for tree clearing/cutting, the cut trees of which will remain on site. A few trucks or other machinery may be required to move in and out of the site while tree clearing/cutting is in operation but vehicle movements will be minimal and only during this time of tree clearing. Access to the site us easy and simple. There is plenty of room for mulch storage and vehicle parking on the site.

12.0. Notification plan

Neighbours will be notified of tree removal once the proposal has been approved.

13.0. Flora and fauna issues

The fora and fauna report by Hawkeswood (2014) found that there were no endangered fauna spieces were on the site and none were likely to be fund there in the future because of the highly disturbed and modified nature of the site which has cleared much of the area(i.e. there are large treeless patches). In addition, there is no native shrub layer and virtually no regrowth of shrubs or trees because the area is regularly mown. Most of the trees are in an appalling condition as a result of severe infestations of termites and borers. Because of these conditions, the site is little or no conservation value. The site is therefore more valuable to the client for farming. There are two or three large habitat trees and these will be retained.

The flora and fauna report by Hawkeswood (2014) addresses the NSW Species Conservation Act (1995) and the EPA (1979) modified by the TSC Act (1995). Guidelines published by the Department of Environment and Climate Change have been followed where applicable. A 7-part Test of Significance has been provided in this report to satisfy the NSW TSC Act (1996). This is because the trees and remnant herbs correspond to the Castlereagh Scribbly Gum Woodland (CSGW). Because of the poor quality vegetation and its highly modified and altered state the site contains no vegetation of conservation significance.

As regards the EPBC Act (2000), under this Act, action must be undertaken if either of the following two questions indicate that the action will have a significant impact on the environment, either endangered ecological communities or species etc.

Is the proposed action likely to have a significant impact on a matter of national environmental significance? Is the proposed action likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

A 7-part test of significance and other information has been provided. There will be no significant impact on any matter of environmental significance. The Castlereagh Scribbly Gum Woodland on the property will not become extinct. The proposal will not have any significant impact on the environment in general because the site has been partially cleared in the past, does not have a shrub layer and the trees present are mostly dead or

dying due to severe infestations of termites and beetle borers. Therefore, no further provisions of the EPBC Act (2000) are required.

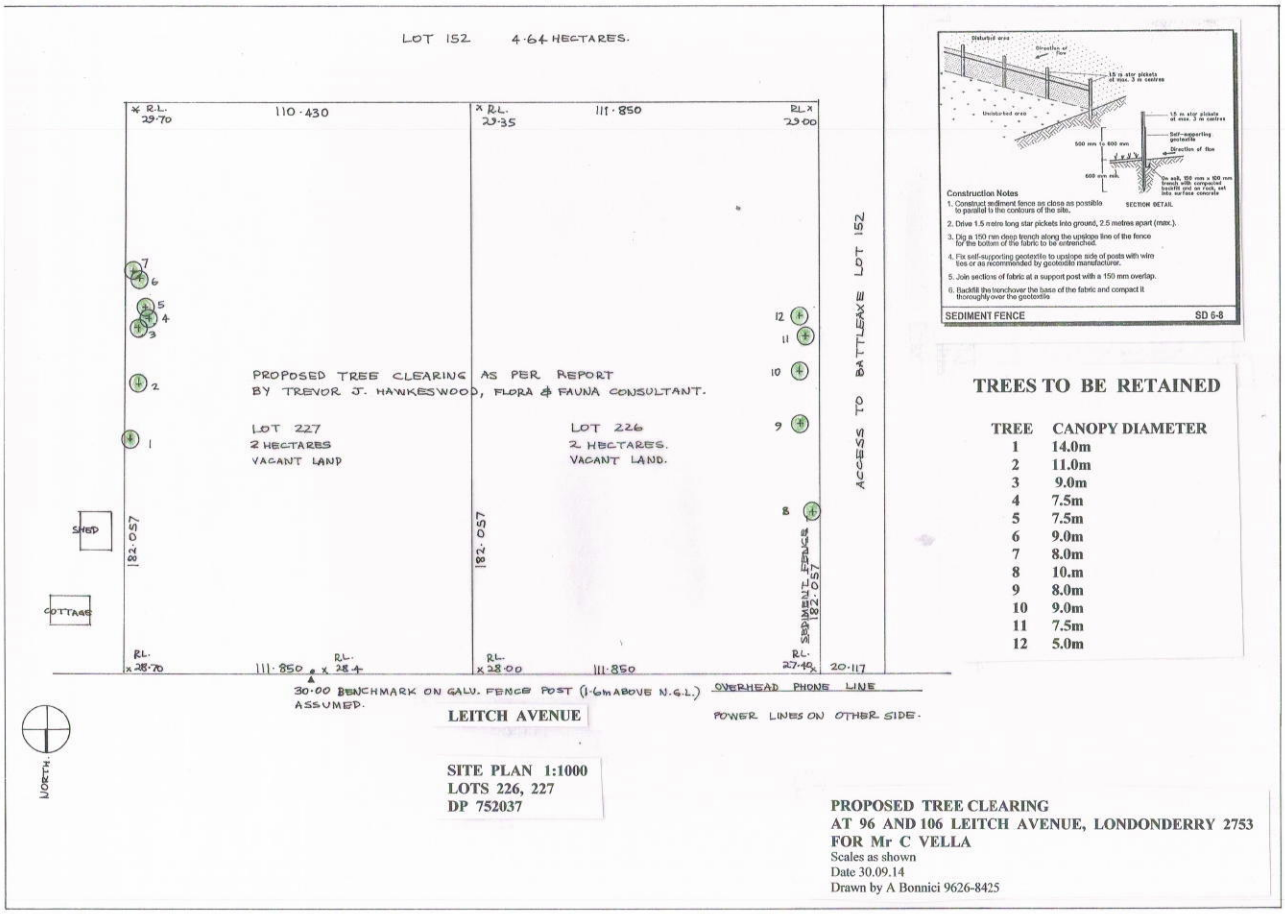

Fig. 1. Plan of the subject property showing trees to be retained and details of sediment fences to be installed.

14.0. Reference

Hawkeswood, T.J. (2014). *Flora and fauna survey and assessment of 96 and 106 Leitch Road, Londonderry, New South Wales*: 1-34.

15.0. Qualifications of the Author

Diploma of Archaeology (College of Management Science, London, 2014)

Diploma of Science (College of Management Science, London, 2014)

Bachelor of Science (Honours)(University of New England, 1975-1978)

Bachelor of Science (American Institute of Metaphysics, USA, 2014)

Bachelor of Applied Science (Environmental Science)(Charles Sturt University 1992-1996)

Bachelor of Metaphysical Humanistic Science (Institute of Metaphysical Humanistic Science, USA, 2013)

Master of Metaphysical Humanistic Science (Institute of Metaphysical Humanistic Science, USA, 2014)

Doctor of Philosophy (Honorary)(Cosmopolitan University, USA, 2001)

Doctor of Metaphysics (Bliss-Parsons Institute, USA, 2013)

Author of over 1850 papers, books and scientific reports on the Australian flora and fauna which have been accepted by the Australian and International Scientific Community