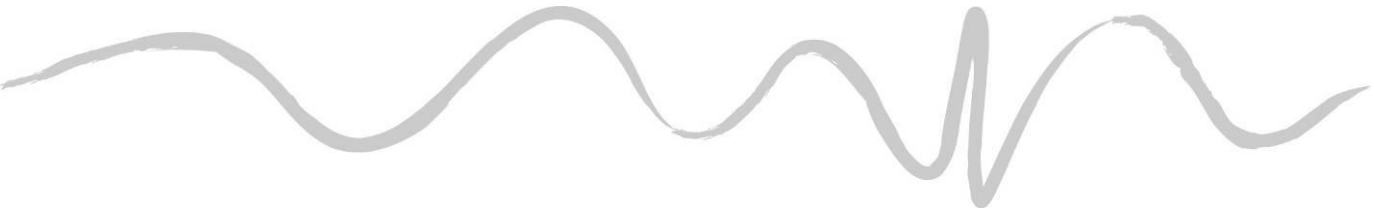
Flora and Fauna Survey and Impact Assessment

Proposed Residential Subdivision of Lot 4 DP 1124599, North Street, West Kempsey



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Flora and Fauna Survey and Impact Assessment

Proposed Residential Subdivision of Lot 4 DP 1124599, North Street, West Kempsey

Project Manager: David Andrighetto
Ref: 1601795
Date: September 2010

PO Box 9
Lennox Head NSW 2478
T 02 6687 7666

PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

info@geolink.net.au

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1 Introduction

1.1 Background

GeoLINK has been engaged by Hadlow Design Services to prepare a flora and fauna survey and assessment to accompany a Statement of Environmental Effects for a development application with respect to the proposed residential subdivision of Lot 4 DP 1124599, North Street, West Kempsey. Kempsey is located on the Mid North Coast of NSW, in the Kempsey Shire Council (KSC) local government area (LGA).

For the purposes of this assessment:

- '***the site***' refers to the whole of Lot 4 DP 1124599 which may be directly affected by the proposal;
- '***the study area***' refers to the site and adjacent land within 100 m of the site; and
- '***the locality***' refers to land within a 10 km radius of the site.

The purpose of this assessment is to provide baseline data on the ecological attributes of the site via intense ecological survey, and identify any ecological constraints for the proposed development and identify opportunities to avoid or mitigate potential impacts.

The assessment provided herein addresses these requirements and includes a detailed flora and fauna assessment to address the following Acts:

- *Threatened Species Conservation Act 1995 (*TSC Act); and
- *Environment Protection and Biodiversity Conservation Act 1999 (*EPBC Act).

1.2 The Site

1.2.1 Location

The 4.185 ha site is located on the southern side of North Street, approximately 600 m west south-west from the North Street/Kemp Street intersection (refer to **Illustration 1.1**). It is located approximately 2 km north north-east of the Kempsey central business district. Kempsey is located on the NSW Mid-North Coast, in the NSW North Coast Bioregion.

1.2.2 Topography

The site is located on the southern side of a small hill. It contains a gentle slope to the south, with a low-lying wetland in the south. Elevation changes from approximately 14 m Australian Height Datum (AHD) in the central north, to approximately 1.5 m AHD in the south.

1.2.3 Landuses and Disturbance History

The site and adjacent land to the far north, east and south largely consist of pastoral grassland, subject to varying intensities of livestock grazing and pastoral improvement. Adjacent land directly to the north-west, west and south-east consists of residential areas.

The majority of the site consists of pasture/pastoral woodland. It has predominantly been used for cattle grazing with livestock, which are able to access all portions of the site. The vegetation has historically been partly cleared, and subject to pastoral improvement works (e.g. sowing of pastoral grasses). Evidence of past logging is indicated by occasional tree stumps.

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North

The Site and Study Area

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Illustration 1.1

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North

Aerial Photograph of the Study Area

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Illustration 1.2

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2 The Proposal

2.1 Description of Proposed Subdivision

It is proposed to rezone and subsequently subdivide Lot 4 DP 1124599, North Street, West Kempsey. The Proposal is for subdivision of the site into low density residential allotments with one larger residue lot containing flood prone land.

The development site is located within the Kempsey Local Government Area and therefore the Kempsey Local Environmental Plan 1987 (KLEP) applies.

The site is currently zoned 1(d) Rural Investigation under KLEP, and any new lots created in this zone must have a minimum lot size of 40 ha. It is therefore proposed to rezone the land to enable residential subdivision.

Plates 1.1 to 1.3 provide views of the site. **Illustration 1.1** shows a site locality plan identifying the subject land. **Appendix A** provides an indicative lot layout.

Plate 2.1 The site viewed from North Street, facing south-east

Plate 2.2The site from North Street facing South

Plate 2.3 Low-lying land in the south of the site

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3 Methodology

3.1 Report Methodology

The methodology for this ecological survey and assessment has been formulated based on a review of the NSW Department of Environment, Climate Change and Water (DECCW) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft, November 2004* (DEC 2004a). The report methodology is as follows:

- literature review of background information;
- conduct a search of the following databases to identify potential issues:
  - DECCW Atlas of NSW Wildlife Flora Records;
  - DECCW Atlas of NSW Wildlife Fauna Records; and
  - *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool.
- undertake flora and fauna field surveys;
- assess the habitat;
- assess the ecological impacts; and
- outline mitigation measures to be implemented to reduce potential impacts.

Specific flora and fauna survey methodology is provided in **Sections 3.4** and **3.5**.

3.2 Site Survey

Flora and fauna surveys within the site were undertaken by GeoLINK over five days and four nights between 23 and 27 August 2010. The field survey approach, outlined below, focused on specific flora and fauna surveys and habitat assessments in accordance with the *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft November 2004* (DEC 2004a).

3.3 Weather

The specific weather conditions during the survey and survey dates are described in **Appendix B**.

3.4 Flora Surveys

Flora surveys were conducted in order to provide a list of all species observed within the site, identify vegetation communities and determine the likely occurrence on the site of threatened species that were identified during threatened species database searches. A total survey effort of five field hours was dedicated to flora surveys.

3.4.1 Random Meander Surveys

The 'random meander' method, as explained within the *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft November 2004* (DEC 2004a), was undertaken to record general flora species and also target potential threatened species as outlined in Cropper (1993). This method was adopted instead of quadrat surveying due to the relatively small size

and modified nature of the site. **Illustration 3.1** shows the location of random meander transects undertaken during the survey.

The floristic composition and structure of vegetation communities within the site were recorded. The identification of flora species were recorded in the field and those that required further clarification were collected and keyed out using relevant literature.

3.4.2 Targeted Threatened Flora Searches

Targeted threatened flora surveys were incorporated into the random meander and quadrat surveys as indicated above. The full area of the site was traversed.

3.5 Fauna Surveys

3.5.1 General Fauna Surveys

Opportunistic sightings of fauna species were recorded during field surveys. This included noting the location and species of any fauna encountered during general field work (i.e. not specific targeted surveys). In general, the following fauna survey methodology follows guidelines set out in DEC (2004a) and Murray *et. al.* (2002).

Following an initial habitat assessment, target species were determined and surveys were undertaken for those species that were identified as having potential habitat within the site.

3.5.2 Amphibian Survey

In order to adequately survey for frogs species, a number of specific survey techniques were employed. These are as follows:

Diurnal Searches

Surveys were concentrated in the freshwater wetlands in the south. Specific habitat searches included the investigation of potential basking and sheltering sites such as emergent aquatic vegetation and areas of dense clumps of groundcover vegetation. A total of two hours were spent on diurnal searches specifically for amphibians.

Nocturnal Searches

Surveys were concentrated in the freshwater wetlands in the south (refer to **Illustration 3.2** for spotlighting locations). This involved call playback of pre-recorded frog calls, listening for calls and spotlight searches. Frog calls not able to be identified during field surveys were recorded and played back against pre-recorded frog calls for positive identification. A total of four hours (one hour per night for four nights) was spent on nocturnal surveying specifically for amphibians.

3.5.3 Reptile Survey

Herpetofauna searches were undertaken across the site within areas representing potential reptile habitat (refer to **Illustration 3.2** for survey locations). This involved searching under logs, decorticated bark and deeper leaf litter accumulations, and was combined with general fauna surveys.

During night surveys, spotlighting targeting reptiles was incorporated into general spotlighting activities, targeting potential nocturnal reptile habitats (e.g. tree trunks, fallen logs, areas with deeper leaf litter accumulations). A total of four hours (one hour per night for four nights) was spent undertaking reptile surveys.

3.5.4 Diurnal Bird Survey

The area search method as outlined within DEC (2004a) was conducted as part of this study. Specific observations were recorded from visual and vocal identification conducted during peak morning and late afternoon activity periods. Bird calls not able to be identified during field surveys were recorded and played back against pre-recorded bird calls for positive identification.

3.5.5 Nocturnal Bird Survey

Call Playback, Spotlighting and Stag Watches

Nocturnal bird surveys employed a combination of call playback, spotlighting and stag watches. The primary target species were the Masked Owl (*Tyto novaehollandiae*), Barking Owl (*Ninox connivens*), Powerful Owl (*Ninox strenua*), Grass Owl (*Tyto capensis*) and Bush-stone Curlew (*Burhinus grallarius*). Call playback involved the broadcasting of pre-recorded vocalisations of the using a 15 watt 'TOA' megaphone ER-1215S. An initial listening period of 10 minutes was undertaken at the call playback broadcast site followed by 10 minutes spotlighting the immediate area. Calls were then broadcast intermittently for approximately five minutes followed by a 10 minute listening period. After all calls had been broadcast a further 15 minutes of spotlighting was undertaken within the broadcast area. Call playback was undertaken over four consecutive nights during the survey from the centre of the site (refer to **Illustration 3.2** for call playback location).

Stag watches were undertaken on three different trees on four nights (refer to **Illustration 3.2** for stag watch locations). The methodology as outlined within DEC (2004a) was adopted.

3.5.6 Mammal Survey (Excluding Microchiropteran Bats)

Mammal survey methodology employed included arboreal Elliott B trapping, spotlighting, call playback, searches of tracks, scats and other traces (diggings, prints, scratches, etc), and habitat analysis. The specific methodologies adopted are detailed below. Survey methods such as wire cage trapping, ground Elliott A trapping and hair tubes sampling were not undertaken due to the highly modified state of the site (hence low habitat value for target species), proximity of the site to residential areas (hence concern for fauna welfare) and conservative use of habitat evaluation.

Arboreal Elliott B Trapping

Ten arboreal Elliott B traps were set for four consecutive nights (40 trap nights in total) on trees throughout the site (refer to **Illustration 3.2** for Elliott B trap locations). The traps were set on platforms on a slight angle to allow drainage out the entrance, and were set on or directly adjacent to hollow-bearing trees. They were baited with a honey, peanut butter, apple and rolled oats mixture, targeting the Brush-tailed Phascogale (*Phascogale tapoatafa*) and Squirrel Glider (*Petaurus norfolcensis*). Trap trees were sprayed with a honey, vanilla essence and water solution as an attractant.

Stag Watches

Stag watches were undertaken on four different trees on four nights (refer to **Illustration 3.2** for stag watch locations). The methodology as outlined within DEC (2004a) was adopted.

Spotlighting

Spotlighting was undertaken over four nights on foot using a 100 watt spotlight (refer to **Illustration 3.2** for spotlighting transect locations). The moon phase during spotlighting was full at the middle of the survey period, creating light night surveying conditions. Survey effort covered four nights, each being for a period of one hour per night. All habitat components were targeted, (i.e. tree canopies for arboreal mammals, logs for terrestrial fauna, etc). A total of four hours of spotlighting was undertaken.

Tracks, Scats and other Traces

During surveys, opportunistic recordings of tracks, scats, scratches, diggings and other traces were observed and/or collected for further analysis and reference to Triggs (2004). A total of three hours was devoted specifically to habitat searches which included searches for scats and tracks.

3.5.7 Megachiropteran Species (Flying-foxes, Fruit Bats)

Spotlighting

Spotlighting was undertaken on foot using a 100 watt spotlight. Survey effort covered four nights, each being for a period of one hour.

Vocal Detection

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is known to emit audible vocal calls especially during territorial disputes when feeding (Christesen and Nelson 2000). Listening for vocal calls was undertaken during night surveys over four consecutive nights.

3.5.8 Microchiropteran Bats

Ultrasonic Echolocation Detection

Microchiropteran bats (microbats) emit high frequency echolocation calls to navigate and forage. Ultrasonic call detection and analysis is recognised as an effective way of surveying microbat species within a range of habitats (Murray *et.al.* 2002). An Anabat SD1 CF bat detectors were set for 2.5 hours per night, for four nights (10 hours in total) in the pastoral woodland (refer to **Illustration 3.2** for Anabat locations). Recorded echolocation calls were forwarded to Anna Lloyd, an Anabat echolocation call analysis specialist, for call identification.

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Flora and Diurnal Fauna Survey Transects

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Illustration 3.1

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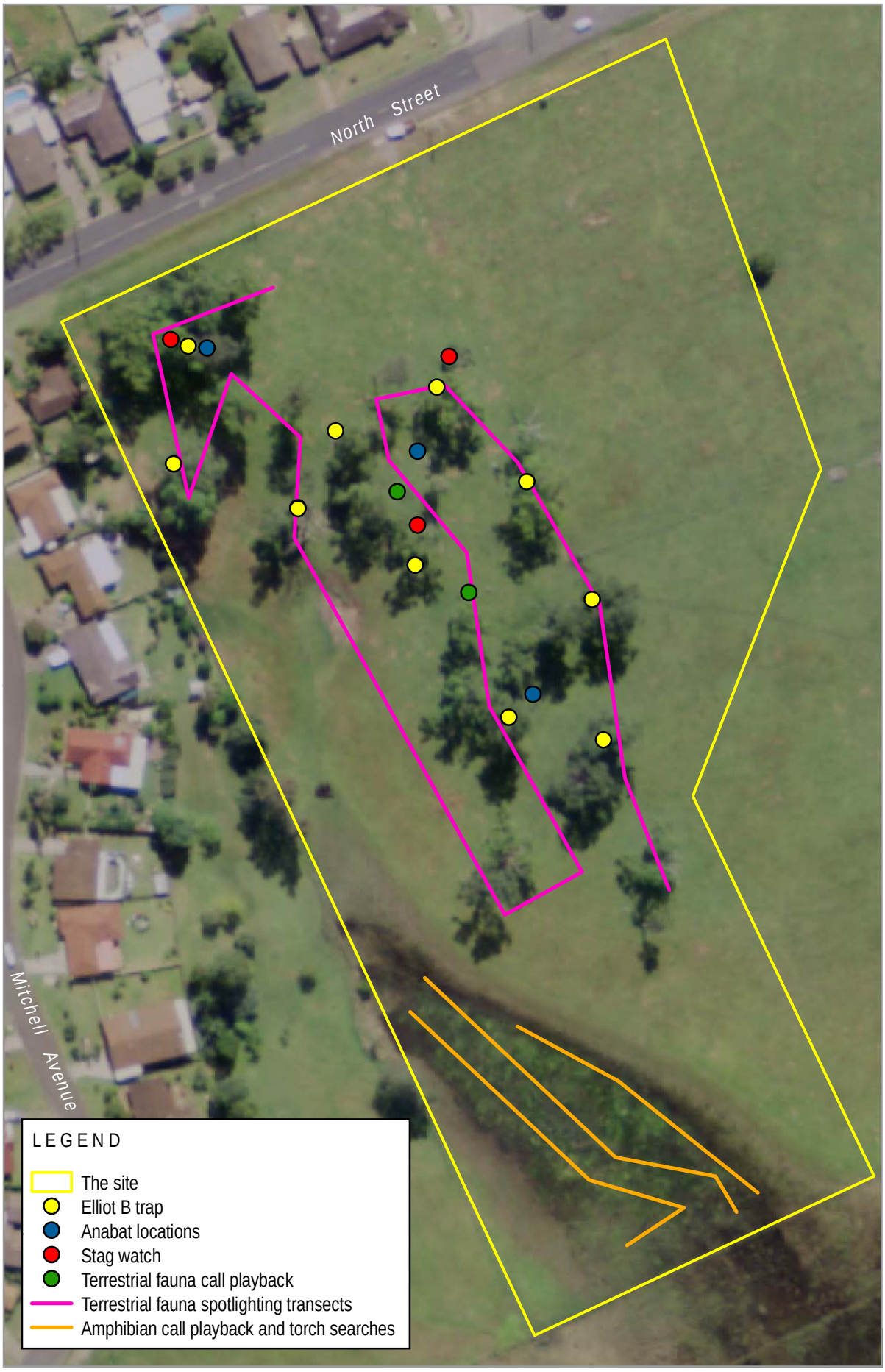

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Nocturnal Survey Method Locations

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Illustration 3.2

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3.6 Habitat Assessment

As it is recognised that not all species can be detected during a single seasonal period, habitat assessment was undertaken within the site to identify the occurrence of potential habitats and subsequently determine the suitability of these for threatened species.

3.6.1 Random Meander Surveys

The 'random meander' method, as explained within the *Threatened Species Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft November 2004* (DEC 2004a), was undertaken to assess the habitat present. The following features of fauna habitat were recorded:

- land use;
- vegetation structure;
- dominant plant species;
- level of disturbance;
- presence of scats, tracks, scratches and pock marks, etc;
- tree hollows and spouts;
- connectivity;
- rocky outcrops or caves; and
- availability of water.

3.7 Survey Limitations

The survey was conducted during late Winter, which is favourable for the identification of some target threatened fauna and flora species such as the Wallum Froglet (*Crinia tinnula*) which breeds in Winter, and the Swift Parrot (*Lathamus discolour*) which is a Winter migrant to mainland Australia (DECCW undated). This time of year however is less desirable for surveying for other target species such as the Green and Golden Bell Frog (*Litoria aurea*) which breeds in Summer (DECCW undated). As many flora species do not flower or fruit during this period, some may have been overlooked. Additionally, while some species may be present, they may have avoided detection due to their rarity, elusive nature or the sporadic utilisation of the site. Habitat evaluation and application of the precautionary principle is subsequently adopted to address these limitations.

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4

Results

4.1 Vegetation Communities

Three vegetation communities were identified on the site: pastoral woodland, pastoral grassland and freshwater wetlands. The locations of these communities and their structural and floristic compositions are detailed in **Sections 4.1.1**, **4.1.2** and **4.1.3**. All flora species detected are listed within **Appendix C**. The location of these vegetation communities on the site is shown in **Illustration 4.1**.

4.1.1 Pastoral Woodland

Structure and Floristic Composition

Canopy – Consists of 39 mature trees between 15 to 20 m high. Cover is open. Diameter at breast height (DBH) ranges from 0.35 to 0.9 m. Trees present include:

- fourteen (14) Brush Box (*Lophostemon confertus*);
- fourteen (14) Tallowwood (*Eucalyptus microcorys*);
- five (5) Red Mahogany (*Eucalyptus resinifera*);
- four (4) Red Bloodwood (*Corymbia gummifera*);
- one (1) Small-fruited Grey Gum (*Eucalyptus propinqua*); and
- one (1) Forest Red Gum (*Eucalyptus tereticornis*).

Mid-storey – Absent.

Groundcover – Generally mid-dense to dense. Height is generally between 0.1 to 0.7 m. Pastoral grasses and weeds are dominant, including Kikuyu Grass (*Pennisetum clandestinum**), Narrow-leaved Carpet Grass (*Axonopus affinis**), Fireweed (*Senecio madagascariensis**), Cobbler's Pegs (*Bidens pilosa**), Paddy's Lucerne (*Sida rhombifolia**), Blackberry Nightshade (*Solanum nigrum**), White Clover (*Trifolium repens**) and Stinging Nettle (*Urtica incisa**). Native species present include Whiteroot (*Pratia purpurascens*), Pennywort (*Centella asiatica*) and Native Wandering Jew (*Commelina cyanea*).

Distribution and Variation of Community within the Site

This community occurs as the wooded portion of the site and has an area of approximately 1 ha (refer to **Illustration 4.1**). Structure and floristic composition is consistent throughout the site. Species diversity is overall low, which is attributed to disturbances such as partial clearing and pastoral improvement works.

Condition of Vegetation

This community has experienced an extensive disturbance history including partial clearing, livestock disturbances (grazing and trampling) and pastoral improvement works (e.g. sowing of exotic pastoral species, artificial drainage enhancement, etc). Consequently this community is of poor quality in terms of native flora biodiversity values.

Conservation Significance

The DECCW BioMetrics Vegetation Types includes a list of native vegetation communities in the Northern Rivers Catchment Management Authority (NRCMA) area and an estimate of the percentage of each vegetation type which has been cleared. This can assist in determining the conservation status of particular vegetation communities.

Due to the modified state of the pastoral woodland, it did not strongly correlate to any of the listed BioMetrics Vegetation Types, nor was it possible to identify which community it was likely to have originally resembled. This community does not constitute any TSC Act or EPBC Act listed endangered ecological communities. Overall it is of low conservation significance in terms of conservation of floristic diversity.

Plate 4.1 Pastoral woodland viewed from north to south

4.1.2 Pastoral Grassland

Structure and Floristic Composition

Canopy – Absent

Mid-storey – Absent.

Groundcover – As for pastoral woodland groundcover (refer to **Section 4.1.1**).

Distribution and Variation of Community within the Site

This community occurs over the majority of the site, with an area of approximately 2.5 ha (refer to **Illustration 4.1**). Structure and floristic composition is very simple due to historic disturbances, particularly clearing and pastoralism. Species diversity is overall very low.

Condition of Vegetation

This community has experienced an extensive disturbance history including clearing, livestock disturbances and pastoral improvement works (e.g. sowing of exotic pastoral species, artificial drainage enhancement, etc). Consequently this community is of poor quality in terms of native biodiversity values.

Conservation Significance

The pastoral grassland in the study area does not correspond to any of the DECCW BioMetrics listed vegetation types for the NRCMA. This community does not constitute any TSC Act or EPBC Act listed endangered ecological communities. Overall it is of low conservation significance.

Plate 4.2 Pastoral grassland in the eastern portion of the site and adjacent land to the east

4.1.3 Aquatic/Freshwater Wetland

Structure and Floristic Composition

Canopy – Absent

Mid-storey – Absent.

Groundcover – Treeless, consisting of a mix of predominantly native aquatic species. Cover is generally mid-dense to dense. *Juncus usitatus*, Pepper Knotweed (*Persicaria hydropiper*) and Water Couch (*Paspalum distichum*) are common in the dry areas with little or no surface water (though typically with a saturated soil profile), while *Eleocharis spp*., Water Primrose (*Ludwigia peploides subsp. montevidensis*) and *Triglochin microtuberosum* are common in the areas with deeper surface water. Other commonly occurring species include River Buttercup (*Ranunculus inundates*) and *Persicaria strigosa*.

Distribution and Variation of Community within the Study Area

Occurs along the minor drainage line and floodplain depression in the southern portion of the site (refer to **Illustration 4.1**), with a total area of approximately 0.6 ha. Species dominance varies with water availability and depth.

Condition of Vegetation

The quality of this community has been degraded to varying degrees due to historic clearing, livestock disturbances (e.g. trampling and grazing) and poor water quality associated with direct livestock access, receiving runoff from agricultural land and residential land. However it still retained structural and native floristic integrity, particularly in the broader section. The majority of this community is in a fair condition, though the north-west is in poor condition.

Conservation Significance

This community correlates to the DECCW BioMetrics vegetation types "*coastal floodplain sedgelands, rushlands, and forblands*" and "*coastal freshwater meadows and forblands of lagoons and wetlands*". Clearing of these communities in the NRCMA is estimated at 80% and 40% respectively. The freshwater wetlands on the site constitutes the TSC Act listed EEC *Freshwater Wetlands on Coastal Floodplains of*

the NSW North Coast, Sydney Basin and South East Corner Bioregion. Consequently this community (more so the less degraded areas) is of high conservation value. This is detailed further in **Section 4.3**.

Plate 4.3 Freshwater wetlands in poor condition in the north-western portion of this community

Plate 4.4 Broader freshwater wetland section which is in fair condition

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Vegetation Communities

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Illustration 4.1

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4.2 Threatened Flora

4.2.1 Survey Results

No threatened flora species were recorded during the survey.

4.2.2 Database Results

Records of threatened flora species, populations or ecological communities known to occur within a 10 km radius of the site were obtained from the DECCW Atlas of NSW Wildlife. The search of the Atlas of NSW Wildlife identified two threatened flora species occurring within the search area. Additionally, records of threatened plant species, communities or species habitat likely to occur within 10 km of the site were obtained from the Environment Protection Biodiversity Conservation (EPBC) database. The EPBC database listed seven threatened flora species as '*species habitat likely to occur within area*'.

The suitability of habitat within the search area and therefore the potential occurrence of the threatened species are listed in **Table 4.1**. The species listed within the EPBC search are not actual records, rather just *species or species habitat **likely** to occur within area;* therefore the EPBC results have not been included within **Table 4.1**. The list of all threatened species found within these database searches is provided in **Appendix D**.

Table 4.1 Potential Occurrence Assessment of Threatened Flora Recorded in DECCW Atlas of NSW Wildlife

Scientific Name	*Common Name*	*Status*		*Habitat Requirement* *(Source DECCW undated)*	*Suitability of Habitat on the Site*	*Potential Occurrence*
		TSC Act	*EPBC Act*			
Maundia triglochinoides	-	V	-	Swamps or shallow fresh water on clay.	Low to moderate in freshwater wetland.	Low given not recorded despite targeted searches and the disturbance history of the study area.
Parsonsia dorrigoensis	Milky Silkpod	V	E	Subtropical and warm temperate rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils	Low	Low

E = Endangered; V = Vulnerable

As illustrated in **Table 4.1**, no threatened flora species are considered likely occurrences on the site which has experienced an extensive disturbance history. Consequently threatened flora are not considered further in this assessment as no threatened flora are considered likely to be affected by the proposed development.

4.3 Endangered Ecological Communities

The freshwater wetland on the site constitutes the TSC Act 1995 listed EEC *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion* (hereon in referred to as freshwater wetlands EEC (refer to **Illustration 4.1**). Condition varies from poor in the north-western portion of this community, to fair elsewhere. This community extends on to the adjacent land to

the south-east, and is known to occur locally along the drainage lines and depressions on the Macleay estuary floodplain.

No other EECs listed under the TSC Act 1995 or EPBC Act 1999 were identified on the site.

4.4 Fauna Results

4.4.1 Survey Results

Fauna recorded during the survey are listed in **Table E.1** (refer to **Appendix E**). Three threatened fauna species were confident recordings during the survey: the Grey-headed Flying-fox (*Pteropus poliocephalus*), Little Bent-wing bat (*Miniopterus australis*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). These species are all listed as Vulnerable under the TSC Act. The Grey-headed Flying-fox is also dually listed as Vulnerable under the EPBC Act. The habitat value of the site for these species is detailed in the introduction to the Seven-part Test in **Appendix F**.

The microchiropteran bat echolocation call analysis showed '*possible'* recordings of three *Vespadelus spp.* that are indistinguishable in northern NSW: the Eastern Forest Bat (*Vespadelus pumilus*), Eastern Cave Bat (*Vespadelus troughtoni*) and Little Forest Bat (*Vespadelus vulturnus*). The Eastern Cave Bat is listed as a Vulnerable species under the TSC Act. The actual chance of this species occurring on the site is low given the lack of suitable cave roost in proximity to the site and lack of local records. Additionally, the habitat in the study area is more suitable for the other subject *Vespadelus spp,* thus are the likely culprit species of subject echolocation calls.

Small flocks of up to five Cattle Egrets (*Ardea ibis*) were recorded amongst the cattle on the site during the survey. This species is listed as a migratory species under the EPBC Act. No other EPBC Act listed migratory species were recorded, though several others are considered potential occurrences (refer to **Section 4.6**).

4.4.2 Habitat Assessment

The site habitats were assessed to determine their value for native fauna species. This assessment was completed in conjunction with the flora surveys. The assessment focused on identifying habitat features known to be associated with threatened species and other native fauna groups. Observations made in respect of these habitat features are listed in **Table 4.2**. These features are components of the environment that, if present, will support fauna communities or indicate that fauna may be present. Habitat assessment is used to help determine the occurrence potential of threatened fauna species later in the report.

Table 4.2 Habitat Features

Habitat Feature	*Indicator*	*Score*	*Comment*
Claw Marks on Trees	Claw marks on trees indicate the presence of arboreal mammals such as Possums, Gliders and Koalas and reptiles such as the Lace Monitor	3	Evidence of arboreal fauna activity was indicated by claw marks on smoothed barked trees and tracks on rough barked species (refer to **Plate 4.5**). These occurred on most trees in the pastoral woodland (indicative of a high level of fauna activity), with scratches varying in age from old to fresh. Discernable scratches detected were of Lace Monitors (*Varanus varius*) (confident) and Common Brushtail Possums (*Trichosurus vulpecular*) (confident).

Habitat Feature	*Indicator*	*Score*	*Comment*
Scats	A range of animal faeces may be recorded indicating the presence of certain animals	2	Scats of the Common Brushtail Possum were detected below most trees on the site. Rabbit (*Oryctolagus cuniculus**) scats were also common in the pastoral woodland, while cattle scats occurred commonly throughout the site.
Allocasuarina sp.	*Allocasuarina spp.* provide key foraging sources for the Glossy Black Cockatoo (DEC 2004b)	0	No *Allocasuarina spp.* occur on the site. Hence the site is of negligible foraging habitat value for the threatened Glossy Black Cockatoo (*Calyptorhynchus lathami*).
Tracks	A range of animal tracks in the soil may be recorded indicating the presence of certain animals	0	No discernable native fauna tracks were detected.
Tree Hollows and stags	Tree hollows and stags provide shelter and roosting areas for a variety of birds, reptiles and arboreal mammals	3	Twenty-eight of the 39 trees in the pastoral woodland contained discernable tree hollows to an on-ground observer (refer to **Plate 4.6**). Most of these contained small apertures (<10 cm aperture diameter). Only three trees contained hollows with medium apertures (10 to 20 cm), while two trees contained hollows with large apertures (>20 cm) (one of these was shallow and poorly formed, while the other hollow was located at the top of the tree trunk hence exposed to the elements). These trees provide denning/roosting/nesting opportunities for a number of hollow obligate fauna capable of inhabiting modified remnants on the interface between existing agricultural and urban environments (e.g. microchiropteran bats, lorikeets, Brushtail Possums, etc). During the survey, a number of hollow-obligate fauna were observed using the hollows on the site including Australian Wood Duck (*Chenonetta jubata*), Rainbow Lorikeet (*Trichoglossus haematodus*), Common Brushtail Possum (*Trichosurus vulpecular*) and Galah (*Cacatua roseicapilla*). The occurrence of this aggressive hollow-obligate species and other ecologically limiting factors (e.g. disturbance history of the site, poor habitat connectivity, etc) substantially reduce the potential for the tree hollows on the site to be utilised by threatened hollow-obligate species such as the Glossy Black Cockatoo. General observations elsewhere in the study area and

Habitat Feature	*Indicator*	*Score*	*Comment*
			general locality, noted that hollow-bearing trees were rare or absent. In addition to the noted actual hollow-bearing trees all trees on the site contained small crevices, broken limbs and/or notches that were considered likely to form future additional hollows in the next 10 to 30 years (potential hollows). The location of discernable hollow-bearing trees on the site is shown in **Illustration 4.2**, while the number of hollows per tree is shown in **Table 4.3**.
Rocky Outcrops	Rocky outcrops are preferred by certain fauna	0	No major rocky outcrops occur on the site.
Animal Diggings	A range of animal diggings in the soil may be recorded indicating the presence of certain animals	2	Rabbit diggings were detected in several locations in the pastoral woodland (refer to **Plate 4.7**). No native fauna diggings were detected.
Burrows	Fauna can be identified by the types of burrows present	1	A few rabbit burrows were detected in the pastoral woodland, mainly at the base of trees. No other burrows were encountered.
Leaf Litter	Large amounts of leaf litter often indicates ample invertebrate activity and shelter for small animals	1	Leaf litter accumulations were generally poor and restricted to the drip line of trees within the pastoral woodland.
Bones	Bones can be used to identify fauna	0	No bones were detected on the site.
Aquatic Habitat	Fauna are often attracted to water bodies to drink, spawn or forage	2	The majority of the southern portion of the site is located below the high flood level, hence may be subject to periodic inundation and provide at least temporary aquatic habitat. The main aquatic habitat however consist of the freshwater wetland in the south (refer to **Plate 4.8** and **Illustration 4.1**). In this area the watertable was generally at or above the soil profile (approximately 25 cm deep in the middle). It is generally covered in aquatic vegetation, though livestock access has inhibited the development of thick aquatic vegetation in the centre of the wetland.

Habitat Feature	*Indicator*	*Score*	*Comment*
			The freshwater wetland on the site is considered to provide habitat for a number of waterfowl, including the threatened Black-necked Stork (*Ephippoorhynchus asiaticus*). It also provides potential habitat for common frogs, though the potential for any threatened frogs to occur is low due to presence of only marginal habitat (mainly due to the study areas extensive disturbance history which includes historic clearing, livestock disturbances, marginal runoff from urban and agricultural land, etc). The potential for the freshwater wetland to provide foraging habitat for the Large-footed Myotis (*Myotis adversus)* is limited by the lack of open surface water.
Fallen Timber and Hollow Logs	Fallen timber and hollow logs often provide shelter for a variety of fauna, as well as provide prey (including invertebrate prey) habitat	1	Logs and fallen timber of varying size (up to 30 cm diameter), and old tree stumps were scattered throughout the pastoral woodland (refer to **Plate 4.9**). Many of the stumps contained hollows which were being used by Rainbow Lorikeets as nesting sites during the survey. The location of the site in an urban/agricultural interface environment and livestock disturbances reduce the value of this substrate for relevant threatened species.
Extent of Well Developed Vegetation Structure	An area with a large extent of well developed vegetation structure will encourage fauna	1	The study area has been highly modified. The main habitat areas on the site (i.e. the freshwater wetland and pastoral woodland) are limited in extent and have been modified in a way which reduces structural integrity (or complexity?) (e.g. the pastoral woodland lacks any mid-storey or native groundcover). Overall areas with developed vegetation structure are limited in the study area.
Sap Sources	Specific Angophoras, Eucalypt and Corymbia species may provide potential sap sources for *Petaurus spp.* (Van Dyck and Strahan 2008)	1	The main species which provide potential sap sources for *Petaurus spp.* include Red Bloodwoods, Small-fruited Grey Gum and Forest Red Gum. Only two of the Red Bloodwoods was weeping sap, though it was not possible to determine whether this was from *Petaurus spp.* incisions or damage to the tree.
Diversity of Flora Species	A broad flora species diversity provides a large range of food sources	1	The site has a relatively low diversity of species, with no mid-storey or rainforest species. The canopy species present may provide seasonal nectar and pollen sources for nectivorous birds, arboreal mammals and megachiropteran bats during flowering periods, though the limited number of and diversity of trees means periods with

Habitat Feature	*Indicator*	*Score*	*Comment*
	and habitat available for fauna		no nectar and pollen sources are expected regularly. The fragmented distribution of habitat locally and the disturbance history of the study area reduces the overall value of this component to more mobile or habitat generalist species.
Understorey, Shrub Layer and Ground Cover	Dense understorey or ground cover such as thick grass provides shelter for small ground dwelling fauna	1	There is no shrub layer in any of the vegetation communities on the site. While groundcover vegetation occurs in most areas, it predominantly consists of a low matting and experiences livestock disturbances such as grazing and trampling. Overall the site has limited potential to support threatened terrestrial fauna dependent on dense groundcover.
Connectivity and Corridors	Areas that are connected to other areas of vegetation provide a corridor for movement and can accommodate large numbers of fauna	1	The freshwater wetland in the southern portion of the site is continuous with similar wetland habitat on adjacent land to the south. Collectively, these continuous wetland areas form part of a mosaic of wetlands locally along drainage lines and depressions amongst pastoral grassland on the Macleay River floodplain. The freshwater wetland example locally which encompasses the southern portion of the site is fragmented by urban land, pastoral grassland and/or infrastructure such as local roads and the north coast railway line. Despite such habitat fragmentation, mobile wetland fauna (e.g. waterfowl) would be expected to be able to move readily between local wetlands. Movements of less mobile species such as frogs would be expected to be restricted mainly to wetland areas (e.g. on the eastern side of Kemp Street), during wet periods, or via culverts. With regards to the pastoral woodland, this habitat is very poorly connected to swamp forest habitats to the north-west (along Belmore Street) and south-west (along the edge of the floodplain) via remnant/regrowth or planted pastoral and urban trees (refer to **Illustration 1.2**). Only highly mobile habitat generalist (Brushtailed Possums, woodland birds) would be expected to use these habitat links, though threatened species such as the Squirrel Glider (*Petaurus norfolcensis*) and Brush-tailed Phascogale (*Phascogale tapoatafa*), have been recorded in the Kempsey Shire Council LGA and Port Macquarie-Hastings LGA using similar linkages (Jason Berrigan, director Darkheart Eco-Consultancy *pers. comm.*; personal observations). The potential of these species to actually occur on the site is however reduced by the lack of similar and more suitable proximate habitats (e.g. larger areas of eucalypt forest) and the disturbance history of the general locality. Other linkages between habitats to the north and south of North Street locally are limited to scattered urban trees located to the west of the site.

Habitat Feature	*Indicator*	*Score*	*Comment*
			On a broader scale, the habitats on site may provide a minor stepping stone link for flying species such as the Grey-headed Flying-fox dispersing over the Kempsey area. Overall due to the fragmented distribution of habitat areas and modified state of the landscape most species likely to move across this area either for dispersing or as part of general movements throughout their range, would be highly mobile habitat generalist. The study area has not been mapped by DECCW as part of any regional corridors, subregional corridors or key habitat areas (refer to **Illustration 4.3**).
Koala browse species	Refer to State Environmental Planning Policy (SEPP) 44 Koala Habitat Assessment in **Section 5**	3	Refer to SEPP 44 Koala Habitat Assessment in **Section 5**.
Raptor roost and/or nest trees	Most raptors are very selective in choosing both the type of tree and the location used for roosting or building of nests (e.g. Ospreys typically utilise large dead trees near coastal waterways).	1	Due to the open structure of the habitat on the site and dimensions of the tree hollows present, the site has limited potential to support roosting or nesting of any threatened forest owls such as the Powerful Owl (*Ninox strenua*). The pastoral woodland may provide potential nesting sites for raptors that utilise stick nests in living trees. During the survey a pair of Black-shouldered Kites (*Elanus axillaris*) appeared to have currently been nesting in one of the stick nest on the site. Trees in this community also provide good vantage points this and other similar raptor species that may forage in pastoral environments. No large stick nests indicative of potential roosting of locally recorded threatened raptors were present. The potential for the site to support roosting by such raptors is limited by the small extent of the habitat on the site (hence limited potential to support an abundance of prey, particularly during breeding periods) and/or the lack of large open water bodies (e.g. for foraging by the Eastern Osprey *Pandion cristatus*).

0 *Nil*
1 *Low Occurrence*
2 *Medium Occurrence*
3 *High Occurrence*
* *denotes exotic/ introduced species*

Plate 4.5 Scratch marks on the Small-fruited Grey Gum

Plate 4.6 Hollows on a Tallowwood in the north-western corner of the site

Plate 4.7 Rabbit diggings and scats

Plate 4.8 Freshwater wetland section with permanent surface water

Plate 4.9 Hollow log and tree stumps

Table 4.3 Tree Species and Hollow-bearing Trees on the Site

Tree Number (refer to Illustration 4.2)	Scientific Name	Common Name	Approximate DBH (m)	Approximate Total Number of Discernable Hollows	Approximate Number of Hollows Per Aperture Diameter Range		
					<10 cm	10-20 cm	>20 cm
1	*Eucalyptus microcorys*	Tallowwood	0.8	3	2	1	-
2	*Eucalyptus microcorys*	Tallowwood	0.9	5	4	1 (vertical stout)	-
3	*Corymbia gummifera*	Red Bloodwood	0.6	9	9	-	-
4	*Eucalyptus microcorys*	Tallowwood	0.9	2	2	-	-
5	*Eucalyptus microcorys*	Tallowwood	0.6	0	-	-	-
6	*Lophostemon confertus*	Brush Box	0.6	0	-	-	-
7	*Lophostemon confertus*	Brush Box	0.6	2	2	-	-
8	*Lophostemon confertus*	Brush Box	0.6	2	2	-	-
9	*Eucalyptus resinifera*	Red Mahogany	0.6	0	-	-	-
10	*Eucalyptus resinifera*	Red Mahogany	0.4	0	-	-	-
11	*Eucalyptus microcorys*	Tallowwood	0.75	2	1	1	-
12	*Lophostemon confertus*	Brush Box	0.65	0	-	-	-
13	*Lophostemon confertus*	Brush Box	0.6	2	2	-	-
14	*Eucalyptus resinifera*	Red Mahogany	0.4	0	-	-	-
15	*Corymbia gummifera*	Red Bloodwood	0.5	0	-	-	-
16	*Eucalyptus resinifera*	Red Mahogany	0.7	11	8	1	2
17	*Eucalyptus microcorys*	Tallowwood	0.55	2	2	-	-
18	*Eucalyptus microcorys*	Tallowwood	0.55	4	3	-	1 (shallow)
19	*Eucalyptus microcorys*	Tallowwood	0.75	9	9	-	-
20	*Lophostemon confertus*	Brush Box	0.6	1	1	-	-
21	*Eucalyptus microcorys*	Tallowwood	0.6	0	-	-	-
22	*Eucalyptus tereticornis*	Forest Red Gum	0.45	3	3	-	-
23	*Lophostemon confertus*	Brush Box	0.45	1	1	-	-
24	*Lophostemon confertus*	Brush Box	0.6	4	4	-	-
25	*Eucalyptus*	Red	0.35	1	1	-	-

Tree Number (refer to Illustration 4.2)	Scientific Name	Common Name	Approximate DBH (m)	Approximate Total Number of Discernable Hollows	Approximate Number of Hollows Per Aperture Diameter Range		
					<10 cm	10-20 cm	>20 cm
	resinifera	Mahogany					
26	*Eucalyptus microcorys*	Tallowwood	0.7	5	4	1	-
27	*Eucalyptus microcorys*	Tallowwood	0.8	0	-	-	-
28	*Eucalyptus microcorys*	Tallowwood	0.65	1	1	-	-
29	*Eucalyptus propinqua*	Small-fruited Grey Gum	0.55	1	1	-	-
30	*Lophostemon confertus*	Brush Box	0.8	1	1	-	-
31	*Lophostemon confertus*	Brush Box	0.65	2	2	-	-
32	*Lophostemon confertus*	Brush Box	0.6	3	3	-	-
33	*Lophostemon confertus*	Brush Box	0.65	4	4	-	-
34	*Lophostemon confertus*	Brush Box	0.9	2	2	-	-
35	*Lophostemon confertus*	Brush Box	0.75	0	-	-	-
36	*Eucalyptus microcorys*	Tallowwood	0.9	2	2	-	-
37	*Corymbia gummifera*	Red Bloodwood	0.5	2	2	-	-
38	*Eucalyptus microcorys*	Tallowwood	0.65	6	6	-	-
39	*Corymbia gummifera*	Red Bloodwood	0.6	5	5	-	-
Total	**-**	**-**	**-**	**97**	**89**	**5**	**3**

Note: Vertical slits are nominated in the hollow per aperture diameter range, based on the width of the slit.

Overall, the study area has experienced an extensive disturbance history including clearing, pastoralism (including artificial drainage enhancement) and weed invasion. Despite these impacts the study area still supports a variety of habitat types, including potential habitats for a variety of locally recorded threatened fauna species (refer to **Section 4.5**). The site itself has been substantially modified and generally only offers potential habitat for threatened species capable of inhabiting small, poorly connected habitats on an the agricultural/urban interface.

Information shown is for illustrative purposes only

Drawn by: AMM Reviewed by: RE Date: September 2010
Source of base data: Kempsey Shire Council

North

0 30

Trees on the Site

GeoLINK environmental management and design

Flora and Fauna Survey and Impact Assessment: Proposed Residential Subdivision of Lot 4 DP 1124599 North Street, West Kempsey
1601038

Illustration 4.2

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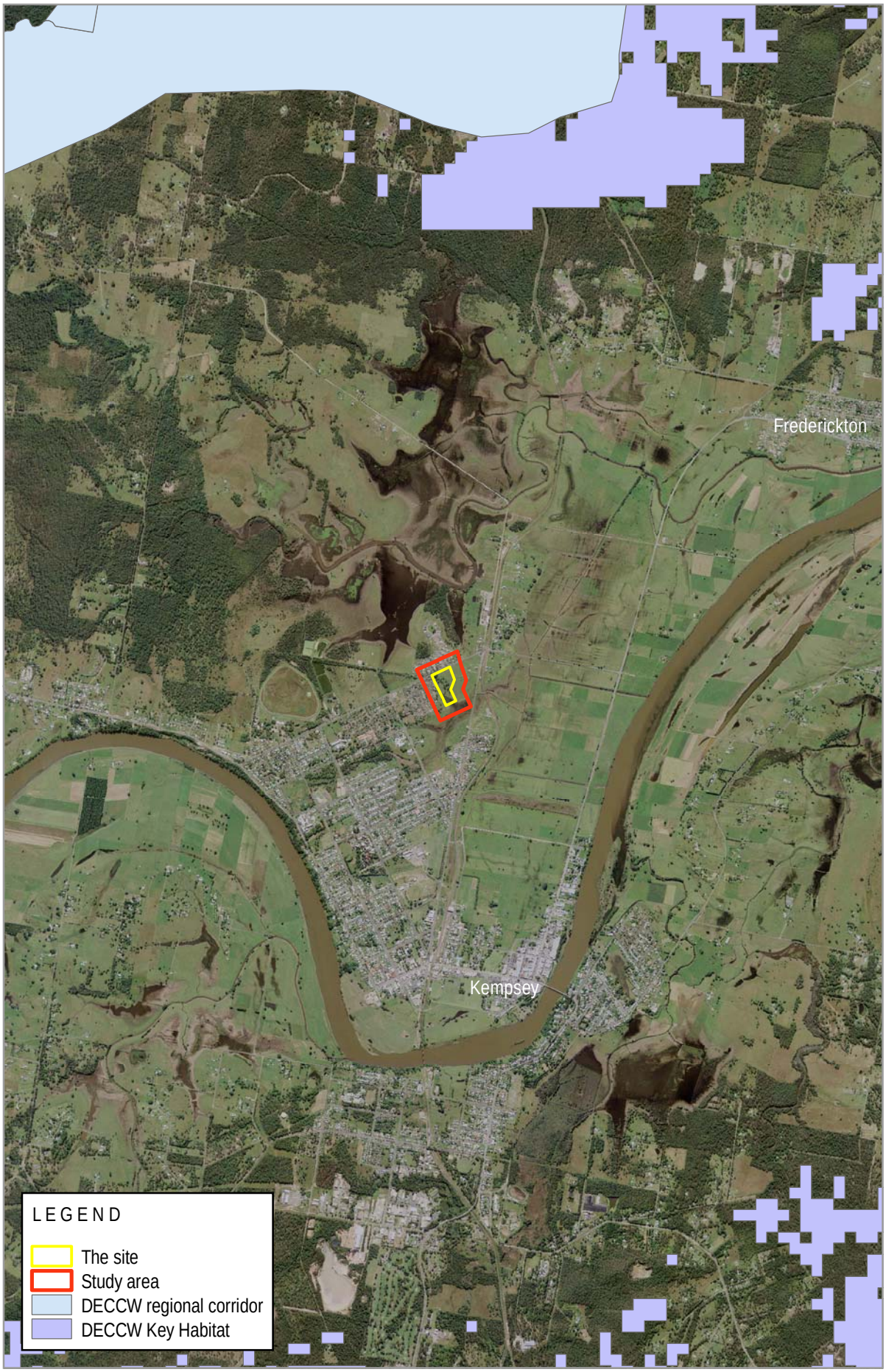
Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: September 2010
Source of base data: Kempsey Shire Council and DECCW



0 1 km

North

Site Context of DECCW Identified Key Habitat, Regional and Sub-regional Corridors

GeoLINK environmental management and design

Flora and Fauna Survey and Impact Assessment: Proposed Residential Subdivision of Lot 4 DP 1124599 North Street, West Kempsey
1601039

Illustration 4.3

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4.5 Threatened Fauna

Records of threatened fauna species known to occur within a 10 km radius of the site were obtained from the DECCW Atlas of NSW Wildlife. The search of the Atlas of NSW Wildlife identified 34 threatened fauna species occurring within the search area. Additionally, records of threatened fauna species or species habitat likely to occur within 10 km of the site were obtained from the EPBC database. The EPBC database listed 13 threatened fauna species as '*species habitat likely to occur within area*'.

The suitability of habitat within the search area and therefore the potential occurrence of the threatened species are listed in **Table 4.4**. The species listed within the EPBC search are not actual records, rather just *species or species habitat **likely** to occur within area;* therefore the EPBC results have not been included within **Table 4.4**. The list of all threatened species found within these database searches is provided in **Appendix D**.

Assessments of potential occurrence are based on the field survey results, habitat evaluation and knowledge of the ecological requirements of threatened fauna species known from the locality. Potential occurrences are discussed as either possible, likely or unlikely occurrences.

Table 4.4 Potential Occurrence Assessment of Threatened Fauna Recorded in DECCW Atlas of NSW Wildlife

Scientific Name	***Common Name***	***Status***		***Habitat Requirement*** *(Source DECCW undated)*	***Suitability of Site Habitat***	***Potential Occurrence***
		TSC Act	***EPBC Act***			
Aves						
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1000 m.	Low – no preferred foraging sources on the site	Low
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Marginal suitable in broad habitat terms in the pastoral woodlands.	Low given limited extent of potential habitat on the site; that the site is somewhat isolated from any larger areas of likely potential habitat; and presence of aggressive native and exotic species.
Ephippoorhynchus asiaticus	**Black-necked Stork**	E	-	Swamps, mangroves, mudflats, dry floodplains.	Moderate in the freshwater wetland	**Possible**

Scientific Name	*Common Name*	*Status*		*Habitat Requirement (Source DECCW undated)*	*Suitability of Site Habitat*	*Potential Occurrence*
		TSC Act	*EPBC Act*			
Glossopsitta pusilla	**Little Lorikeet**	V	-	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.	Moderate in the pastoral woodland	**Possible**
Hamirostra melanosternon	Black-breasted Buzzard	V	-	Inland habitats along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands.	Low to moderate in broad habitat terms	Low given only one record in the locality (DECCW Atlas of NSW Wildlife).
Hieraaetus morphnoides	**Little Eagle**	V	-	Occupies open eucalypt forest, woodland or open woodland.	Low to moderate in broad habitat terms	**Marginally possible**
Irediparra gallinacea	Comb-crested Jacana	V	-	Among vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	Low given limited floating vegetation in freshwater wetland	Low
Ixobrychus flavicollis	Black Bittern	V	-	Dense vegetation fringing and in streams, swamps, tidal creeks and mudflats, particularly amongst swamp sheoaks and mangroves.	Marginally suitable in freshwater wetland, though marginal water quality and livestock disturbances reduces occurrence potential.	Low given presences of only marginal habitat, not recorded during the survey (though difficult to detect) and only one record in the locality.
Lophoictinia isura	**Square-tailed Kite**	V	-	Dry woodland and open forest, particularly along major rivers and belts of trees in urban or semi-urban areas. Home range can extend over at least 100 km^2.	Low to moderate in broad habitat terms	**Possible**

Scientific Name	Common Name	Status		Habitat Requirement (Source DECCW undated)	Suitability of Site Habitat	Potential Occurrence
		TSC Act	EPBC Act			
Ninox strenua	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest, common along drainage lines.	Marginal structurally suitable in broad habitat terms, however the site is limited in extent and extremely poorly connected to other larger forest habitat areas. Also the site lacks an abundance or high diversity of potential prey, and suitable tree hollows for nesting.	Low
Pandion cristatus (formerly *Pandion haliaetus)*	Eastern Osprey	V	-	Forage for fish in fresh, brackish or saline waters of rivers, lakes, estuaries with suitable nesting sites nearby.	Low	Low – possibly only as transient flying over the general area
Petroica boodang	Scarlet Robin	V	-	Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Marginally suitable in broad habitat terms in the pastoral woodland.	Low given limited extent of potential habitat on the site; that the site is somewhat isolated from any larger areas of likely potential habitat; only one record in the locality (DECCW Atlas of NSW Wildlife); and presence of aggressive native and exotic species.

Scientific Name	Common Name	Status		Habitat Requirement (Source DECCW undated)	Suitability of Site Habitat	Potential Occurrence
		TSC Act	EPBC Act			
Petroica phoenicea	Flame Robin	V	-	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys.	Marginally suitable in broad habitat terms in the pastoral woodland.	Low given limited extent of the site which is on interface of urban and agricultural areas; only one record in locality (DECCW Atlas of NSW Wildlife); and presence of aggressive native and exotic species.
Podargus ocellatus	Marbled Frogmouth	V	-	Subtropical rainforest spending most time is deep, wet sheltered gullies.	No suitable habitat	Unlikely
Sterna albifrons	Little Tern	E	-	Coastal waters, bays, shallow inlets, salt or brackish lakes.	No suitable habitat	Unlikely
Tyto capensis	Eastern Grass Owl	V	-	Areas of tall grass, including tussocks in swampy areas, grassy plains, swampy heath, cane grass, sedges on flood plains.	Marginally suitable in freshwater wetland as foraging habitat.	Low given limited extent of potential habitat on the site, only two records in locality (DECCW Atlas of NSW Wildlife), limited potential for freshwater wetland to support an abundance of prey, etc.
Tyto novaehollandiae	Masked Owl	V	-	Dry eucalypt forest and woodlands.	Marginal structurally suitable in broad habitat terms, however the site is limited in extent and extremely poorly connected to other larger forest habitat areas. Also the site lacks an abundance or high diversity of potential prey, and tree hollows suitable for nesting.	Low

Scientific Name	Common Name	Status		Habitat Requirement (Source DECCW undated)	Suitability of Site Habitat	Potential Occurrence
		TSC Act	EPBC Act			
Tyto tenebricosa	Sooty Owl	V	-	Dry, subtropical and warm temperate rainforests and wet eucalypt forests. Nest in large tree hollows.	No suitable habitat on the site	Low
Mammalia						
Chalinolobus nigrogriseus	**Hoary Wattled Bat**	V	-	Dry open eucalypt forest dominated by spotted gum, boxes and ironbarks. Also healthy coastal forests where Red Bloodwood and Scribbly Gum are common. Naturally sparse understorey is favourable.	Low to marginally suitable in broad habitat terms in the pastoral woodland	**Marginally possible**
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Low	Low
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Moist and dry eucalypt forest and rainforest, particularly at high elevations.	Low to marginally suitable in broad habitat terms in the pastoral woodland	Low as prefers more elevated habitats
Miniopterus australis	**Little Bent-wing bat**	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	Moderate as seasonal foraging and non-breeding roosting habitat	**Possible**
Miniopterus schreibersii oceanensis	**Eastern Bentwing-bat**	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	Moderate as seasonal foraging and non-breeding roosting habitat	**Recorded**
Mormopterus norfolkensis	**Eastern Freetail-bat**	V	-	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts in tree hollows.	Moderate as foraging and roosting habitat	**Recorded**
Myotis adversus	Large-footed Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	Low as foraging habitat due to the lack of open surface water in the freshwater wetland. Low as roosting habitat due to the lack of quality potential foraging habitat locally.	Low

Scientific Name	Common Name	Status		Habitat Requirement (Source DECCW undated)	Suitability of Site Habitat	Potential Occurrence
		TSC Act	EPBC Act			
Petaurus australis	Yellow-bellied Glider	V	-	Tall mature eucalypt forests.	Low due to lack of extensive forests	Low given limited and extent of habitat on the site, very poor connectivity to extensive forest areas and not recorded during survey.
Petaurus norfolcensis	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum forest inland.	Pastoral woodland is structurally suitable and there are records of the Squirrel Glider in similar structured habitat in Kempsey LGA near Aldavilla and near Crescent Head Road. However the site is highly modified and fragmented from known habitats in the Aldavilla/ Yarravel and Fredericton areas. A range of predators are also known to occur in the general area (e.g. cats, Lace Monitor, etc). Aggressive hollow-obligated birds are also present (e.g. Common Myna, Noisy Miner, etc).	Low given previous points and not recorded despite intensive targeted surveying.
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Drier forests and woodlands with hollow-bearing trees and sparse ground cover.	Generally as for Squirrel Glider.	Generally as for Squirrel Glider. Low
Phascolarctos cinereus	**Koala**	V	-	Appropriate food trees in forests and woodlands, and treed urban areas.	Possible however site is poorly connected to known habitat areas around Aldavilla/ Yarravel area.	**No Koalas or evidence of occurrence recorded during the survey. Marginally possible**

Scientific Name	*Common Name*	*Status*		*Habitat Requirement* *(Source DECCW undated)*	*Suitability of Site Habitat*	*Potential Occurrence*
		TSC Act	*EPBC Act*			
Pteropus poliocephalus	**Grey-headed Flying-fox**	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	High as seasonal foraging habitat	**Likely**
Saccolaimus flaviventris	**Yellow-bellied Sheathtail-bat**	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Marginally suitable in pastoral woodland as foraging and roosting habitat	**Marginally possible**
Scoteanax rueppellii	**Greater Broad-nosed Bat**	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Marginally suitable in pastoral woodland as foraging and roosting habitat	**Marginally possible**
Amphibia						
Litoria brevipalmata	Green-thighed Frog	V	-	Rainforest, moist to dry eucalypt forest and heath, typically where surface water gathers after rain.	Habitat generalist requirements suggest that the freshwater wetlands may be marginally structurally suitable in broad habitat terms.	Low given disturbance history of the site and general area, marginal water quality in wetland (i.e. from livestock disturbances and urban runoff, etc) and lack records in the locality on the northern side of the Macleay River
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	No suitable habitat on the site	Unlikely

E = Endangered; V = Vulnerable;

As mentioned previously, three threatened fauna species were confident recordings during the survey: the Grey-headed Flying-fox (*Pteropus poliocephalus*), Little Bent-wing bat (*Miniopterus australis*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). As illustrated in **Table 4.4**, the following species are considered at least marginally possible potential occurrences at some stage on the site:

- Black-necked Stork (*Ephippoorhynchus asiaticus*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Little Eagle (*Hieraaetus morphnoides*);
- Square-tailed Kite (*Lophoictinia isura*);
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*);

- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Koala (*Phascolarctos cinereus*);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) and;
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

4.6 EPBC Act Listed Migratory Species

Searches on the EPBC Act Protected Matters Search Tool identified potential habitat for 18 migratory listed species within a 10 km of the study area (refer to **Appendix D**). This included marine turtles which would not occur on the site due to the lack of potential habitat. Based on the habitats present, the survey results and local knowledge; the following migratory species listed by the database search are considered potential occurrences at some stage in the study area:

- White-throated Needletail (*Hirundapus caudacutus*);
- Rainbow Bee-eater (*Merops ornatus*);
- Satin Flycatcher (*Myiagra cyanoleuca*);
- Rufous Fantail (*Rhipidura rufifrons*);
- Great Egret (*Ardea alba*);
- Cattle Egret (*Ardea ibis*); and
- Fork-tailed Swift (*Apus pacificus*).

5

SEPP 44 Koala Habitat Assessment

5.1 Potential Koala Habitat Assessment

5.1.1 Introduction

Potential Koala habitat as defined in the State Environmental Planning Policy (SEPP) 44 is a vegetation community with a minimum of 15 percent of trees in the upper and lower strata which are species listed in Schedule 2 of SEPP 44. The upper strata are those trees in the forest canopy, while the lower strata are those trees in mid-understorey or sub-canopy trees.

The policy applies to areas of land at least 1 ha in size and may include adjoining land under the same ownership. The identification of land as SEPP 44 potential Koala habitat may include properties with a minimum of 1 ha of habitat with sufficient Schedule 2 species to qualify as potential Koala habitat within a larger property (St Ives Bus Services v. Ku-ring-gai Council 1995 NSW LEC 189).

SEPP 44 listed Schedule 2 listed species are as follows:

- White Box (*Eucalyptus albens*);
- River Red Gum (*Eucalyptus camaldulensis*);
- Broad-leaved Scribbly Gum (*Eucalyptus haemastoma*);
- Tallowwood (*Eucalyptus microcorys*);
- Bimble Box (*Eucalyptus populnea*);
- Large-fruited Grey Gum (*Eucalyptus punctata*);
- Swamp Mahogany (*Eucalyptus robusta*);
- Scribbly Gum (*Eucalyptus signata*);
- Forest Red Gum (*Eucalyptus tereticornis*); and
- Ribbon Gum (*Eucalyptus viminalis*).

5.1.2 Methods and Results

The determination of the percentage of Schedule 2 listed species is typically undertaken by counting all tree species greater than 10 cm DBH in the upper and lower strata within a series of 20 x 20 m quadrats within each vegetation community. The percentage of Schedule 2 species within the upper and lower strata layers is subsequently calculated. If a site is not identified as potential Koala habitat no further assessment under SEPP 44 is required. Conversely, if SEPP 44 potential Koala habitat is identified, further investigations under SEPP 44 are required to determine if the site supports SEPP 44 core Koala habitat.

Preliminary site inspections identified the following Schedule 2 listed species on the site: Tallowwood (*Eucalyptus microcorys*) and Forest Red Gum (*Eucalyptus tereticornis*). Due to the limited number of trees on site, all trees were counted for the SEPP 44 Potential Koala habitat assessment. A list of each tree on the site has been provided previously in **Table 4.3**. In total the site contains 39 trees, of which 15 (38.5%) are Schedule 2 listed species (14 Tallowwoods and 1 Forest Red Gum). Hence the site qualifies as SEPP 44 potential Koala habitat and assessment for core Koala habitat is required.

5.2 Core Koala Habitat Assessment

5.2.1 Introduction

Core Koala habitat is defined by SEPP 44 as '*an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population*'. To identify if the site supports a resident population, the following techniques were used:

- review of DECCW Kempsey 1:100,000 threatened species map sheet Koala records;
- review of the draft *Comprehensive Koala Plan of Management* (*CKPoM*) *for the Eastern Portion of Kempsey Shire Council LGA* (Phillips and Hopkins 2009a, 2009b); and
- field survey using a variety standard survey techniques (direct observations of Koalas, spotlighting, call playback, and scat and scratch searches).

5.2.2 Methods and Results

5.2.2.1 Desktop Assessment

DECCW Records

DECCW Koala records within the locality were reviewed from the Kempsey 1:100,000 threatened species map sheet (obtained from DECCW under a data licence agreement). Only one DECCW Koala record occurs within a 5 km radius of the site on the northern side of the Macleay River. It located approximately 3 km to the west north-west. Approximately 18 Koala records occur within 5 km of the site on the southern side of the Macleay River, however these are not particularly relevant to the site as the Macleay River provides a substantial natural barrier locally between Koala populations on the northern and southern side of the river. No Koala records were shown on the site.

Draft *Comprehensive Koala Plan of Management* (*CKPoM*) *for the Eastern Portion of Kempsey Shire Council LGA*

The draft *Comprehensive Koala Plan of Management* (*CKPoM*) *for the Eastern Portion of Kempsey Shire Council LGA* (Phillips and Hopkins 2009a, 2009b) habitat mapping identified the site as:

- Secondary (Class B) – primary food tree species absent, habitat comprised of secondary and supplementary food tree species only.

This is inconsistent with the findings of this survey which found primary food tree species (mainly Tallowwood) occurring as co-dominant canopy species.

Local records of the Koala shown in Phillips and Hopkins (2009a) were duplicates of the DECCW Kempsey 1:100,000 threatened species map sheet Koala records. No Koala records were shown on the site.

5.2.2.1 Field Survey

Methods

Surveying for Koalas formed part of the general fauna survey undertaken on the site. Refer to **Section 3.5.6** for specific details of the methodology undertaken. The main methods undertaken which targeted the Koala include:

- direct searches and opportunistic observations;
- spot lighting;
- call playback; and
- scat and scratch detection.

All Tallowwood, Forest Red Gum, Red Mahogany and Small-fruited Grey Gum on the site were targeted for scat and scratch searches. Several limitations associated with the adopted surveying methodology must be considered including:

- location of Koalas in trees may impair detection during diurnal observations and spotlighting;
- groundcover vegetation and livestock disturbances may inhibit detection of Koala scats;
- life span of scats;
- rough barked species generally do not produce scratches enabling confident detection of species; and

- only breeding age male Koalas respond to call playback.

Despite these limitations, these methods are readily used to identify Koalas and assist in the determination of SEPP 44 core Koala habitat (DEC 2004a, Darkheart Eco-Consultancy 2005). Furthermore the survey was undertaken during the Koala breeding season (DECC 2008), hence male Koalas are more likely to respond to call playback during this time of year.

Results
No Koalas or evidence of their occurrence (i.e. scats and scratches) were recorded during the survey.

5.2.3 Discussion and Conclusion

Attributes stated within SEPP 44 as defining core Koala habitat are provided as examples only, hence other attributes (e.g. presence of areas of major Koala activity) may be used to identify the presence of core Koala habitat with or without the example attributes provided in the SEPP 44 definition.

This assessment failed to identify the SEPP 44 example attributes of core Koala habitat detailed as follows:

1) "*Breeding females (that is, females with young)"*. No Koalas or evidence of their occurrence was recorded during the survey.

2) "*Recent sightings and historical records of a Koala population*". No Koalas or evidence of their occurrence was recorded during the survey and there are known records of Koalas on or directly adjacent to the site.

Other attributes of core Koala habitat such as areas of major activity (Phillips and Callaghan 2001) were also not identified during the survey. Overall, there is insufficient evidence to suggest that the site supports a resident Koala population. Hence the site does not constitute core Koala habitat by strict interpretation of the SEPP 44 definition.

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6 Impact Assessment

6.1 Potential Impacts

The main impact associated with the proposed residential subdivision is the direct loss of vegetation and habitat. This is detailed in **Table 6.1**, which also outlines other potential impacts on local biodiversity from the proposed development. Mitigation measures to help minimise these impacts are also provided.

Table 6.1 Potential Impacts and their Management

Potential Impact	*Management Measures*
Direct habitat loss	
The proposed development would result in the direct loss/modification of the pastoral grassland and pastoral woodland within the proposal footprint. While several of the 36 trees located within the proposal footprint may be retained (e.g. trees located in the road reserve or near the edge of the proposed lots), this assessment will assume the worst case-scenario; in that all 36 trees in the residential lots and road reserve would require removal. Only trees 37, 38 and 39 (refer to **Illustration 4.2**) are located on proposed Lot 34, the proposed reserve in the far south; hence would be retained. Of the 36 trees potentially requiring removal, 25 of these trees contain actual tree hollows as discernable to an on-ground viewer, while the remaining trees were potential hollow bearing trees (i.e. contained hollows that were not visible to an on ground observer or structures that are likely to form hollows in the next 10 to 20 years or so). The removal of these trees contributes to a key threatening process attributed to the decline of many locally recorded hollow obligated threatened species. The freshwater wetland in the southern portion of the site is located on proposed Lot 34, which is proposed to consist of a reserve. Consequently it would not be directly affected by the proposal.	▪ Trees are to be retained to the maximum extent possible, prioritising, actual hollow-bearing trees and winter flowering species and Koala browse species. ▪ Trees to be retained would be clearly mapped and marked in the field prior to any vegetation removal. The drip line of trees to be retained would be fenced off. No materials, plant equipment or vehicles would be stored in this area, and no soil/root disturbance is permitted. ▪ All personnel involved in the clearing and construction works are to be informed of the relevant ecological management measures during the site induction. The relevance of marked items including clearing boundaries and subsequent requirements must be communicated to all contractors. ▪ Establishment of compensatory nest boxes (refer to **Section 7.1.2**) ▪ It would be desirable if endemic native species suited to floodplain foothills were planted on the more elevated portion of the proposed reserve on Lot 34 and as part of ornamental plantings, to help compensate of the habitat loss/modification associated with the proposal (e.g. provide foraging sources for the Grey-headed Flying-fox). ▪ The freshwater wetland on the proposed reserve (Lot 34), would be allowed to naturally regenerate.
Direct injury/mortality	
Fauna may be killed or injured during vegetation clearing. This is a particular risk for fauna utilising tree hollows and hollow logs/tree stumps as nesting/roosting/denning sites, which potentially includes threatened microchiropteran bats.	▪ A suitably qualified and experienced ecologist would be present during the tree removal stage of the proposal. ▪ A pre-clearing survey would be undertaken by the ecologist immediately prior to the commencement of any vegetation clearing. The primary aim of this survey would be to inspect the habitats within and

Potential Impact	*Management Measures*
	adjoining the clearing areas for any fauna (particularly threatened species), including visual arboreal searches and active searches of hollow logs/tree trunks; to minimise the risk of direct mortality or injury during vegetation clearing. Any ground dwelling fauna would be captured by the ecologist and appropriately relocated into suitable habitat areas. ▪ If arboreal fauna are detected, a 10 m construction buffer area is to be established around trees with non-threatened fauna, while a 25 m construction buffer area is to be established around significant fauna until the specimen voluntarily moves on. ▪ Removal of hollow-bearing trees would be undertaken in accordance with the following procedure: o All trees (including potential hollow-bearing trees which may contain hollows which are not visible to an onground observer) are to be cleared using the following procedures where possible and inaccordance with Occupational Health and Safety requirements: – The subject tree would be gently "bumped" three times over a minimum 5 minute period (minimum 1 minute pause between each bump). The aim of this procedure is to encourage nesting/denning/roosting hollow dependant fauna to disperse. If fauna are identified dispercing this would continue until a minimum 5 minute period where no fauna are detected evacuating the tree is experiened. – At least 1 minute after the final bump, the subject tree may be felled. The tree would be felled slowly (e.g. using an excavator to dig around the roots than gently push the tree over). – Felling of any of the subject hollow-bearing tree would occur during late March and April to avoid the breeding/maturnity periods of potentially roosting locally recorded hollow-obligated microchiropteran bats. ▪ Once fallen the suitably qualified ecologist would inspect the hollows, and capture and appropriately relocate any detected fauna (i.e. to the established local nest boxes), as well as record any detected fauna mortality. ▪ The tree would be left at the felled site for at least 48

Potential Impact	*Management Measures*
	hours after being fallen. ▪ Should injured fauna be found on the site, local wildlife care groups and/or local veterinarians are to be contacted immediately and arrangements made for the immediate welfare of the animal. The phone number of the local FAWNA group would be known to the ecologist and project foremen (FAWNA Mid-North Coast: 02 6581 4141). ▪ A written report is to be provided to Council following the removal of hollow-bearing trees and the pre-clearing survey detailing all results and actions undertaken, as well as a review of the methodology and its success in minimising fauna mortality.
Habitat fragmentation	
Habitat loss/modification associated with the proposed development will reduce habitat connectivity locally between trees, and trees/forest/woodland areas north and south of North Street. However marginal connectivity between these areas would still remain via urban trees to the west (e.g. along Cockrane Street). Additionally all potentially occurring threatened species on the site and to the south of North Street would be highly mobile species capable of utilising fragmented habitats in urban and pastoral environments. Fences established on the site would be expected to be solid urban fences similar to those on adjacent residential land (e.g. timber paling, colour bond, solid wire-mesh, etc). While such fences may present a barrier to the movement of non-flying terrestrial species, given the pre and particular post development highly modified state of the site, fences established on the site are considered unlikely to create a significant barrier to local fauna movement.	No additional recommendations are required.
Increased introduction and establishment of weeds on the site	
Establishment of lawns and gardens on the site would increase the occurrence of exotic species and potentially weeds on the site. The proposal will also increase the potential for weeds to be introduced and established in adjacent vegetation and habitats (including the freshwater wetland) due to garden escapes, changes in drainage and nutrient cycling, etc. This is not considered likely to be a significant impact given the abundance of exotic species and weeds locally (e.g. in pastoral areas and adjacent residential gardens) and the highly modified state of the general area.	▪ Street plantings and future owners are encouraged to plant local endemic species in any future established gardens. ▪ During the construction stage of the proposal care would be taken to minimise the spread of weeds into or throughout the site or surrounding area by regularly carefully cleaning and maintaining equipment. ▪ Only clear fill from a licensed quarry would be used on the site.
Water quality degradation and hydrological modification	
Potential water quality degradation associated with the proposal includes erosion and sedimentation impacts	▪ Drainage systems from constructed roads would be designed to avoid runoff flowing directly into the

Potential Impact	*Management Measures*
during the construction stage of the proposal, chemical spills during construction of roads and dwellings, application of gardening chemicals (e.g. pesticides and fertilisers), etc. Changes to existing hydrological movements locally is expected through vegetation removal, establishment of hard surfaces, addition of fill on proposed Lots 12 to 19, etc. Water quality degradation and hydrological modification can result in a number of ecological impacts including creating conditions no longer suitable for sensitive species (e.g. frogs), modification of vegetation floristic and structural composition, weed invasion, etc. These are a particular risk to the freshwater wetland (EEC) in the southern portion of the site and on adjacent land which receive runoff from the remainder of the site. To some extent, the above impacts have however already degraded the quality of habitat in the study area due to existing land uses.	freshwater wetland (EEC) and minimise potential erosion/sedimentation impacts. ▪ All drainage systems would be installed and maintained to Council standards. ▪ No storage of materials, waste, plant or other construction features is permitted on proposed Lot 34 during the construction stage of the proposal to maximise buffering of the freshwater wetland EEC.
Powerline collision	
Establishment of powerlines on/adjacent to the site may incrementally (though not significantly) increase the risk of powerline electrocution for species such as the Grey-headed Flying-foxFlying-fox.	▪ It would be desirable if any powerlines established locally were covered conductor type (CCT) powerlines or underground.
Fauna injury or mortality through traffic collision	
The proposal would result in new residential streets, which service the proposed Lots. Given the location of these roads in what will be a highly modified residential landscape, the proposal will not create a significant fauna traffic collision risk on the site. Given the levels of traffic along local roads, the incremental extent to which the proposal may increase the risk of traffic along these roads should not be substantial.	No additional recommendations are required.
Predation by domestic cats and dogs	
Future residents are considered likely to own domestic dogs and/or cats which will increase the risk of predation of local fauna. However as the majority of the site would consists of a highly modified residential landscape and considering the existing occurrence of domestic cats and dogs on residential land locally, it is considered unlikely that the proposal would substantially increase the risk of domestic cat and dog predation locally.	▪ All non-resident dogs, cats or other vertebrate pests (e.g. foxes) should be reported to Council's rangers or Livestock Health and Pest Authority for control. ▪ Cats should be confined to enclosures or the indoors during the night.
Fauna collision and entanglement with fences	
Establishment of fences on site may increase the risk of collision and/or entanglement (e.g. for Grey-headed Flying-foxes). Due to the post development modified nature of the site, and that solid urban type fences are	No additional recommendations are required.

Potential Impact	*Management Measures*
likely to be established, this is not considered likely to be a significant impact	
Light spill	
Artificial lighting will be introduced on site which may disturb nocturnal species. Due to the post development modified nature of the site, and that the site currently receives light spill from adjacent residential areas and street lighting, this is not considered likely to be a significant impact.	▪ Street lighting would be established to minimise spillage on retained trees and habitat areas (e.g. the freshwater wetland EEC to the south) locally. ▪ Future owners should be encouraged to minimise spillage of artificial lighting onto into retained trees/habitat, with all external lighting being localised, of low luminosity and directed towards the ground.
Increased human presence	
Human presence can result in a number of disturbances to native fauna including direct interference and noise. The proposal would result in permanent human presences on the site. Given the post development highly modified state of the site and the existing high levels of human presence locally (particularly on adjacent residential land) this is not considered likely to be a significant impact.	No additional recommendations are required.
Clearing and construction related sedimentation and erosion	
Disturbances to soils associated with vegetation removal/modification, earthworks, etc, have potential to result in degradation of low catchment habitats which includes freshwater wetland EEC on and adjacent to the site.	▪ During the construction stage of the subdivision and construction of future dwellings, sediment and erosion controls as specified in the Blue Book (Landcom 1998) are to be established and maintained. Maintenance of these controls would continue until bare soils have re-vegetated or been otherwise stabilised.
Altered fire regime	
Increased human presence associated with the proposal may increase the desire for prescription burning and/or arson locally. Conversely increased human presence may result in more rapid response to local fires. Due to the highly modified state of the site and general area (particularly the lack of any extensive forested vegetation), and existing high rate of human inhabitancy locally, the proposal is not considered likely to increase the risk of ecological unsustainable fire regimes on local native vegetation communities.	▪ Fire should be prevented from establishing in the freshwater wetland EEC. ▪ All fallen trees would not be burnt, but disposed of via mulching and used appropriately on site or at an off-site location.

6.2 Vegetation Communities

The proposed residential subdivision would result in the direct loss/modification of the pastoral woodland and pastoral grassland within proposed residential lots. Thirty-six of the 39 trees on the site would require removal. The freshwater wetland in the southern portion of the site and on adjacent land would not be directly or substantially indirectly affected by the proposal given:

- the existing modified state of the site and general area, as well as local land-use practices (e.g. pastoralism, residential development, etc);

- retained grassland vegetation between the proposed dwelling Lots and the freshwater wetland may provide some buffering of runoff;
- livestock would no longer be able to access the freshwater wetland EEC on the site, which is considered a positive impact; and
- the freshwater wetland on the site is located on the proposed reserve (Lot 34) and would be able to naturally regenerate.

6.3 Threatened Flora

As detailed previously, no threatened flora species were recorded on the site or considered likely occurrences. Consequently no threatened flora species are considered likely to be directly affected by the proposal.

6.4 Endangered Ecological Communities

As mentioned previously, freshwater wetland EEC occurs in the southern portion of the site, as well as on directly adjacent land to the south/south-east. The proposed subdivision layout enables full retention of this community in the reserve on proposed Lot 34, where it would be allowed to naturally regenerate. While the proposal may impose a risk of indirect impacts (e.g. water quality degradation, hydrological changes, sedimentation and erosion impacts, etc) the incremental extent that the proposal may contribute to these threats should not be substantial, especially with effective implementation of the mitigation measures of this report.

Seven-part tests of significance have been prepared (refer to **Appendix E**) in accordance with Section 5A of the EP&A Act for freshwater wetland EEC. This assessment concluded that while the proposed works will impose a risk of indirect impacts to the freshwater wetlands on and directly adjacent to the site (particularly sedimentation and erosion and water quality impacts), the proposed subdivision is not considered likely to place the local occurrence of freshwater wetland EEC at significant risk of extinction. Affective implementation of the mitigation measures in this report would also reduce the risk of such impacts.

6.5 Threatened Fauna

For the 12 known/potentially occurring threatened species that may utilise the pastoral woodland habitat on the site (refer to **Table 4.3**) the proposal would significantly reduce the site's habitat values for these species. Most of the trees in this poorly connected pastoral woodland would require removal, which provide either direct foraging sources, prey habitat and/or roosting/nesting opportunities for these species. During vegetation clearing, the proposal would also impose a real risk of mortality/injury, particularly for the subject hollow-obligated species such as the subject microchiropteran bats and Little Lorikeet. The proposal would also add other threats to these species including increased human presence, domestic pet predation, etc; however due to the post development highly modified state of the site, and already existing risk of these threats (i.e. from directly adjacent residential areas), the incremental extent which the proposal may contribute to these threats should not be significant.

For the Black-necked Stork, the occurrence potential of this species should largely be retained as the freshwater wetland on the site would not be directly or substantially indirectly affected (refer to **Section 6.3**), and given the proximity of the site to existing residential areas and associated threats (e.g. domestic pet predation).

Seven-part tests of significance have been prepared (refer to **Appendix F**) in accordance with Section 5A of the EP&A Act for all 13 known/potentially occurring threatened species. This assessment concluded that while the proposed development would impose some substantial negative effects (particularly to the site's foraging, roosting/nesting values of the subject forest/woodland species, and potential breeding

aggregates of the subject hollow-obligate species) and contribute to key threatening processes for particular species; the proposed subdivision is not considered likely to place the local population of these species at significant risk of extinction, especially with effective implementation of the mitigation measures detailed in this report.

6.6 Wildlife Corridor

Fauna corridors are described as vegetation communities that allow the movement of fauna between connected landscape elements (Soule and Gilpin 1991). Corridors provide dispersion routes for migrating animals with large foraging or breeding ranges. Corridors are also particularly important for small remnants that do not support large viable populations.

As mentioned previously, the freshwater wetland in the southern portion of the site is continuous with similar wetland habitat on adjacent land to the south. Continuity between these habitats would remain post establishment of the proposal and local fauna movements for species capable of utilising this habitat would largely be unaffected by the proposal.

The pastoral woodland community is very poorly connected to forest habitats to the north-west (along Belmore Street) and south-west (along the edge of the floodplain) via paddock, roadside and/or garden trees (refer to **Illustration 1.2**). Only highly mobile habitat generalist (Brushtailed Possums, woodland birds) would be expected to move between these treed habitat areas. For forest/woodland species, the habitat loss/modification required as part of the proposal would reduce connectively between retained trees on the site, and other paddock/garden/roadside trees and forest/woodland habitats locally. Connectivity between treed habitats features on the north and south sides of North Street would also be reduced, though should be retained via urban/paddock/roadside trees to the west. Overall, while local habitat connectivity will be reduced, the proposed development is not considered likely to result in habitat isolation or fragmentation locally.

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Matters of National Environmental Significance

7.1 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, the following Matters of National Environmental Significance (MNES) are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA).

An assessment of the proposal with regards to MNES is provided in **Table 7.1** below. This assessment was undertaken with reference to an online search using the DEWHA's Protected Matters Search Tool with a buffer area of 10 km around the site.

Table 7.1 Assessment of Matters of National Environmental Significance

	Factor	*Impact*
a	**Any Environmental Impact on a World Heritage Property?**	
	No World Heritage Properties were listed by the Protected Matters Search Tool within 10 km of the site. Consequently the proposed development is not likely to have a significant impact on any World Heritage Property.	Nil
b	**Any Environmental Impact on National Heritage Places?**	
	No National Heritage Places were listed by the Protected Matters Search Tool within 10 km of the site. Consequently the proposed development is not likely to have a significant impact on any National Heritage Places.	Nil
c	**Any Environmental Impact on Wetlands of International Importance?**	
	No Wetlands of International Significance (Ramsar Sites) were listed by the Protected Matters Search Tool within 10 km of the site. Consequently the proposed development is not likely to have a significant impact on any Wetlands of International Significance.	Nil

	Factor	*Impact*
d	**Any Environmental Impact on Commonwealth Listed Threatened Species or Ecological Communities?**	
	No EEC listed under the EPBC Act occurs on or directly adjacent to the site. A total of 20 threatened species listed by the EPBC Act, comprising 7 flora and 13 fauna species, were identified by the Protected Matters Search Tool as '*species or species habitat likely to occur'* within a 10 km radius of the site. The Grey-headed Flying-fox was the only threatened species recorded or considered a potential occurrence on the site. An assessment of significance in accordance with the Administrative Guidelines of Significance for EPBC listed species concluded that the proposal is unlikely to result in a significant impact on this species (refer to **Appendix G**). Overall the proposal is not considered likely to result in a significant impact on any EPBC Act listed threatened species or ecological communities.	Negligible.
e	**Any Environmental Impact on Commonwealth Listed Migratory Species?**	
	A total of 18 listed migratory species were identified by the Protected Matters Search Tool, as '*species or species habitat likely to occur'* within the defined search area. The potential impact of the proposal on the migratory species considered to potentially occur within the study area has been assessed under the Administrative Guidelines (refer to **Appendix G**) for significant impact. The assessment concluded that the proposal is unlikely to result in a significant impact on any listed migratory species.	Negligible.
f	**Does Any Part of the Proposal Involve a Nuclear Action?**	
	The proposal does not involve a nuclear action.	Nil
g	**Any Environmental Impact on a Commonwealth Marine Area?**	
	No Commonwealth Marine Areas were listed by the Protected Matters Search Tool within 10 km of the site. Consequently the proposed development is not likely to have a significant impact on any Commonwealth Marine Areas.	Nil
h	**Any Environmental Impact on Commonwealth Land?**	Nil
	The Proposal is not in proximity to any Commonwealth Land, and therefore would have no impact on such lands.	
i	**Any Environmental Impact to the Great Barrier Reef Marine Park**	
	The study area is not located in proximity to any parts of the Great Barrier Reef Marine Park and therefore would have no impact on this protected matter.	Nil

8 Recommendations

8.1 Primary Mitigation Measures

The following mitigation measures would be implemented to ameliorate potential ecological impacts. The conclusion of this report is based on these primary mitigation measures being adopted and effectively implemented.

8.1.1 Tree/Habitat Retention

- Trees are to be retained to the maximum extent possible, prioritising actual hollow-bearing trees, winter flowering species (i.e. Tallowwood and Forest Red Gum) and Koala browse species (Tallowwood, Forest Red Gum, Small-fruited Grey Gum and Red Mahogany). If required a suitably qualified arborist should inspect trees on the edge of the proposed residential Lots and within the road reserve to identify whether the trees are suitable for retention, and if so, any maintenance to maximise the longevity of the trees.
- Trees to be retained would be clearly mapped and marked in the field prior to any vegetation removal. The drip line of trees to be retained would be fenced off. No materials, plant equipment or vehicles would be stored in this area, and no soil/root disturbance is permitted.
- All personnel involved in the clearing and construction works are to be informed of the relevant ecological management measures during the site induction. The relevance of marked items including clearing boundaries and subsequent requirements must be communicated to all contractors.
- The freshwater wetland on the proposed reserve (Lot 34), would be allowed to naturally regenerate.

8.1.2 Nest Boxes

Compensatory Nest Boxes Numbers

Nest boxes would be installed to replace the loss of the actual and potential hollows bearing trees at a 1:1 ratio (nest boxes: actual/potential hollow-bearing tree removed) (at least 36 nest boxes). A range of nest boxes sizes/designs would be required to mimic the various sizes of the hollows that would be removed (refer to **Table 8.1**). Details associated with the construction of the nest boxes are provided in **Appendix H**.

To allocate the number of nest boxes per design, the following factors were considered:

- the ratio of the hollow aperture sizes recorded (i.e. 92% small, 5% medium and 3% large);
- local habitat types; and
- survey fauna results (particularly hollow-obligate species recorded utilising the hollows on the site, hence would be displaced as part of the proposal) and threatened species identified in the DECCW Atlas of NSW Wildlife (see local search results in **Appendix D**) for a 400 km² area surrounding the site.

Table 8.1 shows the number of nest boxes recommended per required nest box design, to help compensate for the loss of 36 actual/potential hollow-bearing trees required as part of the proposal.

Table 8.1 Nest Box Design Numbers

Nest Box Design/Target Fauna	*Number of Nest Boxes*
Microbats	15
Squirrel Glider	3
Sugar Glider	3

Brushtail Possum	3
Brush-tailed Phascogale	3
Lorikeet/Rosella	4
Galahs	3
Kookaburra	2
TOTAL	**36**

The loss of any other hollow-bearing trees would require further compensatory nest boxes to be established. Number per nest box design would give due consideration to the above factors.

Establishment of Nest Boxes

Compensatory nest boxes would be established prior to undertaking construction works to permit a smooth transition following the removal of habitat associated with the project (i.e. minimum 1 month prior to the commencement of clearing).

Nest Boxes Locations

Criteria for the selection of nest box locations includes:

- nest boxes for possums and gliders would be located on *Eucalypt spp*. or *Corymbia spp.* in areas that are interconnected with larger forest/woodland habitat areas;
- nest boxes would be located in close proximity to potential food sources of the target species to reduce travelling distances and conserve energy; and
- nest boxes for insectivorous bats would be located near water sources and within or adjacent to potential flyways.

Nest boxes would be established locally (preferably within 500 m of the site) in treed areas which are not prone to future vegetation loss (e.g. potentially along the roadside vegetation along Belmore Road to the west). The location of the nest boxes is to be determined between Hadlow Design Services and KSC. A suitably qualified ecologist would undertake or supervise the nest box installation to ensure the above is satisfied and submit a post installation letter to Council stating the location of the nest boxes (including illustrations), type of nest box at each site, their height, orientation, tree type and DBH.

Nest Box Monitoring

The nest boxes would be monitored every 3 months for the first year by a suitably qualified and experienced ecologist to identify and manage pest (e.g. bees and exotic birds), ensure nest boxes are structurally sound and correctly attached, document native fauna inhabitancy and any necessary actions to maximise native fauna usage. Nest box monitoring reports would to be provided to Council and appropriate maintenance/management actions undertaken within one month of completion of each monitoring inspection.

8.1.3 Vegetation Clearing

- A suitably qualified and experienced ecological would be present during the tree removal stage of the proposal.
- A pre-clearing survey would be undertaken by the ecologist immediately prior to the commencement of any vegetation clearing. The primary aim of this survey would be to inspect the habitats within and adjoining the clearing areas for any fauna (particularly threatened species), including visual arboreal searches and active searches of hollow logs/tree trunks; to minimise the risk of direct mortality or injury during vegetation clearing. Any ground dwelling fauna would be captured by the ecologist and appropriately relocated into suitable habitat areas.
- If arboreal fauna are detected, a 10 m construction buffer area is to be established around trees with non-threatened fauna, while a 25 m construction buffer area is to be established around significant fauna until the specimen voluntarily moves on.
- Removal of hollow-bearing trees would be undertaken in accordance with the following procedure:

- All trees (including potential hollow-bearing trees which may contain hollows which are not visible to an on-ground observer) are to be cleared using the following procedures where possible and inaccordance with Occupational Health and Safety requirements:
  - The subject tree would be gently "bumped " three times over a minimum 5 minute period (minimum 1 minute pause between bumps). The aim of this procedure is to encourage nesting/denning/roosting hollow dependant fauna to disperse. If fauna are identified this would continue until a minimum 5 minute period where no fauna are detected evacuating the tree is experienced.
  - At least 1 minute after the final bump, the subject tree may be felled. The tree would be felled slowly (e.g. using an excavator to dig around the roots than gently push the tree over).
  - Felling of any of the subject hollow-bearing tree would occur during late March or April to avoid the breeding/maturnity periods of potentially roosting locally recorded hollow-obligated microchiropteran bats.

- Once fallen the suitably qualified ecologist would inspect the hollows and capture and appropriately relocate any detected fauna (i.e. to the established local nest boxes), as well as record any detected fauna mortality.
- The tree would be left at the felled site for at least 48 hours after being fallen.
- Should injured fauna be found on the site, local wildlife care groups and/or local veterinarians are to be contacted immediately and arrangements made for the immediate welfare of the animal. The phone number of the local FAWNA group would be known to the ecologist and project foremen (FAWNA Mid-North Coast: 02 6581 4141).
- A written report is to be provided to Council following the removal of hollow-bearing trees and the pre-clearing survey detailing all results and actions undertaken, as well as a review of the methodology and its success in minimising fauna mortality.
- All fallen trees would not be burnt, but disposed of via mulching and used appropriately on site or at an off-site location.

8.1.4 General Other

- During the construction stage of the proposal care would be taken to minimise the spread of weeds into or throughout the site or surrounding area by regularly carefully cleaning and maintaining equipment.
- Only clear fill from a licensed quarry would be used on the site.
- Drainage systems would be designed to avoid runoff from constructed roads flowing directly into the freshwater wetland (EEC) and prevent any potential erosion/sedimentation impacts.
- All drainage systems would be installed and maintained to Council stands.
- No storage of materials, waste, plant or other construction features is permitted on proposed Lot 34 during the construction stage of the proposal to maximise buffering of the freshwater wetland EEC.
- All non-resident dogs, cats or other pest (e.g. foxes) should be reported to Council's rangers or Livestock Health and Pest Authority for control.
- Street lighting would be established to minimise spillage on retained trees and habitat areas (e.g. the freshwater wetland EEC to the south) locally.
- During the construction stage of the proposal and of future dwellings sediment and erosion controls as specified in the Blue Book (Landcom 1998) are to be established and maintained. Maintenance of these controls would continue until bare soils have re-vegetated or been otherwise stabilised.
- Fire should be prevented from establishing in the freshwater wetland EEC.

8.2 Secondary Mitigation Measures

The following mitigation measures are provided to help maintain the biodiversity values of the site and general area. It is not assumed that these mitigations measures will be implemented in the conclusion of

this assessment. The adoption of these mitigation measures will be at Councils' and/or the development applicant's discretion:

- It would be desirable if endemic native species suited to floodplain foothills were planted on the more elevated portion of the proposed reserve on Lot 34, to help compensate of the habitat loss/modification associated with the proposal (e.g. provide foraging sources for the Grey-headed Flying-fox).
- Street plantings and future owners are encouraged to plant local endemic species in any future established gardens.
- It would be desirable if any powerlines established locally were covered conductor type (CCT) powerlines or underground.
- Cats should be confined to enclosures or the indoors during the night.
- Future owners should be encouraged to minimise spillage of artificial lighting onto into retained trees/habitat, with all external lighting being localised, of low luminosity and directed towards the ground.

9 Conclusions

A total of three vegetation types were recorded on the site: pastoral grassland, pastoral woodland and freshwater wetland. No threatened fauna species were recorded or considered likely occurrences.

The freshwater wetland community in the southern portion of the site constitutes the TSC Act listed endangered ecological community (EEC) *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion*. No other TSC Act or EPBC Act listed EECs occur on or directly adjacent to the site.

Three threatened fauna species were recorded during the survey: the Grey-headed Flying-fox (*Pteropus poliocephalus*), Little Bent-wing bat (*Miniopterus australis*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). Ten other highly mobile threatened fauna were variably considered potential occurrences.

The SEPP 44 Koala Habitat Assessment identified the site as SEPP 44 Potential Koala Habitat. However no Koalas or evidence of their occurrence was recorded during the survey, and the local records on the northern side of the Macleay River locally are scarce. The survey results and literature review suggest that the site does not qualify as SEPP 44 Core Koala Habitat.

Overall the site and general areas has experienced an extensive disturbance history due to agricultural and urban development. Consequently the site now supports highly modified habitats that are poorly connected to any significant forested areas locally. Despite an extensive disturbance history, the site still retained some ecological values for mobile and somewhat habitat generalist threatened fauna, with key habitat/habitat components provided by the freshwater wetlands and the pastoral woodland which supports mature hollow-bearing trees (28 actual hollow-bearing trees and 11 potential hollow-bearing trees).

The main ecological impacts of the proposal were generally associated with almost complete removal of the pastoral woodland trees (i.e. 36 of 39 trees on the site), which included 25 actual hollow-bearing trees; and hence contributing to key threatening processes responsible for the decline of the known/potentially occurring threatened species. The other main potential impacts of the proposal were generally minor in nature or would be easily mitigated against (e.g. erosion and sedimentation, and water quality impacts). A range of mitigated measures were provided to minimise the impacts of the proposal on local biodiversity.

The proposal is considered unlikely to have a significant impact on any Matters of National Environmental Significance listed under the EPBC Act. Consequently referral to the Minister is not required in relation to these protected matters.

An impact assessment and seven-part tests of significance undertaken in accordance with Section 5A of the *Environmental Planning and Assessment Act 1979* have been prepared (refer to **Appendix F**) for the 12 threatened fauna species known or potential occurrences on the site and freshwater wetland EEC.

These assessments concluded that while the proposed subdivision would impose some negative incremental and cumulative effects (particularly to the site's values to potentially occurring forest/woodland species and breeding aggregates of the local threatened fauna populations which potentially utilise the site) and contribute to key threatening processes, with effective implementation of the primary mitigation measures of this report, the proposal is not considered likely to place the subject threatened species, EEC

and endangered population at significant risk of local extinction. Thus a Species Impact Statement (SIS) is not considered necessary for the proposal.

Project Team

The project team members included:

David Andrighetto
Ecologist

Tony Coyle
Ecologist

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Copyright and Usage

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A

Subdivision Layout

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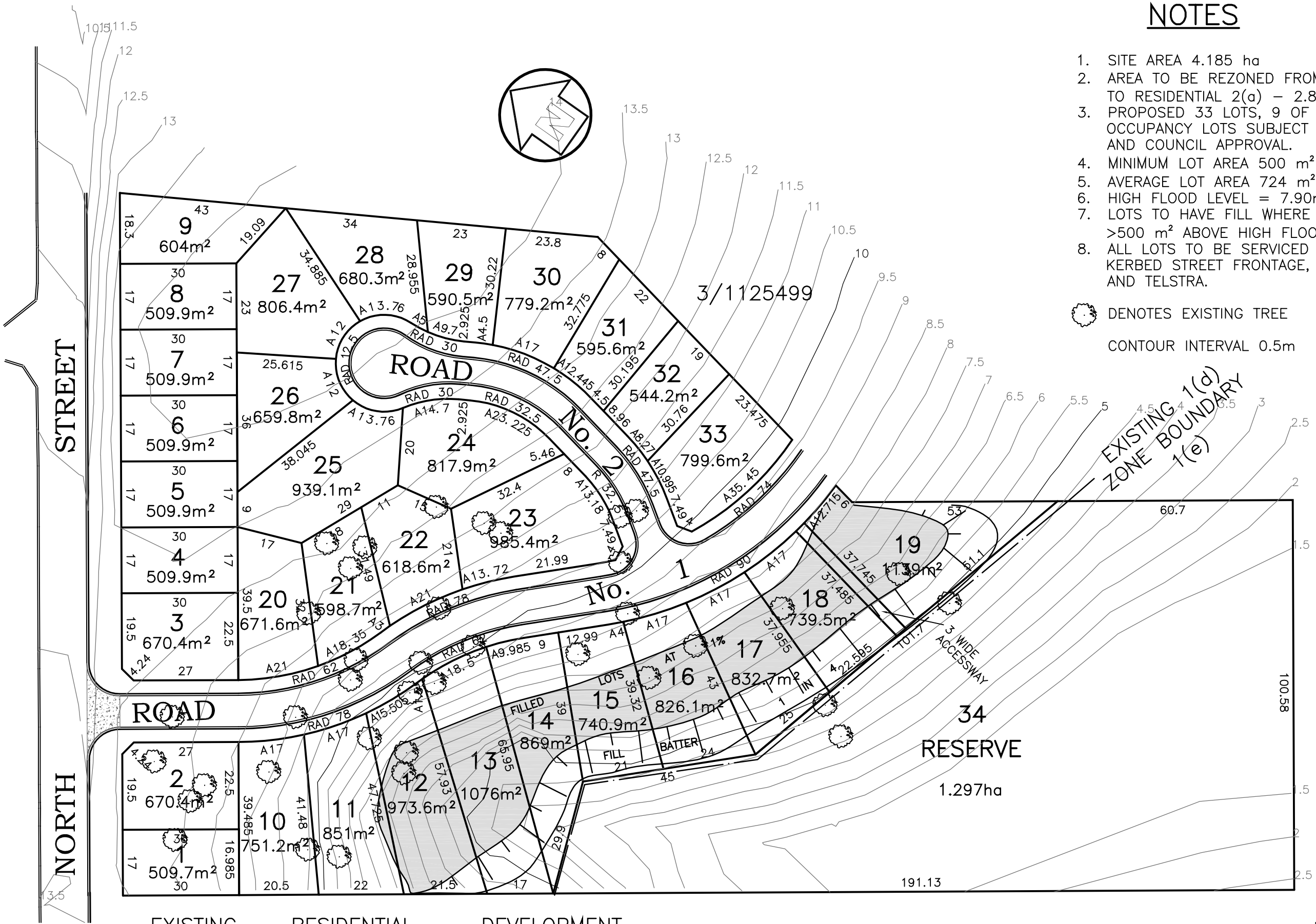
NOTES

1. SITE AREA 4.185 ha
2. AREA TO BE REZONED FROM RURAL INVESTIGATION 1(d) TO RESIDENTIAL 2(a) – 2.887 ha
3. PROPOSED 33 LOTS, 9 OF WHICH ARE POSSIBLE DUAL OCCUPANCY LOTS SUBJECT TO FUTURE APPLICATION AND COUNCIL APPROVAL.
4. MINIMUM LOT AREA 500 m^2
5. AVERAGE LOT AREA 724 m^2
6. HIGH FLOOD LEVEL = 7.90m AHD
7. LOTS TO HAVE FILL WHERE NECESSARY TO ACHIEVE >500 m^2 ABOVE HIGH FLOOD LEVEL.
8. ALL LOTS TO BE SERVICED WITH TOWN WATER, SEWER, KERBED STREET FRONTAGE, UNDERGROUND ELECTRICITY AND TELSTRA.

DENOTES EXISTING TREE

CONTOUR INTERVAL 0.5m



COUNCIL FILE

No.	DATE	REVISION

SCALE 1:1000 @ A3
DATUM : AHD
DRAWN BY :
APPROVED :
DATE: 05/07/2010
DRAWING REF : 1741REZONE.DWG

Hadlow Design Services

3 Riverview Place
South West Rocks
P.O. Box 86
South West Rocks
Ph. (02) 6566 7688
Fax. (02) 6566 7644
Email: info@hadlowdesign.com.au
CIVIL & STRUCTURAL ENGINEERS . BUILDING DESIGNERS. PLANNERS . PROJECT MANAGERS

L.G.A. KEMPSEY

PROPOSED REZONING AND RESIDENTIAL SUBDIVISION
LOT 4 DP 1124599
NORTH STREET - WEST KEMPSEY
FOR: VOYEE PTY LTD & SUPAEAST PTY LTD
LAYOUT PLAN

FILE REFERENCE **51741-DA**

AMENDMENT No. -

SHEET 1 OF 1

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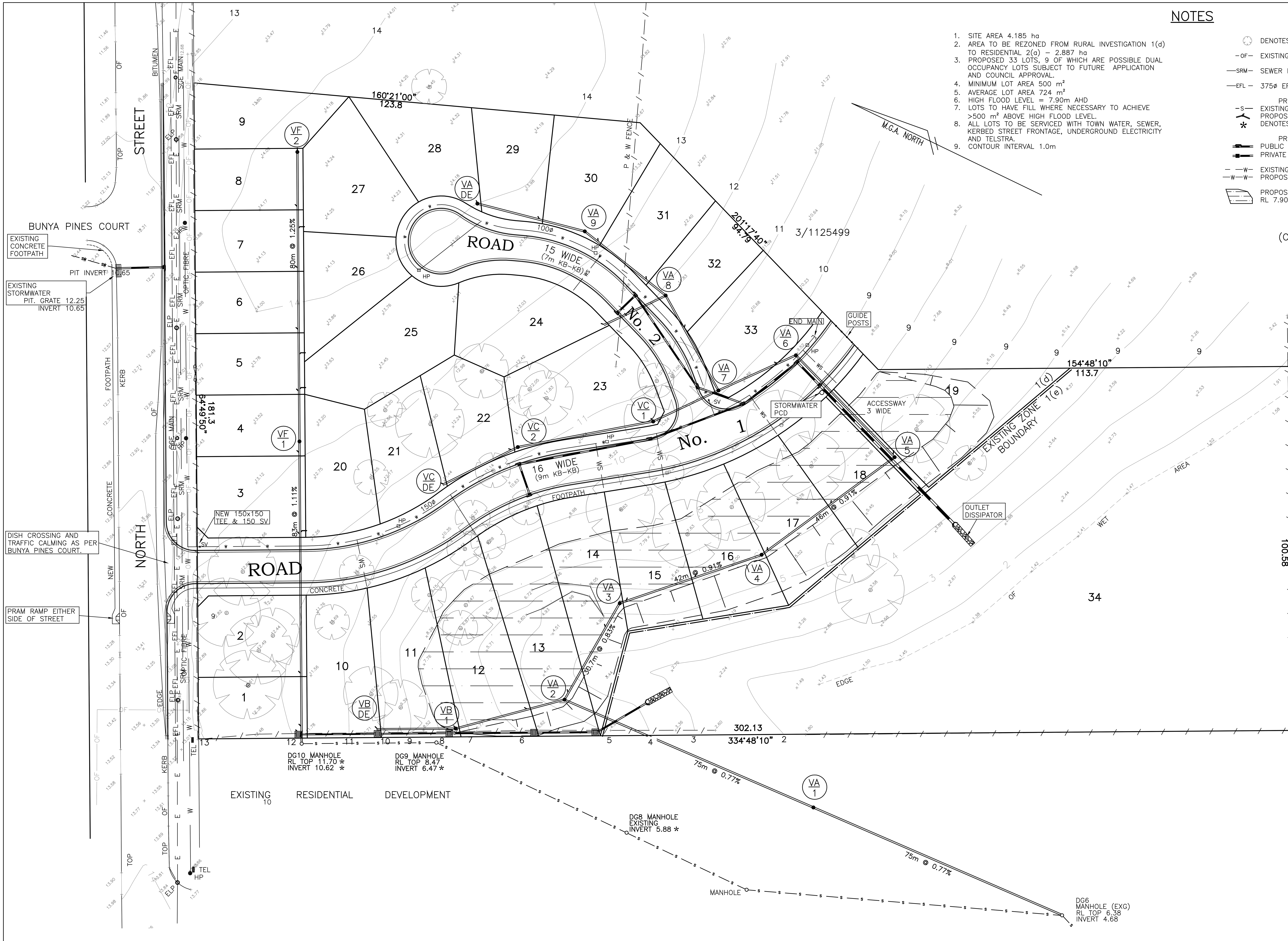

SITE LAYOUT

SCALE 1:500

NOTES

1. SITE AREA 4.185 ha
2. AREA TO BE REZONED FROM RURAL INVESTIGATION 1(d) TO RESIDENTIAL 2(a) – 2.887 ha
3. PROPOSED 33 LOTS, 9 OF WHICH ARE POSSIBLE DUAL OCCUPANCY LOTS SUBJECT TO FUTURE APPLICATION AND COUNCIL APPROVAL.
4. MINIMUM LOT AREA 500 m²
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6. HIGH FLOOD LEVEL = 7.90m AHD
7. LOTS TO HAVE FILL WHERE NECESSARY TO ACHIEVE >500 m² ABOVE HIGH FLOOD LEVEL.
8. ALL LOTS TO BE SERVICED WITH TOWN WATER, SEWER, KERBED STREET FRONTAGE, UNDERGROUND ELECTRICITY AND TELSTRA.
9. CONTOUR INTERVAL 1.0m

- DENOTES EXISTING TREE
- —OF— EXISTING OPTIC FIBRE CABLE
- —SRM— SEWER RISING MAIN
- —EFL— 375ø EFFLUENT OUTFALL LINE

PRELIMINARY SEWER DESIGN
- —S— EXISTING 150mm GRAVITY SEWER LINE
- PROPOSED 150mm GRAVITY SEWER LINE
- * DENOTES LEVELS PROVIDED FROM COUNCIL MAPINFO

PRELIMINARY STORMWATER DESIGN
- PUBLIC LINES
- PRIVATE LINES (INTERLOT DRAINAGE)

- —W— EXISTING NORTH STREET WATER MAIN 150ø
- —W—W— PROPOSED WATER MAINS 150ø & 100ø
- PROPOSED CERTIFIED FILL AREA. MINIMUM RL 7.90m AHD AND GRADED AT 1%

MAINTENANCE HOLES
(CRITICAL FOR GRADE LINES ONLY)

MARK	LID	INVERTS
VA/1	6.10	5.26, 5.29
VA/2	7.90	5.87, 5.90
VA/3	7.90	6.15, 6.18
VA/4	7.90	5.65, 6.59
VA/5	7.90	7.01, 7.04
VF/1	13.25	11.60, 11.63
VF/2	14.20	12.63

No.	DATE	REVISION

SCALE: 1:500
DATUM : A.H.D.
DRAWN BY :
APPROVED :
DATE : 22 JULY 2010
DRAWING REF : 51741CIV.DWG

Hadlow Design Services

3 Riverview Place
South West Rocks
P.O. Box 86
South West Rocks
Ph. (02) 6566 7688
Fax. (02) 6566 7644
Email: info@hadlowdesign.com.au
CIVIL & STRUCTURAL ENGINEERS . BUILDING DESIGNERS. PLANNERS . PROJECT MANAGERS

COUNCIL FILE

L.G.A. KEMPSEY
PROPOSED REZONING AND RESIDENTIAL SUBDIVISION
LOT 4 D.P. 1124599
NORTN STREET, WEST KEMPSEY
FOR: VOYEE PTY LTD & SUPAEAST PTY LTD
PRELIMINARY CIVIL DESIGN

FILE REFERENCE 51741-CIV
AMENDMENT No.
SHEET 1 OF 1

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B

Meterological Data

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Table A.1 Meteorological Data August 2010 – Kempsey

Date	*Min temp (°C)*	*Max temp (°C)*	*Rainfall (mm)*	*Direction of maximum wind gust*	*Speed of maximum wind gust (km/h)*	*9am Temperature (°C)*	*3pm Temperature (°C)*
23/08/10	9.4	15.9	8.1	NW	15	10.4	13.8
24/08/10	6.9	19.2	0.6	WSW	37	15.3	17.5.
25/08/10	7.5	22.0	0	WSW	39	13.5	18.9
26/08/10	3.8	20.0	0	WNW	50	16.0	19.2
27/08/10	6.0	21.2	0	NW	44	16.0	20.4

Source: http://www.bom.gov.au/climate/dwo/201008/html/IDCJDW2069.201008.shtml

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C

Floristic Data

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Table B.1 Floristic Data

Family	*Species*	*Common Name*
Apiaceae	*Centella asiatica*	Pennywort
Apiaceae	*Hydrocotyle sp.*	A Pennywort
Apocynaceae	*Gomphocarpus fruticosus**	Narrow-leaved Cotton Bush
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Asteraceae	*Cirsium vulgare**	Spear Thistle
Asteraceae	*Conyza bonariensis**	Flaxleaf Fleabane
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Taraxacum officinale**	Dandelion
Azollaceae	*Azolla pinnata*	-
Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Cyperaceae	*Eleocharis equisetina*	A Spikerush
Cyperaceae	*Eleocharis sphacelata*	Tall Spike Rush
Cyperaceae	*Juncus usitatus*	-
Fabaceae (Faboideae)	*Trifolium repens**	White Clover
Juncaginaceae	*Triglochin microtuberosum*	-
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Myrtaceae	*Eucalyptus propinqua*	Small-fruited Grey Gum
Myrtaceae	*Eucalyptus resinifera subsp.hemilampra*	Red Mahogany
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Myrtaceae	*Lophostemon confertus*	Brush Box
Onagraceae	*Ludwigia peploides subsp. montevidensis*	Water Primrose
Orchidaceae	*Dendrobium linguiforme*	Tongue Orchid
Oxalidaceae	*Oxalis sp.*	-
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues
Poaceae	*Andropogon virginicus**	Whisky Grass
Poaceae	*Axonopus affinis**	Narrow-leaved Carpet Grass
Poaceae	*Chloris gayana**	Rhodes Grass
Poaceae	*Oplismenus aemulus*	Broad-leaved Forest Grass
Poaceae	*Paspalum distichum*	Water Couch
Poaceae	*Pennisetum clandestinum**	Kikuyu Grass
Poaceae	*Sporobolus africanus*	Parramatta Grass
Polygonaceae	*Persicaria hydropiper*	Pepper Knotweed
Polygonaceae	*Persicaria strigosa*	A Smartweed
Ranunculaceae	*Ranunculus inundatus*	River Buttercup
Solanaceae	*Solanum mauritianum**	Wild Tobacco Bush
Solanaceae	*Solanum nigrum**	Blackberry Nightshade
Solanaceae	*Solanum pseudocapsicum**	Madeira Winter Cherry

Key

* Exotic species

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D

DECCW Atlas of NSW Wildlife and EPBC Act Protected Matters Search Tool Database Results

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NSW National Parks & Wildlife Service
atlas of nsw wildlife

Search Results

Your selection: Flora, threatened species, Selected Area - 152.72960,-31.14687,152.93999,-30.96573 returned a total of 3 records of 2 species.

Report generated on 04/05/2010 - 11:53 (Data valid to 25/04/2010)

view map | search again | clear selection

Choose up to 3 species to map.

** Exotic (non-native) species*

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Apocynaceae						
	☐	Parsonsia dorrigoensis	Milky Silkpod	V	1	
Juncaginaceae						
	☐	Maundia triglochinoides		V	2	

** Exotic (non-native) species*

Choose up to 3 species to map.

OUR ENVIRONMENT it's a living thing

Australian Government
Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

4 May 2010 12:04

EPBC Act Protected Matters Report

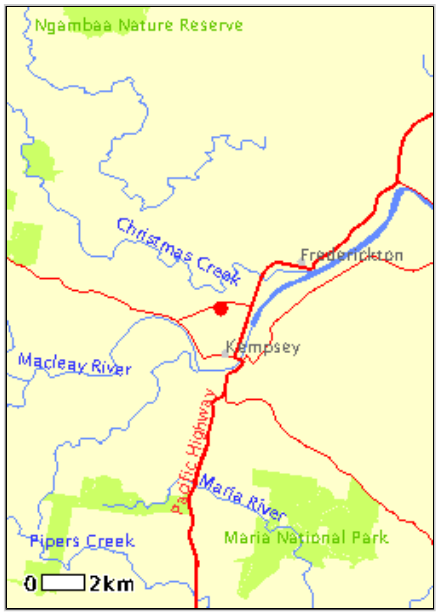
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Point
Buffer: 10 km
Coordinates: -31.05653,152.8347

Report Contents:



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None

Threatened Species:	20
Migratory Species:	18

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Places on the RNE:	6
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	1

Details

Matters of National Environmental Significance

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater	Endangered	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog	Vulnerable	Species or species habitat likely to occur within area

Litoria booroolongensis Booroolong Frog	Endangered	Species or species habitat may occur within area
Mixophyes iteratus Southern Barred Frog, Giant Barred Frog	Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Species or species habitat may occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland)	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Roosting known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle	Vulnerable	Species or species habitat may occur within area
Plants		
Allocasuarina defungens Dwarf Heath Casuarina	Endangered	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant	Endangered	Species or species habitat likely to occur within area
Hydrocharis dubia Frogbit	Vulnerable	Species or species habitat likely to occur within area
Marsdenia longiloba Clear Milkvine	Vulnerable	Species or species habitat likely to occur within area
Parsonsia dorrigoensis Milky Silkpod	Endangered	Species or species habitat likely to occur within area
Quassia sp. Moonee Creek (J.King s.n. 1949) NSW Herbarium	Endangered	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Migratory	Breeding may occur within area
Monarcha trivirgatus Spectacled Monarch	Migratory	Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia	Migratory	Species or species habitat likely to occur

Regent Honeyeater		within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Migratory Marine Species		
Reptiles		
Caretta caretta Loggerhead Turtle	Migratory	Species or species habitat may occur within area
Chelonia mydas Green Turtle	Migratory	Species or species habitat may occur within area
Natator depressus Flatback Turtle	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Lathamus discolor Swift Parrot	Listed - overfly marine area	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly	Species or species habitat may occur within area

	marine area	
Monarcha melanopsis Black-faced Monarch	Listed - overfly marine area	Breeding may occur within area
Monarcha trivirgatus Spectacled Monarch	Listed - overfly marine area	Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle	Listed	Species or species habitat may occur within area
Chelonia mydas Green Turtle	Listed	Species or species habitat may occur within area
Natator depressus Flatback Turtle	Listed	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Communications, Information Technology and the Arts - Australian Broadcasting Corporation

Communications, Information Technology and the Arts - Australian Postal Corporation

Communications, Information Technology and the Arts - Telstra Corporation Limited

Defence

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

Frederickton Public School Group NSW

Headmasters Residence NSW

Kempsey Courthouse NSW

Kempsey Post Office NSW

Public School NSW

Shelter Shed NSW

Extra Information

State and Territory Reserves [Dataset Information]

Kumbatine National Park, NSW

Maria National Park, NSW

Regional Forest Agreements [Dataset Information]
Note that all RFA areas including those still under consideration have been included.

Lower North East NSW RFA, New South Wales

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia

- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Department of the Environment, Water, Heritage and the Arts
GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111

NSW National Parks & Wildlife Service
atlas of nsw wildlife

Search Results

Your selection: Fauna, threatened species, Selected Area - 152.72960,-31.14687,152.93999,-30.96573 returned a total of 430 records of 34 species.
Report generated on 04/05/2010 - 11:51 (Data valid to 25/04/2010)

view map | search again | clear selection

Choose up to 3 species to map.
** Exotic (non-native) species*

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Hylidae						
	☐	Litoria brevipalmata	Green-thighed Frog	V	8	ℹ
Myobatrachidae						
	☐	Mixophyes iteratus	Giant Barred Frog	E1	9	ℹ

Aves	Map	Scientific Name	Common Name	Legal Status	Count	Info
Accipitridae						
	☐	Hamirostra melanosternon	Black-breasted Buzzard	V	1	ℹ
	☐	Hieraaetus morphnoides	Little Eagle	V	1	
	☐	Lophoictinia isura	Square-tailed Kite	V	15	ℹ
	☐	Pandion haliaetus	Osprey	V	4	ℹ
Ardeidae						
	☐	Ixobrychus flavicollis	Black Bittern	V	1	ℹ
Cacatuidae						
	☐	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	32	ℹ
Ciconiidae						
	☐	Ephippiorhynchus asiaticus	Black-necked Stork	E1	48	ℹ
Jacanidae						
	☐	Irediparra gallinacea	Comb-crested Jacana	V	13	ℹ
Laridae						
	☐	Sterna albifrons	Little Tern	E1	1	ℹ
Neosittidae						
	☐	Daphoenositta chrysoptera	Varied Sittella	V	14	
Petroicidae						
	☐	Petroica boodang	Scarlet Robin	V	1	
	☐	Petroica phoenicea	Flame Robin	V	1	
Podargidae						
	☐	Podargus ocellatus	Marbled Frogmouth	V	1	ℹ
Psittacidae						
	☐	Glossopsitta pusilla	Little Lorikeet	V	9	
Strigidae						
	☐	Ninox strenua	Powerful Owl	V	6	ℹ
Tytonidae						
	☐	Tyto capensis	Grass Owl	V	2	ℹ
	☐	Tyto novaehollandiae	Masked Owl	V	1	ℹ
	☐	Tyto tenebricosa	Sooty Owl	V	3	ℹ

Mammalia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Dasyuridae						
	☐	Dasyurus maculatus	Spotted-tailed Quoll	V	6	
	☐	Phascogale tapoatafa	Brush-tailed Phascogale	V	16	
Emballonuridae						
	☐	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	2	
Molossidae						
	☐	Mormopterus norfolkensis	Eastern Freetail-bat	V	16	
Petauridae						
	☐	Petaurus australis	Yellow-bellied Glider	V	2	
	☐	Petaurus norfolcensis	Squirrel Glider	V	7	
Phascolarctidae						
	☐	Phascolarctos cinereus	Koala	V	95	
Pteropodidae						
	☐	Pteropus poliocephalus	Grey-headed Flying-fox	V	47	
Vespertilionidae						
	☐	Chalinolobus nigrogriseus	Hoary Wattled Bat	V	5	
	☐	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	1	
	☐	Miniopterus australis	Little Bentwing-bat	V	36	
	☐	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	17	
	☐	Myotis macropus	Southern Myotis	V	6	
	☐	Scoteanax rueppellii	Greater Broad-nosed Bat	V	3	

** Exotic (non-native) species*

Choose up to 3 species to map.

DISCLAIMER: The Atlas of New South Wales Wildlife contains data from a number of sources including government agencies, non-government organisations and private individuals. These data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Find out more about the Atlas.

E

Fauna Survey Data

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Table E.1 Fauna Survey Data

Common Name	*Scientific Name*	*Recording Type*
	Aves	
Common Myna	*Acridotheres tristis**	Observed
Chestnut Teal	*Anas castanea*	Observed
Cattle Egret	*Ardea ibis#*	Observed
Galah	*Cacatua roseicapilla*	Observed
Australian Wood Duck	*Chenonetta jubata*	Observed
Black-faced Cuckoo-Shrike	*Coracina novaehollandiae*	Observed
Australian Raven/Crow	*Corvus coronoides*	Observed and heard
Laughing Kookaburra	*Dacelo novaeguineae*	Observed and heard
White-faced Heron	*Egretta novaehollandiae*	Observed
Black-Shouldered Kite	*Elanus axillaris*	Observed and heard
Magpie Lark	*Grallina cyanoleuca*	Observed and heard
Welcome Swallow	*Hirundo neoxena*	Observed
Noisy Minor	*Manorina melanocephala*	Observed and heard
Crested Pigeon	*Ocyphaps lophotes*	Observed and heard
Tawny Frogmouth	*Podargus strigoides*	Observed
Purple Swamphen	*Porphyrio porphyrio*	Observed and heard
Satin Bowerbird	*Ptilonorhynchus violaceus*	Observed
Willie Wagtail	*Rhipidura leucophrys*	Observed
Common Starling	*Sturnus vulgaris**	Observed
Australian White Ibis	*Threskiornis molucca*	Observed
Straw-necked Ibis	*Threskiornis spinicollis*	Observed
Rainbow Lorikeet	*Trichoglossus haematodus*	Observed and heard
Barn Owl	*Tyto alba*	Heard
Masked Lapwing	*Vanellus miles*	Observed and heard
	Mammals	
Rabbit*	*Oryctolagus cuniculus*	Scats and burrow detected
Grey-headed Flying-fox	***Pteropus poliocephalus*** [v]	Observed during spotlighting
Little Red Flying-fox	*Pteropus scapulatus*	Observed during spotlighting
Common Brushtail Possum	*Trichosurus vulpecula*	Den watch and spotlighting recording
Gould's Wattled bat	*Chalinolobus gouldii*	"*Possible*" Anabat recording.
Little Bent-wing Bat	*Miniopterus australis Vespadelus*	"*Definite*" Anabat recording.
Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis* [v]	"*Definite*" Anabat recording.
A broadnosed Bat	*Scotorepens sp.*	"*Definite*" Anabat recording.

Common Name	*Scientific Name*	*Recording Type*
White-striped Free-tailed Bat	*Tadarida australis*	"*Definite*" Anabat recording.
Large Forest Bat	*Vespadelus darlingtoni*	"*Definite*" Anabat recording.
Eastern Forest Bat	*Vespadelus pumilus*	"*Definite*" Anabat recording.
Eastern Cave Bat	*Vespadelus troughtoni* [v]	Marginally "*Possible*" Anabat recording. Considered low likely hood of occurrence as not possible to differentiate calls between other likely occurring *Vespadelus spp.* and this species; and lack of suitable roost habitat in proximity of the site.
Little Forest Bat	*Vespadelus vulturnus*	"*Possible*" Anabat recording.
Amphibians		
Common Eastern Froglet	*Crinia signifera*	Heard
Striped Marsh Frog	*Limnodynastes peronii*	Heard
Reptilia		
Grass-Sun Skink	*Lampropholis guichenoti*	Observed
Lace Monitor	*Varanus varius*	Scratch detection

Key:
* - Feral species
[v] - Vulnerable species
Bold denotes EPBC Act listed threatened species
- EPBC Act listed migratory species

F

Seven-part Tests of Significance

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Seven-part Test of Significance for: Threatened Fauna

From **Section 4.5**, the following threatened species required assessment under the Seven-part tests of significance in accordance with Section 5A of the EP&A Act

- Black-necked Stork (*Ephippoorhynchus asiaticus*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Little Eagle (*Hieraaetus morphnoides*);
- Square-tailed Kite (*Lophoictinia isura*);
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*);
- Little Bent-wing bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Koala (*Phascolarctos cinereus*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The study area habitat values and extent of local population per species/species group are detailed below. To minimise repetition, the responses to the seven-part tests are structured as follows:

- Part **(a)**, **(d)**, **(f)** and **(g)** are answered per species or as a collective group of species depending on the nature of impacts.
- Part **(b)** deals specifically with Endangered Populations and is not relevant to the subject threatened species listings.
- Part **(c)** deals specifically with EECs, hence is not relevant to this threatened fauna species assessment.
- Part **(e)** deals with Critical Habitat which is not relevant to the subject species/ proposed works.

Hoary Wattled Bat, Little Bent-wing Bat, Eastern Bent-wing Bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat

Species Profiles

Hoary Wattled Bat

The Hoary Wattled Bat occurs widely in non-arid areas across northern Australia, down the east-coast to northern NSW (Van Dyck and Strahan 2008). The most southern records along the east coast are in the Kempsey LGA (Jason Berrigan, Darkheart Eco-Consultancy pers. comm.). It prefers open habitats, and has been recorded in tall forest, open woodlands, grasslands, mangroves, beach scrubs, heath and urban areas (Van Dyck and Strahan 2008). It is typically forages below the canopy for a broad variety of invertebrate prey.

The species roost in tree hollows, but has reportedly also been found roosting in buildings and caves. The reproductive cycles and behaviours of this species are poorly understood, though pregnant females have been recorded in October, while lactating females have been recorded from October to January (Van Dyck and Strahan 2008).

Little Bentwing-bat

The Little Bentwing-bat is known to forage for small insects within and under the canopy of moist eucalypt forest, rainforest or dense coastal banksia scrub (DECC 2007). The Little Bentwing-bat also forms large maternity roosts at birthing time (December), travelling up to 200 km to these areas. Outside of the birthing season, both males and females prefer to roost in caves, tunnels, disused mines, stormwater drains and sometimes tree hollows. The flight of the Little Bentwing-bat is more manoeuvrable than the Eastern Bentwing-bat and it makes use of sub-canopy areas within well-timbered habitats for foraging.

Eastern Bentwing-bat
The Eastern Bentwing-bat roosts in caves and other structures offering thermal advantages (pipes, small and large mines, concrete bunkers, lava tubes). During birthing season (Spring), females gather in large numbers in select caves to give birth and raise their young, often travelling up to several hundred kilometres from foraging and mating areas. Individuals of this species can live as long as 30 years. This species has fast and direct flight, foraging in open areas including tracks, waterways and above the canopy (Hoye and Hall 2008).

Eastern Freetail-bat
Eastern Freetail-bat occurs mainly in dry eucalypt forest and open woodland, but is also known to occur along rivers in rainforest and wet sclerophyll forest (Van Dyck and Strahan 2008). It roost in tree hollows (including remnant trees in farmland in proximity to forest/woodland) but also under bark or in artificial structures (e.g. bridges and buildings) (DECCW undated, Van Dyck and Strahan 2008). Forages for insects usually within a few kilometres of roost, but have been recorded up to 6 km from roost. Records includes urban remnants, caravan parks and the outskirts of rural town (Jason Berrigan, Darkheart Eco-Consultancy pers. comm., Van Dyck and Strahan 2008).

Yellow-bellied Sheathtail-bat
The Yellow-bellied Sheathtail-bat occurs widely across Australia in most habitat types, including eucalypt forest, mallee and open treeless habitats (DECCW undated, Van Dyck and Strahan 2008). They forage a high speeds and height for invertebrate prey, and appear to defend an aerial territory.

Yellow-bellied Sheathtail-bats roost mainly in tree hollows, but also found in buildings. In treeless areas they are known to roost in mammal burrows. They are usually solitary, though occasionally occur in colonies (<10 individuals). Large maternity colonies may consist of greater than 100 individuals (Van Dyck and Strahan 2008). Breeding is known to occur between December to mid-March, when a single young is born (DECCW undated).

Some evidence available suggests that in southern Australia, the species may be a seasonal winter migrant from cooler to warmer areas (DECCW undated).

Greater Broad-nosed Bat
The Greater Broad-nosed Bat is the only species of its genus, occurring from north-eastern Queensland (Nowak 1994) to north-eastern Victoria. One of the largest microchiropterans found along the coast of northern NSW, the Greater Broad-nosed Bat rarely ventures above 500 m ASL. Foraging on large, slow-flying beetles and other flying insects, this species has also been recorded consuming small microchiropterans in captivity and during capture (Hoye and Richards 1995). It's moderate to low manoeuvrability and slow flight precludes it from utilising dense habitat or specialising in fast flying prey in large open spaces. This species makes use of flyways along creeks and is capable of utilising small open spaces within woodlands through to tall wet coastal sclerophyll forests (Hoye and Richards 2008) and rainforests (Duncan *et al.* 1999). Greater Broad-nosed Bat roost in tree hollows, utilising trunks and branches, as well as roofs of old buildings (Churchill 1998). It has also been described as roosting within fissures in trunks of trees and under exfoliating bark (Duncan *et al.* 1999). Maternity roosts are formed in large hollows (Hoye and Richards 1995). Little is known of its breeding biology. A single young is born in January (Hoye and Richards 1995).

The Scientific Committee, established by the TSC Act, has made a Final Determination to list the Hoary Wattled bat, Little Bent-wing Bat, Eastern Bent-wing Bat, Eastern Free-tail Bat, Yellow-bellied Sheathtail Bat and Greater Broad-nosed Bat as Vulnerable in Schedule 2 of the Act.

Habitat Value of The Site and Local Population Range
The Little Bent-wing Bat and Eastern Bent-wing Bat were '*definite*' recordings during the survey. While none of the other subject species were recorded they have all been recorded in the locality (NPWS Atlas of Wildlife 2010). The pastoral woodland provides structurally suitable foraging habitat to varying suitability for all the subject species. Tree hollows may also provide potential breeding roost sites for the Hoary Wattled Bat, Yellow-bellied Sheathtailed-bat, Eastern Freetail-bat and Greater Broad-nosed Bat,

and potential seasonal non-breeding roost sites for the Little Bentwing-bat and Eastern Bentwing-bat. Decorticating bark from the gums and Brushbox may also provide temporary non-breeding roost sites.

The site has potential to support a small number of aggregates of the local population of the subject as tree hollow roosting habitat (though only non-breeding for the subject bent-wing bats) and a small part of their local foraging range. The locality includes substantial areas of potential similar and/or better quality potential forest/woodland habitat for all of the subject species, including near Yarravel, Yarrabandini, Tamban State Forest, Old Station State Forest and Kalateenee State Forest. Given the high mobility of these species, individuals from these areas and any individual that potentially roost/forages on the site would be expected to be able to interbreed (hence collectively form the local population). The local population of the subject species is considered to consist of those individuals/colonies that may utilise the locality as foraging or roosting habitat. The range of the local population of these highly mobile species would thus extend well beyond the confines of the study area.

Grey-headed Flying-fox

Species Profile

The Grey-headed Flying-fox is a large, grizzled-grey flying-fox with a wide orange-yellow collar. It has fully furred upper legs and they roost in conspicuous often large camps in lowland rainforest, swamp forest and gullies often in remnants or on islands in rivers. The Grey-headed Flying-fox may share camps with Little Red and Black Flying-foxes. They are canopy-feeding frugivores feeding on the fruit, nectar and blossom of more than 80 species of eucalypts, Melaleuca swamps and Banksia woodlands and rainforest plants as well as eating cultivated fruit in times of natural food shortage (NPWS 2004). It plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).

DECC (2008a) note that Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring (Lunney and Moon 1997; Augee and Ford 1999). They forage opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources (Augee and Ford 1999; Tidemann 1999).

Grey-headed Flying-foxes show a regular pattern of seasonal movement. Much of the population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany (*Eucalyptus robusta*), Forest Red Gum (*E. tereticornis*) and Broad-leaved Paperbark (*Melaleuca quinquenervia*) (Eby *et al.* 1999). Food availability, particularly nectar flow from flowering gums, varies between places and from year to year.

The Scientific Committee, established by the TSC Act, has made a Final Determination to list the Grey-headed Flying-fox (*Pteropus poliocephalus*) as Vulnerable in Schedule 2 of the Act.

Habitat Value of The Site and Local Population Range

The Grey-headed Flying-fox was recorded flying over the site during the survey. The site is not known or considered potential roosting habitat for this species. It however provides a small area of potential foraging habitat during flowering incidences, particularly of canopy *Eucalypt spp.* and Red Bloodwood. The site has potential to form a small part of the local Grey-headed Flying-fox populations wider foraging range which would extend beyond the locality. For this assessment, the local population is considered to consist of all individual who roost in the locality or may utilise the locality to satisfy their foraging requirements.

Koala

Species Profile

Koalas are accomplished climbers spending most of their time in trees; however they do descend and traverse open country when moving between trees. Koalas occur in eucalypt woodlands and forests throughout eastern Australia, particularly areas with more productive soils. They have been recorded feeding on over 69 species of eucalypt and 30 non-eucalypt species, although they mainly occur where

there is an appropriate mix of food trees in forests and woodlands (NPWS 2002). The primary food trees in North Coast Bioregion include Tallowwood (*Eucalyptus microcorys*), Parramatta Red Gum (*E. parramattensis*), Forest Red Gum (*E. tereticornis*), Orange Gum (*E. bancroftii*), Swamp mahogany (*E. robusta*) and Cabbage Gum (*E. amplifolia*). Home range sizes varying depending on habitat quality, with male occupying larger ranges than females.

The Scientific Committee, established by the TSC Act, has made a Final Determination to list the Koala as Vulnerable in Schedule 2 of the Act.

Habitat Value of The Site and Local Population Range
Refer to SEPP 44 Koala Habitat Assessment in **Section 5** of the report for details of the habitat potential of this species on the site. In summary, no Koalas or evidence of their occurrence was recorded on the site during the survey. Local records on the northern side of the Macleay River are scarce, with the closed local records being located approximately 3 km to the north-west of the site.

Considering the above, the ecology of the species, the small size of the site, and the poor connectivity between the site other areas of known or likely habitat locally; the site has potential only to form the outer fringes of the local populations range (mainly only if the local population expanded) or a dispersing sub-adult. Given this, the occurrence of known records in forest areas in the north of the locality in marginally tentatively connected habitat on the northern side of the Macleay River, the range of the local population range of the local population extends well beyond the confines of the site and consist of all individuals in known/potential habitat on the northern side of the Macleay River in the locality.

Square-tailed Kite
Species Profile
This medium-sized raptor is a specialised predator of nestling birds in passerine-rich open forests, woodlands and adjacent heathlands (DEC 2005f). Square-tailed Kites depart the breeding grounds of passerines when the latter finish breeding or migrate. Presumably, Square-tailed Kites follow their prey north to take advantage of the mild dry season (Olsen 1995). Breeds from August to December. Nesting generally occurs near water courses in open forest or woodland (Morcombe 2003).

The Scientific Committee, established by the TSC Act, has made a Final Determination to list the Square-tailed Kite as Vulnerable in Schedule 2 of the Act.

Little Eagle
Species Profile
The Little Eagle occurs over a large portion of mainland Australia. It prefers hilly country and is most abundant where open country intermixes with forest or woodland vegetated hills. It inhabits a wide variety of habitat types including open forest, woodlands, open scrubland and tree lined water courses; and generally avoids rainforest and heavy forest areas (Morcombe 2003, DECCW undated). Prey includes a variety of birds, reptiles, mammals and large insects.

They nest in tall living trees within a remnant patches of woodland or along tree lined watercourses. Large stick nest are typically build by pairs in Winter. Two or three eggs are typically laid in Spring, with fledglings emerging in early Summer (DECCW undated).

Habitat Value of The Site and Local Population Range
Neither of the subject species, nor evidence of their occurrence (i.e. large stick nests) was recorded during the survey. The site is considered structurally suitable foraging habitat for these species as part of their extensive foraging range. Larger semi-emergent eucalypts may also provide possible nesting opportunities. The range of the local population would extend well beyond the confines of the site into other forest/woodland areas in the locality.

Little Lorikeet
Species Profile

The Little Lorikeet occurs predominantly in dry, open eucalypt forests and woodlands. Recording have been made in 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.

Little Lorikeets are generally considered to be nomadic, with irregular influxes of individuals occurring year round, apparently related to food availability. However breeding birds appear to be resident from April to December.

Nesting occurs in tree hollows with small aperture diameters (approximately 3 cm), mostly in living, smooth-barked eucalypts. Nest hollows are used repeatedly, though not necessarily by the same individuals (Courtney and Debus 2006, cited in NSW Scientific Committee 2009). Breeding occurs from May to September with two broods of fledglings able to be produced if sufficient foraging sources are available (Higgins 1999, cited NSW Scientific Committee 2009).

Little Lorikeets feed primarily on nectar and pollen in the tree canopy, but also reported feed on fruits, particularly of mistletoes (Higgins 1999, cited NSW Scientific Committee 2009). White Box (*Eucalyptus albens*) and Yellow Box (*E. melliodora*) appear to be important foraging sources on the western slopes and tablelands (Courtney and Debus 2006)

Habitat Value of The Site and Local Population Range
The Little Lorikeet was not recorded during the survey, however it has been recorded in the locality (NPWS Atlas of NSW Wildlife 2010). The pastoral woodland provides structural suitable foraging habitat for this species during seasonal flowering periods of canopy species, while tree hollows may provide potential nesting sites. The actual potential for this species to occur (particularly nest) on the site however is reduce by the high density of aggressive birds (e.g. Galahs, Rainbow Lorikeet, etc) as well as potential predators (e.g. Brushtail Possums, Lace Monitors, etc) locally.

The site has potential to support several pairs or groups of these species (at least as seasonal foraging habitat). Given the size of the site, high mobility of this species and the extent of other known/potential forest and woodland habitat available within the locality, the local population would include groups occupying interconnecting habitat throughout the locality.

Black-necked Stork
Species Profile
The Black-necked Stork occurs in coastal and sub-coastal part of northern and eastern Australia. It occurs mainly in shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams, estuaries and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They prefer open wetlands, and forage in shallow, still water for a variety of prey including fish, frogs, turtles, snakes and invertebrates.

In NSW, the Black-necked Storks usually nest in tall, live and isolated paddock trees, but also recorded in smaller trees such as paperbarks within wetlands. Southern records of breeding in recent years are as far south as Buladelah. Breeding activities have been recorded in most months, nest construction to fledging of young recorded from May to January (DECCW undated).

Habitat Value of The Site and Local Population Range
The freshwater wetland in the southern portion of the site offer potential foraging habitat for this species. It has potential to form a fraction of this species wider foraging range throughout the freshwater wetlands and the shallow estuarine habitats throughout the Macleay River floodplain. No nests were recorded during the survey, and the site is considered somewhat marginal as nesting habitat.

For this assessment, the local population is considered to consist of all individuals/pairs that may utilise the locality at least seasonally to satisfy their breeding and/or foraging requirements.

(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,

General Introduction of the Proposal

The proposal is to subdivide the site into 33 residential Lots and a 1.29 ha reserve in the south. It will require the removal/displacement of the pastoral grass and pastoral woodlands across the majority of the site, including almost complete removal of the pastoral woodland (36 of the 39 tree would require removal), and create a residential housing area. This includes the removal of 25 actual hollow-bearing trees and a further 11 potential hollow-bearing trees. The freshwater wetlands in the southern portion of the site would be retained within the proposed reserve.

Hoary Wattled Bat, Little Bent-wing Bat, Eastern Bent-wing Bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat

For the subject microchiropteran bats, the habitat loss/modification required as part of the proposal would significantly reduce the site's current foraging and roosting (potentially breeding) values. During the vegetation clearing stage of the proposal, there is also a risk of direct mortality/injury of individuals potentially roosting on the site at the time of the survey. While this is a negative effect and would result in incremental and cumulative habitat loss of these species locally, the local population of the subject species are unlikely to be significantly affected given:

- the limited extent of the site, which has potential only to support a small portion of aggregates of the local population;
- the locality supports substantial areas of similar and better quality habitat for the local population of these species;
- all of the subject species are highly mobile and the proposal would not create any barriers to their local movements; and
- effective implementation of the mitigation measures provided in **Section 8** would minimise the risk of direct mortality during vegetation clearing.

The proposal is considered unlikely to significantly contribute to indirect impacts which threaten the subject species (e.g. application of pesticides in or adjacent to foraging areas - DECCW undated), degradation of adjacent habitats through water quality impacts, etc) given:

- the current modified state of the site and general locality, and associated land use practices (e.g. urban lighting);
- the nature of the proposal (e.g. the proposal is not located in proximity to known bent-wing bat maternity caves); and
- mitigation measures provided in **Section 8** aim to minimise the risk of indirect impacts such as sedimentation and erosion impacts and water quality impacts on lower catchment habitats.

Overall the proposal may potentially affect individuals/small colonies of the subject species (potentially including breeding habitat for all of the subject species except the subject Bent-wing Bat), given the extent of foraging and breeding habitat available to the local population of these species in the locality, it is considered unlikely that the proposal would have an adverse affect on the life cycle of any of the subject species such that the local population is likely to be placed at significant risk of extinction.

Grey-headed Flying-fox

The proposed development would substantially reduce the site's value as foraging habitat for the Grey-headed Flying-fox. While this is a negative (incremental and cumulative effect), the local population is unlikely to be significantly affected as:

- the site is not known or likely potential roosting habitat;
- the site has potential only to form a minute fraction of the local population foraging range, and the locality includes relatively extensive areas of potential foraging habitat (e.g. Old Station State Forest, Tamban State Forest, private forest/woodland in the Yarravel and Yarrabandini areas, etc);
- no barriers to the local movement of this highly mobile species would be created; and

- the extent to which the proposal may contribute to other threats would be negligible (e.g. powerlines are abundant throughout the general locality, hence if above powerlines are established, the risk of powerline collision/electrocution locally would only be minutely increased).

Overall, while the proposal may impose some substantial negative effects for the site's value for this species, it is unlikely that the proposed development would have an adverse effect on the life cycle of the Grey-headed Flying-fox such that a viable local population is likely to be placed at significant risk of extinction.

Koala

The proposed development would substantially reduce the site's value for the Koala as the pastoral woodland would be nearly completely cleared and transferred into a residential environment. Other threats to the Koala would also be introduced to the site or increased locally such as barriers created by urban fencing, traffic collision and predation via domestic pets. However the survey results indicate the site is not currently utilised by the Koala, and the site does not appear to be of significant value to the local Koala population as:

- the site is limited in extent, supporting only 39 trees in total and 15 primary browse species;
- the site is somewhat isolated, thus connectivity between known habitat and the site is very poor; and
- local records of the Koala on the northern side of the Macleay River are scarce with the closest local recording being 3 km from the site).

Additionally the site is located on the interface between a cleared agricultural environment and existing residential areas. Hence threats such as traffic collision, and cats and dogs (domestic and feral) are already present. Considering this, and nature of the proposal (particularly the post-development low values of the site for this species), the extent to which the proposal may contribute to key threats to the local Koala population such as predation, traffic collision and habitat fragmentation would be minimal.

Overall, while the proposal may substantially reduce the site's potential habitat values for the Koala, it is considered unlikely that the proposed development would have an adverse effect on the life cycle of the Koala such that a viable local population is likely to be placed at significant risk of extinction.

Square-tailed Kite and Little Eagle

For the Square-tailed Kite and Little Eagle, the proposed development would result in the direct loss of a small area of foraging and possible nesting habitat. However this is considered unlikely to significantly affect any potentially occurring local population as:

- no nesting sites would be affected;
- the site has potential only to form a minor fraction of these species extensive territory and the locality includes relatively extensive areas of habitat of similar values (e.g. Old Station State Forest, Tamban State Forest, private forest/woodland in the Yarravel and Yarrabandini areas, etc);
- no barriers to the local potential movements of these highly mobile species would be created; and
- the extent to which the proposal may contribute to other threats would be negligible (e.g. the locality currently supports a reasonable human population, hence threats such as collection of eggs would not be substantially increased by the increase in human presence imposed by the proposal).

Overall the proposal is considered unlikely to have an adverse effect on the life cycle of either of the subject species such that a viable local population is likely to be placed at significant risk of extinction.

Little Lorikeet

The habitat loss/modification required as part of the proposal would significantly reduce the site's current foraging and nesting (potentially breeding) values for the Little Lorikeet. During the vegetation clearing stage of the proposal, there is also a risk of direct mortality/injury of individuals potentially nesting on the site at the time of the survey. While this is a negative effect and would result in incremental and cumulative habitat loss of these species locally, the local population is unlikely to be significantly affected given:

- the limited extent of the site, which has potential only to support a small portion of aggregates of the local population;
- the site is not a known nesting site and the actual potential for this species to nest is limited due to the high usage of the site by common aggressive species (e.g. Rainbow Lorikeet);
- the locality supports substantial areas of similar and better quality habitat for the local population;
- the Little Lorikeet is highly mobile and the proposal would not create any barriers to its potential local movements; and
- effective implementation of the mitigation measures provided in **Section 8** would minimise the risk of direct mortality during vegetation clearing.

The proposal is considered unlikely to significantly contribute to indirect impacts which threaten the Little Lorikeet (e.g. predation by domestic cats), given the current modified state of the site and general locality, and associated land use practices and threats (e.g. the site is located next to an existing residential area with domestic cats, hence the local domestic cat population (and associated risk of predation) would not be significantly increased by the proposal).

Overall the proposal may potentially affects a number of individuals that may periodically use the site as foraging and nesting habitat, however given the extent of foraging and breeding habitat available to the local population of these species in the locality, it is considered unlikely that the proposal would have an adverse affect on the life cycle of the Little Lorikeet such that a viable local population is likely to be placed at significant risk of extinction.

Black-necked Stork
The proposed development largely affects habitat which is of no significant value to the Black-necked Stork. The freshwater wetlands would be retained on proposed Lot 34, a proposed reserve. The habitat values for this community for the Black-necked Stork would largely be retained given:

- the existing modified state of the site and general area, as well as local land-use practices (e.g. pastoralism, residential development, etc);
- retained grassland vegetation between the proposed dwelling Lots and the freshwater wetland may provide some buffering of runoff;
- livestock would no longer be able to access the freshwater wetland on the site, which is considered a positive impact; and
- effective implementation of the mitigation measures of this report would ensure the potential indirect impacts (such as erosion and sedimentation) are minimised.

Overall the proposal is considered unlikely to have an adverse effect on the life cycle of the Black-necked Stork such that a viable local population is likely to be placed at significant risk of extinction.

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

No consideration under this part of the assessment is required.

(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,

No consideration under this part of the assessment is required.

(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,

All Subject Species
The proposed residential subdivision would require the removal/displacement of the pastoral grass and pastoral woodland across the majority of the site, including almost complete removal of the pastoral woodland (36 of the 39 tree would require removal), and create a residential housing area. This includes the removal of 25 actual hollow-bearing trees and a further 11 potential hollow-bearing trees. The freshwater wetlands in the southern portion of the site would be retained within the proposed reserve and would not be adversely modified from its existing condition given:

- the existing modified state of the site and general area, as well as local land-use practices (e.g. pastoralism, residential development, etc);
- retained grassland vegetation between the proposed dwelling Lots and the freshwater wetland may provide some buffering of runoff;
- livestock would no longer be able to access the freshwater wetland, which is considered a positive impact; and
- effective implementation of the mitigation measures in this report would enable this community to naturally regenerate.

(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

Koala
The pastoral woodland habitat on the site is somewhat isolated. Other areas of potential Koala habitat on the northern side of the Macleay River locally are restricted to the north and west. These areas are only tentatively connected to the site via isolated remnant/planted urban and pastoral trees to the west. Land to the south and east of the site does not support any significant potential Koala habitat. Local Koala records on the northern side of the Macleay River are also restricted to the north and north-west of the site. The site therefore provides a small area of habitat with "cul-de-sac" like attributes, rather than as a corridor.

The proposal will substantially modify the site from its current state and create potential barriers to the movement of the Koala in the form of urban fences and habitat loss. However considering the distribution of Koala habitat locally; that the survey results indicate the site is not currently being utilised; and that the site is of limited value to the local population (due to only supporting a small number of trees, being somewhat isolated from known habitat and being located in an area where threats such as traffic collision and domestic/feral dog attack are prominent), the habitat for the local Koala population is not considered likely to become fragmented or isolated from other areas of habitat as a result of the proposed development.

All Other Subject Species
All of these species are highly mobile flying species, and known to disperse across fragmented landscapes and occur in highly modified environments (NPWS Atlas of NSW Wildlife 2010, Jason Berrigan, Darkheart Eco-Consultancy pers. comm., Van Dyck and Strahan 2008, DECCW undated, personal observations). Consequently the proposal should not create any barriers to the potential local movements of these species and is not expected to result in significant habitat fragmentation or isolation.

(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,

Hoary Wattled Bat, Little Bent-wing Bat, Eastern Bent-wing Bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat
As mentioned previously, the limited extent of the site has potential to support a small portion of aggregates of the local population. The site may be of particular importance for members of the local Hoary Wattled Bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat and/or Greater Broad-nosed Bat that may potentially breed on the site. However relative to the extent of similar and better quality habitat in the locality available to the local population of these species, the site itself is not considered critical to the long-term survival of the subject species in the locality.

Koala
As mentioned previously, the survey results indicate the site is not currently being utilised. The site is considered to be of limited value to the local population due to relatively small number of trees and primary browse species, the somewhat isolated location of the site, and the location of the site where threats such as traffic collision and domestic/feral dog attack are prominent. Overall while the removal of the majority of habitat on the site is a negative (incremental and cumulative) effect, the habitat on the site is not considered critical to the long-term survival of the Koala in the locality.

Little Lorikeet
As mention previously, the limited extent of the site and has potential only to support a small portion of aggregates of the local Little Lorikeet population. The site may be of particular importance for members of the local population that may potentially breed on the site. However relative to the extent of similar and better quality habitat in the locality available to the local population of this species, the site itself is not considered critical to the long-term survival of the Little Lorikeet in the locality.

Black-necked Stork
The pastoral woodland and grassland within the proposal is of no significant habitat value for the Black-necked Stork. The foraging habitat values of the freshwater wetlands on and adjacent to the site (i.e. as part of this species extensive local opportunistic foraging range) should largely be retained post development. Overall, habitat significant to the long-term survival of Black-necked Stork in the locality would not be significantly adversely affected by the proposal.

Grey-headed Flying-fox
The site has potential to form only a fraction of the local Grey-headed Flying-fox populations extensive foraging range, and the locality includes relatively large areas of similar and better quality foraging habitat values. Consequently the proposed subdivision is not considered likely to affect habitat critical to the long-term survival of the Grey- headed Flying-fox in the locality.

Square-tailed Kite and Little Eagle
The site is not known nesting habitat for the Square-tailed Kite or Little Eagle. It provides potential foraging and possible potential nesting habitat as a minor part of habitat of similar or greater value in the locality. Overall the habitat to be affected by the proposal is not significant to the long-term survival of the subject species in the locality.

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

No areas of critical habitat are listed under the TSC Act within the study area nor are there any areas of critical habitat for the subject species listed under the TSC Act.

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

All Subject Species - Introduction
Part 4 of the TSC Act states "*The object of a recovery plan is to promote the recovery of the threatened species, population or ecological community to which it relates to a position of viability in nature*." Any development which adversely affects threatened species or their habitat, or contributes to relevant key threatening processes may be interpreted as being inconsistent with this general objective. However the extent to which the proposal contributes to threats of the subject species is unlikely to interfere with the recovery of any of the subject species. Specific recovery and threat abatement strategies are discussed below.

Koala
An approved recovery plan currently exists for the Koala (DECC 2008), however the specific objectives of this recovery plan are not relevant to the Proposal. The Proposal would not have a significant negative

effect on any of the Priority Action Statements (PAS) actions associated with the Koala (DECCW website: www.threatenedspecies.environment.nsw.gov.au).

Overall the Proposal is not considered significantly inconsistent with the specific objectives or actions of the relevant recovery plan or PAS.

Grey-headed Flying-fox
A draft recovery plan currently exists for the Grey-headed Flying-fox (DECCW 2009). The specific objectives and actions of this plan are not likely to be affected by the Proposal. The Proposal would not have a significant negative effect on any of the PAS actions associated with the Grey-headed Flying-fox (DECCW website: www.threatenedspecies.environment.nsw.gov.au).

Overall the Proposal is not considered significantly inconsistent with the specific objectives or actions of the relevant recovery plan or PAS.

Other Subject Species

No draft or approved recovery plans prepared under the TSC Act currently exists for these remaining subject species. The Proposal would not have a significant negative effect on any of the PAS actions associated with any of the subject species (DECCW website: www.threatenedspecies.environment.nsw.gov.au).

Overall the Proposal is not considered significantly inconsistent with the objectives or actions of the relevant recovery plan or PAS.

(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.

A threatening process is defined under the TSC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of Key Threatening Processes (KTP's) under TSC Act, and whether the proposed development is recognised as a threatening process is shown in **Table F.1**.

Table F.1 Key Threatening Process

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	Likely	***Possible***	***Unlikely***
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Bush rock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)			✓
Competition and habitat degradation by feral goats			✓
Competition from feral honeybee			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	***Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?***		
	Likely	***Possible***	***Unlikely***
Ecological consequences of high frequency fires		✓	
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Herbivory and environmental degradation caused by feral deer			✓
Human caused climate change		✓	
Importation of red imported fire ants into NSW			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by *Phytophthora cinnamomi*			✓
Introduction of the large earth bumblebee, *Bombus terrestris*			✓
Invasion and establishment of *Bufo marinus*			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion of native plant communities by *Chrysanthemoides monilifera*			✓
Invasion of native plant communities by exotic perennial grasses		✓	
Invasion of the Yellow Crazy Ant			✓
Loss and/or degradation of sites used for hill-topping by butterflies			✓
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)			✓
Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)			✓
Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)			✓
Predation by the Ship Rat *Rattus rattus* on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by Feral pigs			✓
Removal of dead wood and dead trees		✓	

The main KTP's listed under the TSC Act which the proposal may contribute to include clearing of native vegetation and anthropogenic climate change.

Clearing of native vegetation is defined as the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of stand or stands (DECCW undated). The proposed development would contribute to this process by requiring almost complete removal of the pastoral woodland vegetation. However the extent to which the proposal contributes to this threatening process is not considered likely to place the local population of the subject threatened species at significant risk of extinction.

Anthropogenic Climate Change is evidence that modification of the environment by humans may result in future climate change. Human induced activities as a result of energy use, industrial processes, solvent and other product use, agriculture, land use change and forestry, and waste cause greenhouse gas emissions (DECCW undated). The incremental extent to which the proposal may contribute to anthropogenic climate change is unlikely to alone put the local population any of the subject species at significant risk of local extinction.

The proposal is not considered likely to significantly contribute to any other KTP, especially with effective implementation of the safeguards provided in **Section 8** of this report.

Conclusion
While the proposed development will impose some negative, incremental and cumulative effects, and significantly reduce the site's values for the forest/woodland species (particularly for breeding aggregates which may utilise the site as roosting/nesting habitat), with effective implementation of the recommendations of this report it is considered unlikely that the local population of the subject species would be placed at significant risk of extinction.

Seven-part Test of Significance for Freshwater Wetland on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.

NSW Scientific Committee Final Determination (NSW Scientific Committee 2004)

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Freshwater Wetland on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

Occurrence on the Site and Local Occurrence

The freshwater wetland in the southern portion of the site constitutes the TSC Act 1995 listed EEC *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion* (hereon in referred to as freshwater wetlands EEC). The location of this community on site is shown in **Illustration 4.1**. Condition of the freshwater wetland varies from poor in the north-western portion of this community, to fair elsewhere. This community extends onto adjacent land to the south-east, and is known to occur locally along the drainage lines and depressions on the Macleay estuary floodplain.

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

No consideration under this part of the assessment is required.

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

No consideration under this part of the assessment is required.

(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,

The proposal is to subdivide the site into 33 residential Lots and a 1.29 ha reserve in the south. It will require the removal/displacement of the pastoral grass and pastoral woodland across the majority of the site, including almost complete removal of the pastoral woodland (36 of the 39 tree would require removal), and create a residential housing area. The freshwater wetlands in the southern portion of the site would be retained within the proposed reserve and would not be adversely modified from its existing condition given:

- the existing modified state of the site and general area, as well as local land-use practices (e.g. pastoralism, residential development, etc);
- retained grassland vegetation between the proposed dwelling lots and the freshwater wetland may provide some buffering of runoff;
- livestock would no longer be able to access the freshwater wetland EEC, which is considered a positive impact; and
- effective implementation of the mitigation measures in this report would enable this community to naturally regenerate.

Subsequently the proposal is not considered likely to adversely affect the extent or substantially and adversely modify the composition of freshwater wetland EEC such that its local occurrence is likely to be placed at significant 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, and

As mentioned in response to *(c)*, the freshwater wetland would be retained and should not be substantially indirectly affected with effective implementation of the mitigation measures of this report.

(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 subdivision would result in the more elevated portions of the site being changed from pastoral grassland and pastoral woodland into a residential housing estate, similar to that on adjacent land to the west and north. The freshwater wetland would be retained in the proposed southern portion of the site and would remain continuous with the freshwater wetland on adjacent land to the south. Subsequently the proposal is considered unlikely to result in fragmentation or isolation of freshwater wetland locally, nor affect the current movement potential of associated fauna or vectors.

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

As mentioned previously, the proposed development would not directly or significantly indirectly affect the local occurrence of freshwater wetland EEC, nor will it result in fragmentation or isolation of this EEC or associated fauna. The proposal mainly affects pastoral grassland and pastoral woodland areas which do not constitute this or any other associated EECs. Subsequently the habitat affected by the proposed development is not considered significant to the long-term survival of freshwater wetland EEC in the locality.

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

No areas of critical habitat are listed under the TSC Act within the study area nor are there any areas of critical habitat for freshwater wetland EEC listed under the TSC Act.

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

No recovery plan or threat abatement plan has been prepared for freshwater wetland EEC. The recovery planning process has now been incorporated into Priority Action Statements (PAS). The proposed development should not create barriers to the implementation of the PAS for the freshwater wetland EEC.

(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.

A threatening process is defined under the TSC Act as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of Key Threatening Processes (KTP's) under TSC Act, and whether the proposed development is recognised as a threatening process is shown in **Table F.2**.

Table F.2 Key Threatening Process

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	*Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?*		
	Likely	*Possible*	*Unlikely*
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Bush rock removal			✓
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)			✓
Competition and habitat degradation by feral goats			✓
Competition from feral honeybee			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Ecological consequences of high frequency fires		✓	
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Herbivory and environmental degradation caused by feral deer			✓
Human caused climate change		✓	
Importation of red imported fire ants into NSW			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by *Phytophthora cinnamomi*			✓
Introduction of the large earth bumblebee, *Bombus terrestris*			✓
Invasion and establishment of *Bufo marinus*			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion of native plant communities by *Chrysanthemoides monilifera*			✓
Invasion of native plant communities by exotic perennial grasses		✓	
Invasion of the Yellow Crazy Ant			✓
Loss and/or degradation of sites used for hill-topping by butterflies			✓
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)			✓
Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)			✓
Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)			✓
Predation by the Ship Rat *Rattus rattus* on Lord Howe Island			✓

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	*Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?*		
	Likely	*Possible*	*Unlikely*
Predation, habitat degradation, competition and disease transmission by Feral pigs			✓
Removal of dead wood and dead trees		✓	

The main KTP's listed under the TSC Act which the proposal may contribute to include clearing of native vegetation and anthropogenic climate change.

Clearing of native vegetation is defined as the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of stand or stands (DECCW undated). The proposed development would contribute to this process by requiring almost complete removal of the pastoral woodland vegetation. However the extent to which the proposal contributes to this threatening process is not considered likely to place the local occurrence of freshwater wetland EEC at significant risk of extinction.

Anthropogenic Climate Change is evidence that modification of the environment by humans may result in future climate change. Human induced activities as a result of energy use, industrial processes, solvent and other product use, agriculture, land use change and forestry, and waste cause greenhouse gas emissions (DECCW undated). The incremental extent to which the proposal may contribute to anthropogenic climate change is unlikely to alone put the local occurrence of freshwater wetland EEC at significant risk of local extinction.

The proposal is not considered likely to significantly contribute to any other KTP, especially with effective implementation of the safeguards provided in **Section 8** of this report.

Conclusion

While the proposed development will impose some negative, incremental and cumulative effects, it is considered unlikely that the local occurrence of freshwater wetland EEC would be placed at significant risk of extinction, especially with effective implementation of the recommendations of this report

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EPBC Act Matters Of National Environmental Significance – Significant Impact Criteria Assessment for Migratory and Threatened Species

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EPBC Act Matters of National Significance: Significant Impact Criteria Assessment For Threatened Species

Vulnerable Species

The Grey-headed Flying -fox was the only EPBC Act listed threatened species considered as potentially occurring in the study area.

DEH (2006) defines an 'important population' as "*a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:*

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

The Grey-headed Flying-fox was recorded flying over the site during the site. The site is not known or considered potential roosting habitat for this species. It however provides a small area of potential foraging habitat during flowering incidences, particularly of canopy *Eucalypt spp.* and Red Bloodwood. The site has potential to form a small part of the local Grey-headed Flying-fox populations wider foraging range which would extend beyond the locality. For this assessment, the important population is considered to consist of all individual who roost in the locality or may utilise the locality to satisfy their foraging requirements.

Vulnerable Species Significant Impact Criteria Assessment

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

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

The proposal is to subdivide the site into 33 residential Lots and with 1.29 ha reserve in the south. It will require the removal/displacement of the pastoral grass and pastoral woodland across the majority of the site, including almost complete removal of the pastoral woodland (36 of the 39 tree would require removal), and create a residential housing area. This will substantially reduce the site's value as foraging habitat for the Grey-headed Flying-fox. While this is a negative (incremental and cumulative effect), the local population is unlikely to be significantly affected as:

- the site is not known or likely potential roosting habitat;
- the site has potential only to form a minute fraction of the local population foraging range, and the locality includes relatively extensive areas of potential foraging habitat (e.g. Old Station State Forest, Tamban State Forest, private forest/woodland in the Yarravel and Yarrabandini areas, etc);
- no barriers to the local movement of this highly mobile species would be created; and
- the extent to which the proposal may contribute to other threats would be negligible (e.g. powerlines are abundant throughout the general locality, hence if above powerlines are established, the risk of powerline collision/electrocution locally would only be minutely increased).

Overall, the proposed works are not considered likely to lead to a significant long-term decrease in the size of the local important population of the Grey-headed Flying-fox.

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

The habitat to be affected by the proposed works is limited in extent and habitat quality. It has potential only to form a fraction of the local important Grey-headed Flying-fox populations' wider foraging range and no known or likely roosting habitat would be affected. Overall the proposal is not expected to result in a significant reduction in the area of occupancy for any important Grey-headed Flying-fox populations.

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

The Grey-headed Flying-fox is highly mobile flying species, and known to be to disperse across fragmented and landscapes and occur in highly modified environments (NPWS Atlas of NSW Wildlife 2010, Jason Berrigan, Darkheart Eco-Consultancy pers. comm., Van Dyck and Strahan 2008, DECCW undated, personal observations). Consequently the proposal should not create any barriers to the potential local movements of these species and is not expected that to result in significant habitat fragmentation or isolation.

- ***adversely affect habitat critical to the survival of a species;***

DEH (2006) states '*Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:*
• for activities such as foraging, breeding, roosting, or dispersal;
• for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
• to maintain genetic diversity and long term evolutionary development; or
• for the reintroduction of populations or recovery of the species or ecological community".

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

The proposal is not considered likely to significantly affect habitat critical to the survival of the Grey-headed Flying-fox as:
- the site does not contain habitat listed on the Register of Critical Habitat or any known recovery plans for the Grey-headed Flying-fox;
- the habitat to be directly affected has potential only to form a fraction of an important Grey-headed Flying-fox populations' wider foraging range;
- similar and better quality potential habitats are relatively extensive in the locality;
- the site is not a known or likely roost; and
- given the nature of the proposed works and modified nature of the local landscape, the current dispersal potential for the Grey-headed Flying-fox would be expected to be retained post development.

- ***disrupt the breeding cycle of an important population;***

With consideration of the previous points, particularly the limited extent and quality of habitat on site, it is considered unlikely that the breeding cycle of any important population of the Grey-headed Flying-fox would be significantly affected by the proposal.

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

For the Grey-headed Flying-fox, the proposed works would result in the direct loss/modification of a small area of pastoral woodland with potential foraging resources. While this is a minor negative effect, the Grey-headed Flying-fox is considered unlikely to be significantly affected given:
- the site is not known or likely potential roosting habitat;
- the site has potential only to form a minute fraction of the local population foraging range, and the locality includes relatively extensive areas of potential foraging habitat (e.g. Old Station State Forest, Tamban State Forest, private forest/woodland in the Yarravel and Yarrabandini areas, etc);
- no barriers to the local movement of this highly mobile species would be created; and
- the extent to which the proposal may contribute to other threats would be negligible (e.g. powerlines are abundant throughout the general locality, hence if above powerlines are established, the risk of powerline collision/electrocution locally would only be minutely increased).

Overall, the proposed works are not considered likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Grey-headed Flying-fox is likely to significantly decline.

- ***result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;***

DEH (2006) states "*an 'invasive species' is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation*."

No invasive species for the Grey-headed Flying-fox or its habitat are considered likely to become established or dispersed as a result of the proposed works.

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

No diseases that may affect the Grey-headed Flying-fox or its habitat are considered likely to become introduced or spread as a result of the proposed works.

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

While the proposal may impose some minor negative impacts to the Grey-headed Flying-fox and its habitat, the nature of the proposed works is such that the recovery of this species is unlikely to be substantially interfered with.

Conclusion
The proposed works are considered unlikely to result in a significant impact on any important Grey-headed Flying-fox population. Consequently referral to DEWHA and approval by the Minister is not required.

EPBC Act Matters of National Significance: Significant Impact Criteria Assessment for Migratory Species

From the EPBC Act Protected Matters Search Tool search results (refer to **Appendix C**), the survey results and local knowledge, the following species are considered known/potential occurrences in the study area:

- White-throated Needletail (*Hirundapus caudacutus*);
- Rainbow Bee-eater (*Merops ornatus*);
- Satin Flycatcher (*Myiagra cyanoleuca*);
- Rufous Fantail (*Rhipidura rufifrons*);
- Great Egret (*Ardea alba*);
- Cattle Egret (*Ardea ibis*); and
- Fork-tailed Swift (*Apus pacificus*).

Of these species, only the Cattle Egret was recorded during the survey.

DEH (2006) states that "*an area of 'important habitat' for a migratory species is:*
a) habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
b) habitat that is of critical importance to the species at particular life-cycle stages; and/or
c) habitat utilised by a migratory species which is at the limit of the species range; and/or
d) habitat within an area where the species is declining."

Migratory Species Significant Impact Criteria Assessment
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 site has potential only to form a fraction of the local ranges for any migratory species and does not contain significant potential foraging resources (e.g. extensive estuarine mudflats or the only stand of winter flowering species within the broader landscape), nesting or breeding habitat. The locality includes extensive areas of similar and better quality habitat for these species. Hence the site is not considered to support an important habitat area of habitat for any migratory species.

Consequently the proposal is not considered likely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.

- ***result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or***

As mentioned previously the proposal does not affect habitat that constitutes important habitat for any migratory species population. Additionally the nature of the proposal is such that no invasive species are considered likely to be introduced.

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

As mentioned previously, the site only provides a small area of foraging and possibly roosting and nesting habitat for a number of somewhat habitat generalist EPBC Act listed migratory species as part of an extensive area of similar and better quality habitat throughout the general locality and beyond. The site

does not provide any significant foraging, roosting or nesting habitat for any migratory species populations. Consequently the proposal is not considered likely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Conclusion

The proposal is considered unlikely to result in a significant impact on any migratory listed species. Consequently referral to DEWHA and approval by the Minister is not required.

Reference

DEH (2006). *EPBC Act Policy Statement 1.1: Significant Impact Guidelines - Matters of National Environmental Significance*. Australian Government Department of the Environment and Heritage.

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Nest Box Construction

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Nest Box Construction

A range of purpose built nest boxes are available from various companies including Hollow Log Homes (http://www.hollowloghomes.com.au/nHome.htm.).

Nest boxes are to be constructed:

- using non-toxic two pack epoxy glue;
- with aluminium angles around the edges of the nest box lid to discourage chewing;
- using plantation hardwood or marine ply on the front face of each nest box to discourage chewing;
- with slots cut into the inside face of the nest box to assist with internal access to the exit hole;
- using stainless steel piano hinges on nest box lids to inhibit rusting and assist in waterproofing; and
- with a 40 mm to 50 mm thick layer of sawdust in the base of the nest box to replicate the inside of decaying hollows.

Nest box dimensions, depths, entrance diameters and installation height ranges would comply with the dimensions, depths, entrance diameters and installation height ranges specified in **Table H.1.**

Table H.1 Construction dimensions of nest boxes for target species

Nest Box Design	*Internal Dimensions (mm)*	*Depth of Chamber (mm)*	*Entrance Diameter (mm)*	*Installation Height Range (m)*
Microbats	150 x 150	400	65	2.0 to 6.0
Squirrel Glider*	150 x 250	300	45	3.0 to 5.0
Sugar Glider*	150 x 200	300	40	3.0 to 5.0
Brushtail Possum	250 x 250	300	100	2.0 to 4.0
Brush-tailed Phascogale	250 x 250	400	60	2.0 to 6.0
Lorikeet/Rosella	150 x 150-200	400	65	2.0 to 6.0
Galahs	250 x 250	500	100	2.0 to 6.0
Kookaburra	250 x 300	60	110	2.0 to 6.0

* nest boxes with rear-facing entrance holes.