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APPENDICES TO ECOLOGICAL ASSESSMENT

VOLUME 2

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BAYSIDE WAY BRUNSWICK HEADS

A REPORT PREPARED FOR
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LISTED EPBC FAUNA HABITAT ASSESSMENT

The Department of Sustainability, Environment, Water, Population and Communities' Environmental Reporting Tool (DSEWPC 2010) was used to determine the suite of fauna species that may potentially occur within 10 kms of Bayside Brunswick, including migratory terrestrial bird species. Each of these species was then assessed as to the possibility of their occurrence on the subject site. The presence of suitable habitat was used as the criteria for a possible occurrence **(TABLE 1)**.

TABLE 1
POSSIBLE OCCURRENCE OF COMMONWEALTH THREATENED SPECIES ON THE SUBJECT SITE

Species	Status[1]	Habitat[2]	Possible Occurrence
Australian Painted Snipe (*Rostratula australis*)	V	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	**Possible**
Bar-tailed godwit *(Limosa lapponica)*	M	Bar-tailed Godwits arrive in Australia each year in August from breeding grounds in the northern hemisphere. Birds are more numerous in northern Australia. Bar-tailed Godwits inhabit estuarine mudflats, beaches and mangroves. They are common in coastal areas around Australia. They are social birds and are often seen in large flocks and in the company of other waders.	**Possible**
Black-breasted Button-quail (*Turnix melanogaster*)	V	Preferred habitat is drier low closed forests, including dry rainforests, vine forest and vine thickets, often in association with Hoop Pine, and Bottletree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat. Birds have been recorded using Lantana thickets at edges of rainforest or Lantana understorey of forest or rainforest.	Unlikely

[1] As listed under the Commonwealth EPBC ACT. E = Endangered, V = Vulnerable, CE = Critically endangered, M = Migratory.
[2] Habitat and Ecology notes modified from DECC (2005)

Species	Status[1]	Habitat[2]	Possible Occurrence
Black-faced monarch *(Monarcha melanopsis)*	M	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	**Possible**
Black-throated Finch (southern) (*Poephila cincta cincta*)	E	Eucalypt woodland and riverside vegetation, including paperbark and wattle shrubland. Areas close to water with a dense understorey of seeding grass and shrubs are favoured.	Unlikely
Campbell Albatross (*Thalassarche melanophris impavida)*	V M	The diet of the Black-browed Albatross primarily consists of a combination of fish, molluscs (mostly cephalopods) and crustaceans (mostly krill). The diet also includes other items such as carrion, jellyfish and salps that are taken less frequently. The Black-browed Albatross is believed to forage during both day and night. It obtains most of its food while settled on the surface of the water by reaching down to seize a food item in the bill or, less frequently, by submerging momentarily to capture prey just below the surface. The Black-browed Albatross is a well-known scavenger that regularly trails fishing vessels to collect discarded items.	Unlikely
Cattle egret *(Bubulcus ibis)*	M	Originally found in Africa, Europe and Asia, the Cattle Egret is now found on nearly every continent, with birds in Australia originating from Asia. In Australia it is most widespread and common in north-eastern Western Australia across the Top End, Northern Territory, and in south-eastern Australia from Bundaberg, Queensland to Port Augusta, South Australia, including Tasmania. The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps, and is often seen with cattle and other stock.	**Recorded**

Species	Status[1]	Habitat[2]	Possible Occurrence
Coxen's Fig-Parrot (*Cyclopsitta diophthalma coxeni*)	E M	Usually recorded from drier rainforests and adjacent wetter eucalypt forest but rarely seen due to its small size and cryptic habits. Also found in the wetter lowland rainforests that are now largely cleared in NSW. The bird shows a decided preference for fig trees, but also feeds on other fruiting rainforest species.	Unlikely
Eastern curlew (*Numenius madagascariensisi*)	M	The Eastern Curlew is widespread in coastal regions in the north-east and south of Australia, including Tasmania, and scattered in other coastal areas. It is rarely seen inland. It breeds in Russia and north-eastern China. On passage, they are commonly seen in Japan, Korea and Borneo. Small numbers visit New Zealand. The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	Unlikely
Fork-tailed swift (*Apus pacificus*)	M	The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines.	**Possible**

Species	Status[1]	Habitat[2]	Possible Occurrence
Great egret (*Ardea alba*)	M	Great Egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups.	Unlikely
Green and golden bell frog *(Litoria aurea)*	V	Inhabits freshwater marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available.	Unlikely
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	**Recorded**

Species	Status[1]	Habitat[2]	Possible Occurrence
Grey-tailed tattler (*Heteroscelus brevipes*)	M	Grey-tailed Tattlers breed in Siberia and on passage are seen along the East Asian-Australasian Flyway (the migration route to Australia). When non-breeding they are found in China, Philipines, Taiwan, Vietnam, Malay Peninsula, Indonesia, New Guinea, Micronesia, Fiji, New Zealand and Australia. They are more commonly seen in the north of Australia. Grey-tailed Tattlers are usually seen in small flocks on sheltered coasts with reefs and rock platforms or with intertidal mudflats. They are also found in intertidal rocky, coral or stony reefs, platforms and islets that are exposed at high tide, also shores of rock, shingle, gravel and shells and on intertidal mudflats in embayments, estuaries and coastal lagoons, especially those fringed with mangroves.	Unlikely
Kermadec petrel *(Pterodroma neglecta neglecta)*	V	Ranges over subtropical and tropical waters of the South Pacific. Breeds on islands across the South Pacific. In Australia it breeds on Ball's Pyramid and Phillip Island (near Norfolk Island). Nests in a crevice amongst rocks. Diet is squid and crustaceans. Vagrant birds occur in coastal NSW waters, particularly after storm events.	Unlikely
Large-eared Pied Bat, Large Pied Bat (*Chalinolobus dwyeri*)	V	Roosts in caves, crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	**Possible**

Species	Status[1]	Habitat[2]	Possible Occurrence
Latham's snipe *(Gallinago hardwickii)*	M	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	**Possible**
Little curlew (*Numenius minutus*)	M	The Little Curlew is widespread in the north of Australia and scattered elsewhere. It is an irregular visitor to New Zealand and Tasmania. It breeds in Siberia and is seen on passage through Mongolia, China, Japan, Indonesia and New Guinea. Little Curlews may gather in large flocks on coastal and inland grasslands and black soil plains in northern Australia, near swamps and flooded areas. They also feed on playing fields, paddocks and urban lawns.	**Possible**
Little tern (*Sterna albifrons*)	M	The Little Tern is almost exclusively coastal with sheltered environments preferred. However, the species may also occur several kilometers from the sea in harbours, inlets and rivers. The Little Tern nests in small, scattered colonies on sandy beaches or shingle pits. These nesting sites are particularly vulnerable to human disturbance, predation and natural catastrophes.	Unlikely

Species	Status[1]	Habitat[2]	Possible Occurrence
Long-nosed Potoroo (SE mainland) (*Potorous tridactylus tridactylus*)	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	**Possible**
New Holland mouse *(Pseudomys novaehollandiae)*	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. The New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire.	**Possible**
Northern giant-petrel *(Macronectes halli)*	V M	The Northern Giant-petrel has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Their range extends into subtropical waters (to 28ºS) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. There are marked differences in diet between the sexes. Females obtain most of their prey live from the sea, while males also scavenge from the carcases of penguins and seals on land. At sea, both sexes are aggressive opportunists, feeding on fish, cephalopods, birds and crustaceans, including euphausiids or krill, and regularly scavenge on fishing vessels.	Unlikely

Species	Status[1]	Habitat[2]	Possible Occurrence
Pacific golden plover (*Pluvialis fulva*)	M	The Pacific Golden Plover breeds on the Arctic tundra in western Alaska. It winters in South America and islands of the Pacific Ocean to India, Indonesia and Australia. In Australia it is widespread along the coastline. The Pacific Golden Plover is found on muddy, rocky and sandy wetlands, shores, paddocks, saltmarsh, coastal golf courses, estuaries and lagoons.	**Possible**
Painted snipe (*Rostratula benghalensis*)	M	The Painted Snipe inhabits inland and coastal shallow freshwater wetlands, occuring in both ephemeral and permanent wetlands, particularly where there is grass. Individuals have been spotted in artificial dams, sewage ponds and waterlogged grasslands.	**Possible**
Rainbow bee-eater (*Merops ornatus*)	M	The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels.	**Possible**
Regent Honeyeater (*Anthochaera phrygia*)	E M	Dry box-ironbark eucalypt woodland and dry sclerophyll forest associations. Along creek flats, or in broad river valleys and foothills.	**Possible**
Rufous fantail (*Rhipidura rufifrons*)	M	Strongly migratory in the south of its range, it moves northwards in winter, and virtually disappears from Victoria and New South Wales at this time. The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	**Possible**

Species	Status[1]	Habitat[2]	Possible Occurrence
Satin flycatcher (*Myiagra cyanoleuca*)	M	The Satin Flycatcher is a migratory species, moving northwards in winter to northern Queensland and Papua New Guinea, returning south to breed in spring. The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	**Possible**
Giant Barred Frog (*Mixophyes iteratus*)	E	Giant Barred Frogs forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m.	Unlikely
Southern giant-petrel *(Macronectes giganteus)*	E	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. It is an opportunistic scavenger and predator, and scavenges from fishing vessels and animal carcasses on land. It is also an active predator of cephalopods (ink fish) and euphausiids (krill), as well as smaller birds (particularly penguins) both at land and at sea.	Unlikely

Species	Status[1]	Habitat[2]	Possible Occurrence
Spectacled Monarch (*Monarcha trivirgatus*)	M	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. It is much less common in the south. It is also found in Papua New Guinea, the Moluccas and Timor. The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves. Resident in Queensland to Rockhampton, summer breeding migrant further south.	Unlikely
Spotted Quoll (*Dasyurus maculatus*)	E	The range of the Spotted-tailed Quoll is now only found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces; these may be visited by a number of individuals; latrine sites can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	Unlikely

Species	Status[1]	Habitat[2]	Possible Occurrence
Swift parrot (*Lathamus discolor*)	E M	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box.	**Possible**
Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*)	V	Found mostly in closed forest and possibly open layered Eucalyptus forest. Generally recorded in moist layered forest on loamy basaltic soils, but also found in closed forest overlying silica sand dunes at Cooloola.	Unlikely
Tristan albatross *(Diomedea exulans)*	E M	The Wandering Albatross visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. They breed on a number of islands just north of the Antarctic Circle: South Georgia Island (belonging to the UK), Prince Edward and Marion Islands (South Africa), Crozet and Kerguelen Islands (French Southern Territories) and Macquarie Island (Australia). They feed in pelagic, offshore and inshore waters, often at night, taking fish and cephalopods such as squid, crustaceans and carrion, and will often follow ships feeding on the refuse they trail.	Unlikely
Wallum Sedge Frog (*Litoria olongburensis*)	V	Paperbark swamps and sedge swamps of the coastal "wallum" country. Wallum is a Banksia dominated lowland heath ecosystem characterised by acidic waterbodies. Olongburra Frogs are usually found amongst sedges and rushes in coastal wetlands.	**Possible**

Species	Status[1]	Habitat[2]	Possible Occurrence
Water Mouse, False Water Rat (*Xeromys myoides*)	V	The water mouse lives in mangrove communities, adjacent freshwater lagoons, swamps and sedged lakes close to coastal foredunes.	Unlikely
Whimbrel *(Numenius phaeopus)*	M	Whimbrels are common across northern Australia and uncommon to rare further south. They breed in central Siberia to Iceland. The subspecies *variegatus* is the one mainly found in Australia and also the Bay of Bengal through to Melanesia, Micronesia and to New Zealand in small numbers. Whimbrels are found mainly on the coast, on tidal and estuarine mudflats, especially near mangroves. They are sometimes found on beaches and rocky shores.	**Possible**
White bellied sea eagle (*Haliaeetus leucogaster)*	M	White-bellied Sea-Eagles have been recorded in the northern hemisphere from India to China and south through Asia, New Guinea and Australia. They occur along the coastline of Australia and also range inland over large rivers and wetlands.	**Possible**
White-throated Needletail *(Hirundapus caudacutus)*	M	The White-throated Needletail is widespread in eastern and south-eastern Australia. They occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	**Possible**

APPENDIX 2
FAUNA ASSESSMENT

FAUNA ASSESSMENT

1. Introduction

This section includes a description of the methods used in determining the suite of fauna species that are likely to use the study area and a discussion of the results of the fauna assessment.

2. Methods

2.1 NPWS Database search

A search of the NPWS database was conducted to find records of threatened fauna species within 10km of the subject site.

2.2 Literature review

A number of sources were reviewed to identify records of threatened species in the locality including:

- Woodward Clyde (1996) Bayside Brunswick Flora and Fauna Assessment
- NRAC study (1995)
- NPWS Wildlife Atlas
- Landmark Byron Fauna Study (1999)
- JWA (2000) Flora and Fauna Assessment for the Brunswick Heads bypass
- JWA reports for the locality

2.3 Site survey (2003 and 2004)

A site survey was completed by JWA in September 2003 and January 2004. The area was traversed a number of times by one (1) scientist on foot over a period of eight (8) hours and all incidental fauna observations were recorded. Target searches for the threatened frogs Wallum froglet and the Wallum sedge frog were undertaken in late summer following a period of rain.

2.4 Fauna Survey (2008)

Introduction

A comprehensive fauna survey was carried out by two (2) scientists between the 14th to the 18th November 2008. Spotlighting was also conducted during this period. The weather was generally fine and warm during the survey period. The survey techniques utilised were in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Development and Activities* (DECCW 2004).

Survey Techniques

Detailed fauna surveys were designed to target identified threatened species. The following survey techniques were utilised in this assessment.

Opportunistic Sightings
The 'random meander' technique (Cropper 1993) was used to traverse the site. All incidental records of fauna utilising the study area were recorded.

Active Searching
Logs, sheets of tin, cardboard, bark and leaves were overturned in search of reptiles and amphibians while incidentally traversing the site. Diggings and signs of droppings were searched for. The site was actively searched for scats and bones. Active observation of bird activity was undertaken during the site visit.

Type 'A' Elliott Box Traps and Cage Traps
This methodology provides an insight into the size and density of populations of ground fauna which may form a component of the diet of raptors such as the Eastern grass owl and the Masked owl. It also indicates the extent of invasion by exotic species such as the Black rat and the House mouse which allows an assessment of the 'naturalness' of the area to be made.

Four (4) lines of Type 'A' Elliot traps with ten (10) traps in each line were set for a period of four (4) nights for a total of one hundred and sixty (160) trap nights. An additional five (5) arboreal Elliot traps were set along each line. Ten (10) cage traps were also deployed for four (4) nights for a total of twenty-four (28) trap nights. Both the Elliot traps and the Cage traps were baited with a mixture of rolled oats, honey and peanut butter. The cage traps were also baited with fruit.

Pitfall Traps
Four (4) pitfall lines of five (5) buckets (20 litre) spaced five (5) metres apart (incorporating drift fencing) were set for a period of four (4) nights. A total of 80 bucket nights were achieved during this component of the Study.

Hair Tubes
Four (4) lines of ten (10) hair tubes each were laid on the site. Each Hair Tube was baited with rolled oats, honey and peanut butter and then set for a period of four (4) nights. Hair tube records were analysed by Barbara Triggs.

Call Playback Techniques
Call playback was carried out over four (4) nights at various locations throughout the site for a period of one (1) hour. Target species included: Masked owl, Barking Owl, Sooty owl and Koala. Calls were broadcast, and then followed by a five (5) minute listening period.

Harp Netting
Two (2) Harp traps were set in potential flyways over four (4) nights. Flyways were chosen on the basis of adequate cover on both sides of the trap, and screening was incorporated to enhance capture success. An overall total of eight (8) trap nights was achieved in this component of the Study.

Anabat Recording
An Anabat II sonar detector (Titley Electronics, Ballina) was used to down-load the ultrasonic calls of Microchiropteran bats. Recording was undertaken for twelve (12) hours per night over two (2) nights. A total of twenty-four (24) hours of recording was undertaken. Recording times commenced from slightly before dusk. Recording was

undertaken by positioning the Anabat II sonar detector facing across possible bat flyways. Anabat records were identified by Dr. Greg Ford.

Spotlighting
Spotlighting was undertaken by two (2) scientists for two and a half (2.5) hours on four consecutive nights for a total of ten (10) hours spotlighting. The weather for the spotlighting survey was generally fine and warm.

All vegetated areas were traversed on foot and spotlighting was carried out using a 50W spotlight powered by a 12V battery. The observer walked at approximately 1km/h allowing intensive listening as an adjunct to visual detection.

2.5 Site survey (2009)

During site surveys in April and May 2009 to update vegetation communities and GPS potential Habitat trees all incidental fauna observations were recorded. Koala scats were also recorded beneath Koala food trees.

2.6 Habitat assessment

Habitat on the subject site was assessed to determine its value for native fauna species. The assessment focused on identifying habitat features associated with threatened species as well as other native fauna groups. Particular attention was paid to habitat features such as:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places.
- The presence of Koala food trees.
- The presence of preferred Glossy black cockatoo feed trees (Forest oak and/or Black she-oak).
- The presence of Yellow-bellied glider feeding scars.
- Condition, flow and water quality of drainage lines and bodies of water.
- Areas of dense vegetation.
- Presence of hollow logs/debris and areas of dense leaf litter.
- Presence of fruiting flora species.
- Presence of blossoming flora species, particularly winter-flowering species.
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation.
- Presence of caves and man-made structures that may be suitable for microchiropteran bat roost sites.
- Presence of Wallum sedge frog and Wallum froglet habitat.

3. Results and Discussion

3.1 NPWS Database search

The results of the search of the NPWS database are shown in **TABLE 1**.

TABLE 1
NPWS DATABASE RECORDS OF THREATENED FAUNA SPECIES
WITHIN 10 KMS OF THE SUBJECT SITE

Scientific Name	Common Name
Mammals	
Syconycteris australis	Common blossom bat
Planigale maculata	Common planigale
Dugong dugon	Dugong
Miniopterus schreibersii oceanensis	Eastern bentwing-bat
Nyctophilus bifax	Eastern long-eared bat
Nyctimene robinsoni	Eastern tube-nosed bat
Scoteanax rueppellii	Greater broad-nosed bat
Pteropus poliocephalus	Grey-headed flying-fox
Megaptera novaeangliae	Humpback whale
Phascolarctos cinereus	Koala
Myotis macropus	Large-footed myotis
Miniopterus australis	Little bent-wing bat
Potorous tridactylus	Long-nosed potoroo
Birds	
Botaurus poiciloptilus	Australasian bittern
Ninox connivens	Barking Owl
Esacus neglectus	Beach stone-curlew
Ixobrychus flavicollis	Black bittern
Ephippiorhynchus asiaticus	Black-necked stork
Amaurornis olivaceus	Bush-hen
Burhinus grallarius	Bush-stone curlew
Todiramphus chloris	Collared kingfisher
Irediparra gallinacean	Comb-crested jacana
Cyclopsitta diophthalma coxeni	Double-eyed fig-parrot
Stictonetta nervosa	Freckled duck
Calyptorhynchus lathami	Glossy black cockatoo
Tyto capensis	Grass owl
Sterna albifrons	Little tern
Anseranas semipalmata	Magpie goose
Lichenostomus fasciogularis	Mangrove honeyeater
Pandion haliaetus	Osprey
Haematopus longirostris	Pied oystercatcher
Ptilinopus regina	Rose-crowned fruit dove
Haematopus fuliginosus	Sooty oystercatcher
Lathamus discolor	Swift parrot
Monarcha leucotis	White-eared monarch
Gygis alba	White tern
Ptilinopus magnificus	Wompoo fruit dove
Reptiles	
Chelonia mydas	Green turtle
Caretta caretta	Loggerhead turtle

Scientific Name	Common Name
Amphibians	
Litoria aurea	Green and golden bell frog
Crinia tinnula	Wallum froglet
Litoria olongburensis	Wallum sedge frog

3.2 Literature review

Threatened species recorded in studies in the locality are shown in **TABLE 2.**

TABLE 2
THREATENED FAUNA SPECIES RECORDED IN STUDIES IN THE LOCALITY[3]

Birds	Glossy black cockatoo	**Amphibians**	Wallum froglet
	Collared kingfisher		Wallum sedge frog
	Comb-crested jacana		
	Black Bittern		
	Bush hen		
	Osprey		Common planigale
	Freckled duck		Brush-tailed phascogale
	Black-necked stork		Greater Broad-nosed bat
	Pied oystercatcher		Koala
	Sooty oyster catcher	**Mammals**	Long-nosed potoroo
	Rose-crowned fruit-dove		Common blossom bat
	Grass owl		Eastern long-eared bat
	Mangrove honeyeater		Yellow-bellied sheath-tailed bat
	White-eared monarch		Little bent-wing bat
	Powerful owl		

3.3 Results of Woodward Clyde survey (1996)

A survey of the subject site by Woodward Clyde (1996) recorded the following:

- six (6) amphibian species,
- six (6) reptile species,
- seven (7) mammal species; and
- twenty (20) bird species.

Species are listed in **TABLE 3**.

TABLE 3
FAUNA RECORDED DURING THE WWC (1996) SURVEY

Common Name	Scientific Name
Mammals	
Little bent wing bat	***Miniopterus australis***
White-striped mastiff bat	*Nyctinomus australis*

[3] Sources include: Woodward-Clyde (1996); JWA Reports; NRAC study (1995); Landmark Byron Fauna Study (1999); and NPWS Wildlife Atlas

Common Name	Scientific Name
Mountain brushtail possum	*Trichosurus caninus*
Dog *	*Canis familiaris*
Northern brown bandicoot	*Isodon macrourus*
Swamp wallaby	*Wallabia bicolor*
Grey-headed flying fox	***Pteropus poliocephalus***
Reptiles	
Garden skink	*Lampropholis delicata*
Striped skink	*Ctenotus robustus*
Eastern water skink	*Eulampus quoyii*
Lace monitor	*Varanus varius*
Eastern water dragon	*Physignathus lesueurii*
Eastern brown snake	*Pseudonaja textilis*
Amphibians	
Wallum froglet	***Crinia tinnula***
Common eastern froglet	*Crinia signifera*
Eastern sign-bearing froglet	*Crinia parinsignifera*
Striped marsh frog	*Limnodynastes peronii*
Cane toad*	*Bufo marinus*
Rocket frog	*Litoria nasuta*
Birds	
Osprey	***Pandion haliaetus***
Bar-shouldered dove	*Geopelia humeralis*
Black-faced cuckoo shrike	*Coracina novaehollandiae*
Superb blue wren	*Malurus cyaneus*
White-browed scrub wren	*Sericornis frontalis*
Noisy miner	*Manorina melanophrys*
White-cheeked honeyeater	*Phylidonyris nigra*
Little wattlebird	*Anthochaerus chrysoptera*
Grey fantail	*Rhipidura fuliginosa*
Kookaburra	*Dacelo novaeguineae*
Brown honeyeater	*Lichmera indistincta*
Rainbow lorikeet	*Trichoglossus haemotodus*
Scaly-breasted lorikeet	*Trichoglossus chlorolepidotus*
Pied currawong	*Strepera graculina*
Eastern whipbird	*Psophodes olivaceus*
Rainbow bee-eater	*Merops ornatus*
Welcome swallow	*Hirundo neoxena*
Pied butcherbird	*Cracticus nigrogularis*
Torresian crow	*Corvus orvu*
Whistling kite	*Milvus sphenurus*

* indicates introduced species
Threatened species are shown in **bold**

3.4 Results of fauna survey (2003 and 2004)

In total, nine (9) amphibian species, four (4) reptile species, forty-two (42) bird species and six (6) mammal species were recorded on the subject site.

Two (2) threatened species were recorded - the Koala and Wallum froglet.

Wallum froglets were recorded throughout the drainage lines communities on the site and within regenerating heathlands to the south (**FIGURE 21 – VOLUME 1**).

Koala scats were found at the base of several Scribbly gums in the east of the site and evidence of Koala activity was recorded extensively on adjoining lands to the south (**FIGURE 23 – VOLUME 1**).

Fauna recorded from the site survey are shown in **TABLE 4**.

TABLE 4
FAUNA RECORDED DURING THE SURVEY

Common Name	Scientific Name	Observation
Mammals		
Black rat *	*Rattus rattus*	scats
Koala	***Phascolarctos cinereus***	scats
Common brushtail possum	*Trichosurus vulpecula*	scats
Dog *	*Canis familiaris*	scats and tracks
Cat *	*Felis catus*	scats
Swamp wallaby	*Wallabia bicolor*	sighting
Reptiles		
Common sun skink	*Lampropholis*	sighting
Swamp snake	*Hemiaspis signata*	sighting
Eastern water dragon	*Physignathus*	sighting
Land mullet	*Egernia major*	sighting
Amphibians		
Wallum froglet	***Crinia tinnula***	call
Common eastern froglet	*Crinia signifera*	Call/sighting
Eastern sign-bearing froglet	*Crinia parinsignifera*	Call/sighting
Striped marsh frog	*Limnodynastes*	call
Spotted grass frog	*Limnodynastes*	call
Eastern dwarf tree frog	*Litoria fallax*	call
Rocket frog	*Litoria nasuta*	call
Tusked frog	*Adelotus brevis*	call
Eastern pobblebonk	*Limnodynastes dumerilii*	call
Birds		
Australian Nankeen kestrel	*Falco cenchroides*	Sighting
Bar-shouldered dove	*Geopelia humeralis*	sighting
Black faced cuckoo shrike	*Coracina novaehollandiae*	sighting
Black-shouldered kite	*Elanus axillaris*	sighting
Blue-faced honeyeater	*Entomyzon cyanotis*	sighting
Cattle egret	*Ardea ibis*	sighting
Crested pigeon	*Ocyphaps lophotes*	sighting
Eastern rosella	*Platycercus eximius*	sighting

Common Name	Scientific Name	Observation
Eastern spinebill	*Acanthorhynchus tenuirostris*	sighting
Eastern yellow robin	*Eopsaltria australis*	sighting
Eastern whipbird	*Psophodes olivaceus*	sighting
Galah	*Eolophus roseicapillus*	sighting
Glossy ibis	*Plegadis falcinellus*	sighting
Grey fantail	*Rhipidura fuliginosa*	sighting
Kookaburra	*Dacelo novaeguineae*	sighting
Lewin's honeyeater	*Meliphaga lewinii*	sighting
Little black cormorant	*Phalacrocorax sulcirostris*	sighting
Little wattlebird	*Anthochaera*	sighting
Magpie	*Gymnorhina tibicen*	sighting
Magpie lark	*Grallina cyanoleuca*	sighting
Masked plover	*Thinornis rubricollis*	sighting
Noisy miner	*Manorina melanocephala*	sighting
Noisy friarbird	*Philemon corniculatus*	sighting
Pacific black duck	*Anas superciliosa*	sighting
Pied butcherbird	*Cracticus nigrogularis*	sighting
Pied currawong	*Strepera graculina*	sighting
Purple swamp hen	*Porphyrio porphyrio*	sighting
Rainbow bee-eater	*Merops ornatus*	sighting
Rainbow lorikeet	*Trichoglossus*	sighting
Red-browed finch	*Neochmia temporalis*	sighting
Sacred ibis	*Threskiornis aethiopicus*	sighting
Silvereye	*Zosterops lateralis*	sighting
Spangled drongo	*Dicrurus bracteatus*	sighting
Spotted turtledove*	*Streptopelia*	sighting
Straw-necked ibis	*Threskiornis spinicollis*	sighting
Superb fairy wren	*Malurus cyaneus*	sighting
Torresian crow	*Corvus orru*	sighting
Variegated fairy wren	*Malurus lamberti*	sighting
Welcome swallow	*Hirundo neoxena*	sighting
Whistling kite	*Milvus sphenurus*	sighting
White-faced heron	*Ardea novaehollandiae*	sighting
Willy wagtail	*Rhipidura leucophrys*	sighting
Wood duck	*Chenonetta jubata*	sighting

* indicates introduced species
Threatened species are shown in **bold**

3.5 Results of Fauna Survey (2008)

Amphibians

The Wallum froglet (*Crinia tinnula)*, a listed threatened species (NSW TSC Act), and the invasive Cane toad (*Bufo marinus*) were recorded on the subject site.

Reptiles

Four (4) reptile species were recorded during the site survey. The survey was completed in late winter and during a relatively warm period. Reptile activity could be expected to be moderate. **TABLE 5** lists the reptile species recorded during the survey.

TABLE 5
REPTILE SPECIES RECORDED ON THE SUBJECT SITE

Common name	Scientific name	Status*	Method of identification
Wall skink	*Cryptoblepharus virgatus*	Common	Visual
Common garden skink	*Lampropholis delicata*	Common	Visual
Pale- flecked Garden Sunskink	*Lampropholis guichenoti*	Common	Visual
Bearded dragon	*Pogona barbata*	Common	Visual

Birds

Fifty-two (52) bird species were recorded on the subject site. **TABLE 6** shows the bird species recorded during the survey.

TABLE 6
BIRD SPECIES RECORDED ON THE SUBJECT SITE

Scientific name	Common name
Alectura lathami	Australian brush-turkey
Aegotheles cristatus	Australian owlet-nightjar
Geopelia humeralis	Bar-shouldered dove
Coracina novaehollandiae	Black-faced cuckoo-shrike
Haliastur indus	Brahminy kite
Lichmera indistincta	Brown honeyeater
Coturnix ypsilophora	Brown quail
Acanthiza pusilla	Brown thornbill
Ardea ibis	Cattle egret
Ocyphaps lophotes	Crested pigeon
Platycercus eximius	Eastern rosella
Acanthorhynchus tenuirostris	Eastern spinebill
Eopsaltria australis	Eastern yellow robin
Sphecotheres viridis	Figbird
Todiramphus macleayii	Forest kingfisher
Rhipidura fuliginosa	Grey fantail
Colluricincla harmonica	Grey shrike-thrush

Scientific name	Common name
Dacelo novaeguineae	Laughing kookaburra
Meliphaga lewinii	Lewin's honeyeater
Chrysococcyx minutillus	Little bronze cuckoo
Philemon citreogularis	Little friarbird
Anthochaera chrysoptera	Little wattlebird
Gymnorhina tibicen	Magpie
Grallina cyanoleuca	Magpie-lark
Vanellus miles	Masked lapwing
Philemon corniculatus	Noisy friarbird
Manorina melanocephala	Noisy miner
Oriolus sagittatus	Olive-backed oriole
Pandion haliaetus	**Osprey**
Pelecanus conspicillatus	Pelican
Centropus phasianinus	Pheasant coucal
Cracticus nigrogularis	Pied butcherbird
Strepera graculina	Pied currawong
Merops ornatus	Rainbow bee-eater
Trichoglossus haematodus	Rainbow lorikeet
Malurus melanocephalus	Red-backed fairy-wren
Neochmia temporalis	Red-browed finch
Zosterops lateralis	Silvereye
Larus novaehollandiae	Silver gull
Ninox boobook	Southern boobook
Pardalotus striatus	Striated pardalote
Podargus strigoides	Tawny frogmouth
Megalurus timoriensis	Tawny grassbird
Corvus orru	Torresian crow
Hirundo neoxena	Welcome swallow
Haliastur sphenurus	Whistling kite
Haliaeetus leucogaster	White-bellied sea-eagle
Sericornis frontalis	White-browed scrubwren
Egretta novaehollandiae	White-faced heron
Gerygone olivacea	White-throated gerygone
Rhipidura leucophrys	Willie wagtail
Lichenostomus chrysops	Yellow-faced honeyeater

* indicates introduced species
Threatened species are shown in **bold**

Mammals

Ten (10) mammal species were recorded including two threatened species **(TABLE 7)**.

TABLE 7
MAMMALS SPECIES RECORDED ON THE SUBJECT SITE

Scientific Name	Common Name	Method of Identification
Isoodon Macrourus	Northern brown bandicoot	Visual
Pteropus alecto	Black flying-fox	Visual
Rattus Lutreolus	Swamp rat	Visual
Rattus rattus	Black rat*	Visual
Pteropus poliocephalus	**Grey-headed flying-fox**	Visual
Lepus capensis	Hare*	Visual
Mus musculus	House mouse*	Visual
Perameles nasuta	Long-nosed bandicoot	Visual
Macropus rufogriseus	Red-necked wallaby	Visual
Wallabia bicolor	Swamp wallaby	Visual

* indicates introduced species
Threatened species are shown in bold

3.6 Results of Fauna Survey (2009)

Two (2) mammal, two (2) reptile and twenty three (23) bird species were recorded **(TABLE 8)**.

TABLE 8
FAUNA RECORDED DURING THE SURVEY

Common Name	Scientific Name	Observation
Mammals		
Koala	***Phascolarctos cinereus***	**scats**
Swamp wallaby	*Wallabia bicolor*	sighting
Reptiles		
Common sun skink	*Lampropholis delicata*	sighting
Eastern water dragon	*Physignathus lesueurii*	sighting
Birds		
Cattle egret	*Ardea ibis*	sighting
Crested pigeon	*Ocyphaps lophotes*	sighting
Eastern rosella	*Platycercus eximius*	sighting
Eastern spinebill	*Acanthorhynchus tenuirostris*	sighting
Eastern yellow robin	*Eopsaltria australis*	sighting
Eastern whipbird	*Psophodes olivaceus*	sighting
Galah	*Eolophus roseicapillus*	sighting

Common Name	Scientific Name	Observation
Glossy black cockatoo	***Calyptorhynchus lathami***	**Chewed cones**
Grey fantail	*Rhipidura fuliginosa*	sighting
Kookaburra	*Dacelo novaeguineae*	sighting
Lewin's honeyeater	*Meliphaga lewinii*	sighting
Little wattlebird	*Anthochaera*	sighting
Magpie	*Gymnorhina tibicen*	sighting
Magpie lark	*Grallina cyanoleuca*	sighting
Noisy miner	*Manorina melanocephala*	sighting
Noisy friarbird	*Philemon corniculatus*	sighting
Pied butcherbird	*Cracticus nigrogularis*	sighting
Pied currawong	*Strepera graculina*	sighting
Rainbow lorikeet	*Trichoglossus*	sighting
Silvereye	*Zosterops lateralis*	sighting
Superb fairy wren	*Malurus cyaneus*	sighting
Willy wagtail	*Rhipidura leucophrys*	sighting
Wood duck	*Chenonetta jubata*	sighting

* indicates introduced species
Threatened species are shown in **bold**

3.7 Habitat assessment

Amphibians

Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction, with the exception of two highland genera (*Assa darlingtoni* and *Philoria* spp.) The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter.

The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. These species include the Red-eyed tree frog (*Litoria chloris*), Leseuer's frog (*Litoria leseueri*), Fletchers frog (*Lechriodus fletcheri*) and the Barred frogs of the *Mixophyes* genus.

The subject site provides good quality habitat for a range of lowland and wallum frogs. The main drainage lines provide vegetated areas and areas of moderately tall grasses and shrubs for shelter, although periodic slashing reduces the vegetation cover. After a period of heavy rain (February 25th 2004), it was observed that much of the subject site was inundated and a large number and variety of frogs were observed and heard calling throughout the inundated area. The frog species observed included Wallum froglets (Vulnerable TSC Act 1995).

The Paperbark forest, Sawsedge and Swamp mahogany communities, although small in area, may also provide habitat for the Wallum sedge frog and Wallum froglet.

Sedge and Grasslands provide suitable habitat for a range of Amphibian species, particularly along drainage depressions, soaks and drainage lines. Species likely to occur in the sedge and grassland communities include the Common eastern froglet, Eastern sign-bearing froglet, Striped marsh frog, Spotted grass frog, Eastern dwarf tree frog, Rocket frog and Whistling tree frog.

Species typically encountered in or adjacent to Closed Forests include the Eastern dwarf tree frog, Red-eyed tree frog, Striped marsh frog, Cane toad and Dainty green tree frog. Relatively few species occur in conjunction with Closed Forest types when permanent water is absent. Species that typically occur in low elevation Rainforest and permanent streams such as the Giant barred frog (*Mixophyes iteratus*) are unlikely to occur at the study site.

Reptiles

As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa, which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate and other factors affecting thermoregulation such as shade and availability of shelter and basking sites (Smith *et al*.1994).

In a survey of the moist forest herpetofauna of North-eastern NSW, Smith *et al*. (1989) found that few species discriminated between rainforest and wet sclerophyll forest, however, most species exhibited a response to differences in elevation and the availability of microhabitat components and other substrates.

The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction.

Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. This contrasts markedly with the distribution patterns of birds, and most mammals.

The single limiting factor in terms of species diversity in coastal vegetation is the lack of shelter sites (*e.g*. logs, tree hollows and decorticating bark). Such habitat components characterise eucalypt forests and woodlands, where species diversity may be much higher, depending on disturbance factors.

The subject site is considered to provide good quality habitat for reptiles due to the presence of: the combination of shelter and basking sites; rocky areas and fallen logs for shelter particularly in surrounding areas; availability of water in drainage lines; the variety of habitat types in surrounding areas; and reliable sources of prey. In particular very good habitat and deep litter layers are present in forest types to the east and west of the subject site, and dense heathland to the south provide ample shelter for a number of reptile species.

Birds

The significance of near coastal environments of the N.S.W. Far North Coast and South-east Queensland as overwintering habitat for migratory birds has been established by many observers and bird banders including Keast (1968), Robertson (1973), Gravatt (1974), Porter (1982) and Robertson and Woodall (1983). These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia (Fitzpatrick and Nix 1973; Edwards 1979; Nix 1982; Specht *et al.*1981).

Many insectivorous birds from higher latitudes and elevation overwinter in the locality. Species such as the Fantail cuckoo, Sacred kingfisher, Rainbow bee-eater, Tree martin, Black-faced cuckoo-shrike, Wattlebirds, Honeyeaters, Cicada bird, Golden whistler, Rufous whistler, Rose robin, Grey fantail, White-throated gerygone, Silvereye, Olive-backed oriole and Spangled drongo, were recorded during the site survey. The small-flowering species and ample water sources present on the subject site support a relatively large number of insects for insectivorous birds.

Birds such as honeyeaters and lorikeets are Blossom nomads (*ibid*). These birds move locally in response to variation in the availability of nectar and or pollen, important components in their diet. Porter (1982) highlights the importance of flowering eucalypt species, Broad-leaved paperbark and Coast banksia for Scaly-breasted and Rainbow lorikeets as these species flower during the lorikeet's winter breeding period. A predominance of important nectar-bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon on the Site provide a continuity of food for a variety of nectarivorous birds.

Studies of bird usage in rainforest remnants by Holmes (1987), Connelly and Specht (1988) and Lott & Duigan (1993) indicate that the diversity and abundance of birds is related to the size of the Rainforest patches and their degree of isolation from major areas of native forest. Small patches of closed wet forest occur toward the west of the Site. Lott & Duigan (1993) and Howe *et al.*(1981) also note that sites with a higher diversity of vegetation and those which are closer to water generally support a greater diversity of birds. Locally nomadic and migratory rainforest species such as the Wompoo, Rose-crowned and Superb fruit-doves, Common koel and Black-faced cuckoo-shrike are known to use scattered areas of habitat as steeping stones between more intact areas of forest (Date *et al.*1992; Lott & Duigan 1993). These species are likely to be very occasional visitors to the subject site, due to the areas of open water and proximity to local rainforest patches.

The variety of habitats present in the Study area is likely to result in a high diversity of resident and nomadic birds occurring on the Site over the year. Adjacent areas of vegetation represent quality habitat for frugivorous birds, particularly toward the west and north-west. However, the Site itself provides few fruiting species.

The subject site provides quality foraging resources for a range of nectarivorous birds, offering a number of flowering *Acacia*, *Banksia*, *Eucalyptus*, *Callistemon* and *Leptospermum* species. The level of disturbance to the drainage line and intermittent flow may preclude the occurrence of birds associated with permanent watercourses. However, species such as bitterns and rails may possibly occur in those areas with retained vegetation for shelter.

There are a number of large trees with hollows (Scribbly gums and old growth Banksias) on the Site and the surrounding areas particularly to the east, north and south-east. These hollows are suitable for a variety of hollow-nesting birds. The Study area may also represent forage habitat for hollow-dependent avifauna breeding in wet and dry Sclerophyll forests in the locality.

Mammals

Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense understorey layer, which provides shelter from predators and provides nesting opportunities, is particularly important.
In general medium-large terrestrial mammals such as macropods select habitats that provide a dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats.

All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Smith & Lindenmeyer (1988) consider that shortage of nest hollows is likely to limit arboreal mammal populations where density of hollow bearing trees is less than 2 to 8 trees per hectare.

Arboreal folivores (*e.g.* Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate.
Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as *Banksia* and *Acacia* species. These mammals also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivore/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate producing trees (Sap feed trees) and shrubs (*e.g. Acacia* spp.). Arboreal nectarivores and insectivores are generally hollow dependent species.

There are a number of Scribbly gums with hollows necessary for hollow-dependent mammals, and, as with the birds, the Study area may represent forage habitat for hollow-dependent mammals resident in Sclerophyll forests in the locality. Suitable habitat trees have been mapped (APPENDIX 8).

The structural complexity and habitat diversity of the site is likely to support a relatively high diversity and abundance of ground dwelling mammals. However, the majority of the site has been slashed, reducing the habitat value in the short term.

Insectivorous bats like insectivorous birds overlap considerably in diet and broad vegetation preferences (Hall 1981), but specialise in foraging in specific layers or substrates within the forest (Crome and Richards 1988). The Study area is likely to provide forage habitat for a relatively high diversity and abundance of insectivorous bats, due to the combination of open, forested and denser areas of vegetation. The site provides a relatively low diversity and abundance of fruiting species and represents relatively poor

foraging habitat for frugivorous bats. The nectarivorous Common blossom bat may forage on Banksias throughout the site.

There are numerous Scribbly gums with hollows and fissures suitable as roost habitat for hollow-dependant bats on the site. Areas of rainforest, to the north and north west of the site may also provide roost sites for bat species that roost in dense vegetation, rock faces or within strangling figs. These areas represent suitable roost habitat for the threatened Grey-headed flying-fox and Common blossom bat.

3.8 Koala Habitat

The primary Koala feed trees Scribbly gum and Swamp mahogany occur on the subject site, with numerous Scribbly gums present. A variety of secondary browse trees (Pink bloodwood, Swamp turpentine, Broad-leaved paperbark, She-oak) also occur on the Site. Primary and secondary Koala Habitat has been mapped according to known the presence of known primary and secondary food trees and field evidence of the presence of Koala (I.e. scratches and scats) **(FIGURE 24 – VOLUME 1).**

3.9 Threatened species considered possible occurrences in the Study area

Based on the presence of potential habitats, threatened fauna species known from the locality were assessed for the likelihood of their occurrence on the site.

The following oceanic and coastal species will not occur in the Study area and are not considered in **TABLE 9:**

- Sooty and pied oystercatcher;
- Red-tailed tropicbird;
- Black-winged petrel;
- Great knot;
- Humpback whale;
- Dugong;
- Australian fur seal;
- Loggerhead turtle; and
- Green turtle.

TABLE 9
LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA SPECIES ON THE SITE

Species	Likelihood of occurrence	Notes
Australasian bittern	**Possible**	The Australasian bittern generally prefers freshwater habitats although it may also use dense saltmarsh vegetation in estuaries and flooded grasslands (Smith *et al.*1995, in NPWS 1999).
Beach stone-curlew	Unlikely	This species occurs on sandy shores and well-worn reefs and on estuarine mudflats.
Black bittern	**Possible**	This species occurs in riparian habitats.
Black-necked stork	**Possible**	The Black-necked stork occurs in swamps, mangroves, mudflats, dry floodplains and irrigated land. The Black-necked stork may use grassland habitats in the Study area during periods of inundation.
Bush hen	Unlikely	The Bush hen is normally associated with moist stands of deep rank grass along permanent running streams.
Bush stone-curlew	Unlikely	This species forages and breeds in open-grassed woodlands or sparsely treed rangelands, often with a non-existent shrub layer and abundant leaf litter.
Collared kingfisher	**Possible**	The Collared kingfisher is restricted to mangroves in Australia.
Comb-crested jacana	Unlikely	This species lives on floating vegetation in freshwater lakes and ponds, and has been recorded less than 1 km to the north of the subject site.
Common blossom bat	**Possible**	Common Blossom Bats in NSW, the Southern part of their range, feed mostly on nectar. There are a number of blossom producing trees in the Study area.
Common planigale	**Recorded on the site (Nov 2008)**	This species occupies a wide range of habitats from rainforest, sclerophyll forest, grasslands, marshlands, rocky areas and even some suburban areas.

Species	Likelihood of occurrence	Notes
Double-eyed fig-parrot	Unlikely	This is a very rare species that lives in the canopy of dense rainforest.
Eastern long-eared bat	**Possible**	This species typically roosts in old growth trees with hollows. It may occasionally roost in dense forested vegetation, dead rainforest foliage and under the bark of paperbarks.
Freckled duck	Unlikely	Preferred habitats for the Freckled duck are freshwater swamps or creeks rich in plankton with a heavy growth of cumbungi, lignum or tea-tree.
Glossy black cockatoo	**Recorded on the site JWA 2009**	Found in coastal forests and open inland woodland in eastern Australia. The Glossy black-cockatoos distribution is limited to habitat which contains sufficient seed reserves of their three favoured species of food trees: *Allocasuarina littoralis*, *A. torulosa* and *A. verticillata* (Forshaw 1981) and suitable large hollow bearing trees for nesting. There are numerous *Allocasuarina littoralis* on the subject site.
Grass owl	**Possible**	The Grass owl occupies coastal heath and grassland across northern Australia (Reader's Digest 1993). Areas of tall grass in the Study area may provide some marginal habitat for this species.
Greater broad-nosed bat	**Possible**	This species forages over a range of habitats, including rainforest and moist forests (SFNSW 1995). Creeks and small rivers are favoured corridors (Hoye and Richards 1995).
Green and golden bell frog	Unlikely	This species appears to be associated with semi-permanent or permanent water including marshes, dams and stream-sides. These waterways frequently contained bullrushes (*Typha* sp.) or spike rushes (*Eleocharis* sp.). Bell frogs seem to have disappeared from many of these habitats in NSW, and, in the Greater Sydney Region, are most frequently found in disturbed sites, often extremely so, such as disused industrial sites, brick pits, mines, recently cleared bushland or council tips. Records of this species occur 5km to the south of the site (NPWS Atlas).

Species	Likelihood of occurrence	Notes
Grey-headed flying fox	**Recorded by Woodward Clyde (1996)**	This species travels along the east coast of Australia, foraging on fruiting and blossoming species. Numerous Banksia on the site provide suitable forage for this species.
Koala	**Recorded on site JWA 2003-2004 JWA 2009**	The preferred Koala food trees Swamp mahogany and Scribbly gum occur on the site. Koalas may use the site and area surrounding for feeding and roosting.
Large-footed myotis	**Possible**	This bat forages over water bodies such as creeks, rivers, estuaries, dams etc. Suitable forage habitat occurs in Simpson Creek, and to a lesser extent in drainage lines on the site.
Little bent-wing bat	**Recorded by Woodward Clyde (1996)**	This species generally occupies caves and tunnels during the day and, at night, forages for small insects beneath the canopy of well timbered habitats. It may occasionally roost singularly or in small collectives under the bark of mature paperbark trees.
Long-nosed potoroo	**Possible**	The preferred habitat of this species is dense coastal heath. Suitable habitat occurs in the study area particularly to the south of the Sites. Long-nose potoroos have been recorded in the vicinity and from Tyagarah Nature Reserve.
Magpie goose	Unlikely	The Magpie goose generally inhabits open lakes, swamps and permanent wetlands which are dominated by rush and sedge vegetation.
Mangrove honeyeater	**Possible**	The Mangrove honeyeater inhabits mangroves along coastal estuaries, creeks and rivers, preferring well-developed mangroves for nesting and roosting.
Osprey	**Recorded by Woodward Clyde (1996)**	This raptor is thinly distributed in coastal Australia. It nests in singularly overtopping, generally dead trees. The Osprey hunts in coastal rivers, estuaries and streams and may gather nesting material from nearby forests.

Species	Likelihood of occurrence	Notes
Pied oystercatcher	Unlikely	This species occurs on the coastline and in estuaries around Australia. It inhabits open beaches, intertidal flats and sandbanks and occasionally rocky headlands.
Rose crowned fruit dove	Unlikely	The Rose-crowned fruit dove prefers tall tropical and subtropical evergreen or semi-deciduous rainforest, especially with a dense regrowth of vines.
Swift parrot	**Possible**	The Swift parrot breeds in Tas. During spring and summer and migrates to south-eastern Australia for winter. Mainland populations of this species favour winter-flowering eucalypt forest and woodland, usually where abundant supplies of Eucalypt nectar exist.
Wallum froglet	**Recorded on site JWA 2003 - 2004 WoodwardClyde(1996) JWA 2009**	The Wallum froglet is found in Paperbark swamps growing in areas with acid sandy (Wallum) soils, warm temperate grassland or near the edge of ponds.
Wallum sedge-frog	**Possible**	The Wallum sedge-frog clings to emergent reeds in Wallum swamp habitats. A small area of suitable habitat occurs within the Scribbly gum, Swamp Mahogany community on the Site.
White-eared monarch	**Possible**	This species occurs in rainforest, particularly the edges of subtropical rainforest, contiguous wet sclerophyll forest and occasionally into mangrove swamps or streamside vegetation in Eucalypt woodland.
Wompoo fruit dove	Unlikely	This species is primarily associated with large undisturbed patches of tropical or subtropical evergreen rainforest. Occasionally this species will occur in patches of monsoon forest, closed gallery forest, wet sclerophyll forest, tall open forest, open woodlands or vine thickets near rainforests (Marchant and Higgins 1993).

APPENDIX 3
GREY HEADED FLYING FOX CAMPS

GREY HEADED FLYING FOX IN THE REGION

Grey-headed flying-foxes are found up to 200 kms inland of the east coast of Australia, from North Queensland to Victoria (DEC 2005). The positions of Grey headed flying-fox camps, in the region, are listed below (B. Roberts pers. comm. August 2010) **(TABLE 1).**

TABLE 1
Grey headed flying fox camps in the region

COLONY NAME	LONG.	LAT.	OCCUPATION	NOTES
Big Island	153.51046991	-28.20700499	annual	
Brooks Rd	153.36003824	-28.30182291		
Caddy's Island	153.51562226	-28.19136931	annual	
Chinderah	153.55697696	-28.25421390		
Dallis Park 1	153.38540954	-28.35731310		destroyed
Dallis Park 2	153.38765808	-28.35549236	annual	destroyed
Daveys Island	153.51262113	-28.19657100		
Dulguigan	153.39191553	-28.29215774		destroyed
Ewingsdale*	153.56882600	-28.64225643	occasional	
Marshalls Creek*	153.54229873	-28.51132163	rare	
Mt. Warning	153.22971766	-28.41222173		
Myocum*	153.52836957	-28.59514080	occasional	
Ocean Shores*	153.54181915	-28.53145232	continuous	
Oxley Cove	153.54478683	-28.23259890	annual	
Pottsville	153.56435675	-28.38732598	occasional	
Stotts Island	153.49451901	-28.27250760		
Terania Creek	153.30588938	-28.58151815	annual	
Uki	153.33296557	-28.41485185	annual	
Canungra	153.18140995	-28.04106165	annual	
Cascade Gardens	153.42640843	-28.02046144	continuous	
Currumbin Valley	153.41712409	-28.18706508	occasional	
Helensvale	153.33381210	-27.90238861	continuous	
Mudgeeraba	153.36232828	-28.10712475	occasional	
Southport	153.41246259	-27.98051380	continuous	
Tallebudgera	153.44354369	-28.11586799	annual	

* Indicates camps are within 10 kms of the subject site.

APPENDIX 4
KEY THRESHOLDS ASSESSMENT

KEY THRESHOLDS ASSESSMENT

1. Background

Assessments of significance (TSC Act) are not required as the project is being assessed under Part 3A of the Environmental Planning and Assessment Act 1979. However, the Department of Environment and Conservation and the Department of Primary Industries have provided guidelines for assessing the impacts of development on threatened species through assessing key thresholds with the response to a set of questions (DEC & DPI 2005).

This section firstly provides a discussion on how the proposal addresses the 'Guiding Principles' for threatened species assessment set out in section 1.2 of the *Guidelines for Threatened Species Assessment* (DEC & DPI 2005). Secondly, this section provides an impact assessment the threatened species and the endangered ecological communities, as listed under the Threatened Species Conservation Act (1995) The impact assessment follows Steps 5 of the Guidelines (DEC & DPI 2005).

2. Guiding Principles for Threatened Species Assessment

2.1 Introduction

The Guidelines for Threatened Species Assessment (DEC & DPI 2005) outlines six (6) environmental outcomes to be delivered by proposed developments. The guiding principles are as follows:

1. Maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation).
2. Conserve biological diversity and promote ecologically sustainable development.
3. Protect areas of high conservation value (including areas of critical habitat).
4. Prevent the extinction of threatened species.
5. Protect the long-term viability of local populations of a species, population or ecological community.
6. Protect aspects of the environment that are matters of national environmental significance.

This section will discuss how the proposed development is in accordance with each guideline.

2.2 Guiding principles

> Maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation).

There will be no net impact on the threatened species or the native vegetation within the Subject site. The impacts of the proposed development are discussed in **SECTION 4** (**VOLUME 1)** in the context of the avoidance strategies taken in layout design, proposed mitigation measures and offsets. There will be a net gain in intact Wallum vegetation (3.85 ha) and Endangered Ecological Communities (1.33 ha of Swamp sclerophyll forest on coastal floodplain). In addition Koala food trees will be replaced at a ratio of 2:1 resulting in a net gain of 57 trees.

Conserve biological diversity and promote ecologically sustainable development.

Ecologically sustainable development (ESD) is a concept that has developed over the last 30 years following widespread concern about the effects of growth and development on the natural environment (DECCW 2008). Ecologically sustainable development (ESD) has been defined as: *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*.

The key principles of ESD are:

- **The precautionary principle**
  Reduce the chance of serious environmental problems, even if we are not sure these problems will occur.
- **Inter-generational equity**
  The present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- **Conservation of biological diversity and ecological integrity**
  Maintain or enhance the range of native plants and animals and the health of natural areas.
- **Improved valuation, pricing and incentive mechanisms**
  Environmental factors should be included in the valuation of assets and services, such as: polluter pays - that is, those who generate pollution and waste should bear the cost of avoiding waste, containing it or abatement, and, the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.

The proposed development at Bayside Brunswick is in accordance with the key principles of ESD.

Protect areas of high conservation value (including areas of critical habitat).

The proposed development has protected all areas, on the subject site, with high conservation value with the exception of the loss of a small area of Swamp sclerophyll EEC in the western portion of the site. This loss will be offset by the restoration of 1.41 ha of Swamp sclerophyll resulting in a net gain of 1.33 ha.

Prevent the extinction of threatened species.

The proposed development will prevent the extinction of threatened species and EECs found on the subject site by providing, improving and managing quality habitat for these species and EECs.

Protect the long-term viability of local populations of a species, population or ecological community.

The proposed development will not accelerate the extinction of the species, population or ecological community or place it at risk. A discussion in the context of each listed species/EEC is provided in the following section.

Protect aspects of the environment that are matters of national environmental significance.

The Proposed development will protect matters of Nation Environmental Significance (NES). An assessment against the EPBC Act is provided in **APPENDIX 1 – VOLUME 2.**

2. Key Thresholds Assessment Questions

2.1 Introduction

The response to the first and last questions considers all threatened fauna and EEC's on the site collectively. The 2nd and 3rd questions will be considered either for individual species/EEC or like groups.

1. *Will the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, maintain or improve biodiversity values?*

Biodiversity should be considered on three (3) levels:

- Genetic diversity - the variation of the genes within a species.
- Species diversity – the number of different types of plants and animals.
- Ecosystem diversity – this is the variety of habitat on earth.

The proposed development will maintain Biodiversity on all of these levels. The proposed development will utilise land zoned 2(a), which has a significant disturbance history and is, at present, subject to an approved slashing regime. The diverse range of ecosystems within the 7(a) & 7(b) land will be retained. The diversity of plants and animals within the site will also be relatively unaffected with the retention of the 7(a) & 7(b) land. The effective management of this land may, overtime, improve the biodiversity values of the site.

2. *Is the proposal likely to reduce the long-term viability of a local population of the species, population, or ecological community?*

3. *Is the proposal likely to accelerate the extinction of the species, population or ecological community or place it at risk?*

2.2 Endangered Ecological Communities (EECs)

Three (3) Endangered Ecological Communities (EEC's) occur on the site:

- Swamp Sclerophyll Forest
- Swamp Oak Floodplain Forest
- Coastal Saltmarsh

Swamp Sclerophyll Forest

Swamp sclerophyll forest occurs in an area zoned 7(a) Wetlands & 7(b) Coastal Habitat in the east of the site. Smaller patches also occur in the far west of the site and are not zoned for environmental protection. 1.5% of this community (in the west of the site) will be affected.

Small areas of Swamp sclerophyll communities are known from the following National Parks and Nature Reserves in Northern Region Conservation Reserves (NSW Scientific Committee 2004):

- Bungawalbin Nature Reserve;
- Tuckean Nature Reserve;
- Moonee Beach Nature Reserve;
- Hat Head National Park;
- Crowdy Bay National Park;
- Myall Lakes National Park; and
- Garigal National Park.

None of these occur within the locality of the site. While Paperbark Communities within the Byron Shire are reserved in Billinudgel, Tyagarah and Cumbebin Nature Reserves (Byron Shire Council 1999). Although, it is evident that Swamp sclerophyll communities are poorly conserved within the locality, the proposal is unlikely to accelerate the extinction of this EEC or place it at risk.

Swamp Oak Floodplain Forest

The EEC Swamp Oak Floodplain Forest will not be affected by the proposed development.

The extent of Swamp Oak Floodplain Forest within the Byron LGA has not been mapped. This community will be remain intact on the subject site so it is unlikely that the he proposal will accelerate the extinction or place it at risk of this EEC.

Coastal Saltmarsh

The EEC Coastal Salt Marsh will not be affected by the proposed development.

The extent of Coastal saltmarsh within the Byron LGA has not been mapped. In the locality, saltmarsh communities occur in TNR, adjacent to the site. The extent of Coastal saltmarsh reserved within other conservation reserves in the locality is not known. Although, it is evident that Saltmarsh communities are poorly conserved within the locality, the proposal is unlikely accelerate the extinction of this EEC or place it at risk?

The long term viability of the EEC's on the subject site will not be reduced by the proposed development.

The Proposal is unlikely to accelerate the extinction or place at risk the EEC's on the subject site.

2.3 Fauna

Seven threatened fauna species have been recorded on the subject site and sixteen (16) are considered possible occurrences over time **(APPENDIX 2).** These species will be assessed against the Key Threshold Assessment Questions.

Australasian bittern

Extent of local population

The NPWS database contains three (3) records of this species within 10 kilometres of the subject site and seven (7) sightings within the Byron Shire LGA. There are no records from the Tyagarah Nature Reserve (TNR).

The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Australasian Bittern is widespread but uncommon over south-eastern Australia. In NSW it may be found over most of the state except for the far north-west. The Australasian Bittern favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleoacharis* spp.). It hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January when nests are built in secluded places in densely-vegetated wetlands on a platform of reeds (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Australasian bittern (DEC 2005):

- Drainage of wetlands and ponds.
- Reduced water quality due to siltation, pollution and salinity.
- Predation by foxes and cats.
- Use of herbicides, pesticides and other chemicals near wetland areas.
- Grazing and associated frequent burning of wetland areas.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Black bittern

Extent of local population

The NPWS database contains two (2) records of this species within 10 kilometres of the subject site and fifty seven (57) sightings within the Byron Shire LGA. There is one (1) record from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Black bittern inhabits both terrestrial and estuarine wetlands, generally in areas with permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. It feeds predominantly on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding undertaken at dusk and at night. During the day the animal, roosts in trees or on the ground amongst dense reeds. When disturbed, it freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds), or will fly up to a branch or flush for cover where it will freeze again.

The species is generally solitary, but occur in pairs during the breeding season, from December to March. Like other bitterns, but unlike most herons, nesting is solitary. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. Between three and five eggs are laid and both parents incubate and rear the young (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Black bittern (DEC 2005): clearing of riparian vegetation; predation by foxes and feral cats on eggs and juveniles; and grazing and trampling of riparian vegetation by stock.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Black-necked stork

Extent of the local population

The NPWS database contained five (5) records of this species within 10km of the site, and thirty eight (38) sightings of this species in the Byron Shire LGA. There is also one (1) record from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

Black-necked storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.

They mainly forage in shallow, still water, prefering open wetlands, and taking a variety of prey, including eels and other fish, frogs, turtles, snakes, and small invertebrates, such as crabs and small insects. Vertebrates form the main mass of the diet, with medium-sized eels contributing the greatest biomass and were also the only food seen to be delivered to nestlings.

In NSW, breeding activity has been recorded in most months, with activities from nest construction to fledging of young recorded from May to January. Most activity, however, takes place between June and December, and clutches present May to September. In NSW, Storks usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 m in diameter, made in a live or dead tree, in or near a freshwater swamp. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. Between three and five eggs are laid and both parents incubate and rear the young (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Black necked stork (DEC 2005):

- Degradation of wetland habitats through pollution and salinisation;

- Loss of paddock trees used for nesting, or potentially providing nesting sites for Black-necked Storks;

- Powerlines, especially close to wetlands or over floodplains, are a significant cause of mortality of Storks and one of the most critical threats to the species in NSW;

- Modification or degradation of wetlands through changes in natural water flows. It is important to maintain or reintroduce flows to provide wetland habitats suitable for foraging by Storks as they require large amounts of vertebrate prey from such habitats; and

- Loss of wetland habitat through clearing and draining for flood mitigation, agriculture and residential development.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Collared kingfisher

Extent of the local population

The NPWS database contained five (5) records of this species within 10 kilometres of the subject site and one (1) sighting within the Byron LGA. There is one (1) record from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

This species is distributed around northern Australia. In NSW it is locally common in the estuaries of northern NSW where it breeds. Rarely found south of this area. This species is restricted to mangroves and estuarine habitats of larger river systems. Threats include destruction of mangrove habitat, loss of coastal trees containing hollows and termite nests, pollution of estuaries and the use of pesticides to protect residential developments.

Mangrove habitats will not be directly affected by the proposed development. There may be some minor impacts associated with increased disturbance from visitors to creek habitats.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Common blossom bat

Extent of the local population

The NPWS database contained sixteen (16) records of this species within 10 kilometres and thirty two (32) sightings within the Byron Shire LGA. There are six (6) records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Common blossom-bat shows preference with regards to feeding sites, often repeatedly visiting the same sites on consecutive nights within a flowering season and returning to the aforementioned site over several years. They require a year round supply of nectar and pollen, which is gathered from a mosaic of coastal complex vegetation types. When these vegetation types are in short supply of nectar and pollen (Nov/Dec in northern NSW) Common Blossom-bats have been known to utilise riverine areas containing Black Bean, Silky Oak and Weeping Bottlebrush. Common Blossom-bats often roost in littoral rainforest and feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps. They have also been recorded in a range of subtropical forest types, rainforest, wet sclerophyll forest and coastal Eucalypt forest. Individuals of the species generally roost individually in dense foliage and vine thickets of the sub-canopy, staying in the same general area for a season. They change roost sites daily, but each roost site is generally only 50m or so away from other recent roosts (DEC 2005, Churchill 1998).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Common blossom-bat (DEC 2005): predation by foxes and feral cats, which may occur whilst the bat is feeding on low hanging flowers and fruit; inappropriate fire regimes applied in heathland habitats leading to reduced flowering of Banksia, Callistemon and Melaleuca species; clearing of coastal habitat for urban development or sandmining; and weeds, such as Bitou Bush, that suppress the regeneration of key food trees, such as Coastal Banksia (DEC 2005).

A relatively small number of potential forage trees (mostly Heath-leaved Banksia) will be lost. Approximately, 5ha of potential habitat for this species will be lost, however, no roost habitat will be affected. Substantial areas of quality forage habitat occur east and south of the site in TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Common planigale

Extent of local population

The NPWS database contained fifteen (15) records of this species within 10 kilometres of the subject site and 53 within the Byron LGA. There are seven (7) records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was recorded in a survey in November 2008 on land to the south of the subject site **(FIGURE 22 – VOLUME 1).**

Habitat and life-cycle

The Common planigale inhabits rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually in locations with close proximity to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. The species are fiercely carnivorous hunters and agile climbers, preying on insects and small vertebrates, some nearly their own size. They breed from October to January where the female builds a nest lined with grass, eucalypt leaves or shredded bark (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Common planigale (DEC 2005): predation by foxes, cats and cane toads; loss and fragmentation of habitat through clearing for agriculture and development in coastal areas; frequent burning and grazing that reduces ground cover such as hollow logs and bark; and disturbance of vegetation surrounding water bodies.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Eastern long-eared bat

Extent of local population

The NPWS database contained twenty one (21) records of this species within 10km of the site, and no records from the TNR. The NPWS online database contained ninety one (91) sightings of this species in the Byron Shire LGA. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Eastern long-eared bat can be found in lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. It shows particular preference to coastal rainforest and patches of coastal. The bats roost in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Eastern long-eared bat (DEC 2005): clearing, fragmentation and isolation of lowland subtropical rainforest, wet and swamp eucalypt forest and coastal scrub, particularly forest and scrub close to the coast, for agricultural, residential and other development; loss of hollow-bearing trees and stands of palms and rainforest trees used for roosting and maternity sites; invasion of habitat by weeds, particularly by Bitou Bush on the coast; and the use of pesticides.

Approximately, 5ha of potential habitat for this species will be lost, however, no roost habitat will be affected. Substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.
Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Freckled Duck

Extent of the local population

The NPWS database contained four (4) records of this species within 10km of the site, and no records from the TNR. The NPWS online database contained six (6) sightings of this species in the Byron Shire LGA. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Freckled duck prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. In drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Generally they rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates.

Nesting usually occurs between October and December but can take place at other times when conditions are favourable. Nests are usually located in dense vegetation at or near water level (DEC 2005).

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Glossy black-cockatoo

Extent of local population

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

The NPWS database contained one (1) record of this species within 10km of the site and thirty five (35) sightings within the Byron Shire LGA. There are no records within the TNR. This species was recorded on the subject site by evidence of chewed Casuarina cones **(FIGURE 23 – VOLUME 1)**. The local population for this species is considered to be comprised of all individuals recorded at the site as well as any individuals within adjoining areas (contiguous or otherwise) that are known or likely to use habitat in the study area.

Life-cycle attributes

The Glossy black-cockatoo inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black she-oak (*Allocasuarina littoralis*), Forest she-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. It feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill.

The Glossy black-cockatoo is dependent on large hollow-bearing eucalypts for nest sites. Adults breed during the autumn and winter. One or two eggs are laid between March and August. During the 29 days of incubation the female is dependent on the male for food as she usually remains on the nest in a large tree hollow, lined with chips and dust. Only one young bird is raised per season and a juvenile may associate with its parents for an indefinite period after fledging at approximately 60 days.

Potential impacts of the proposed development

Based on the results of the site survey it is considered that the subject site provides suitable habitat for this species. There are scattered occurrences of mature Forest oak (*A. torulosa*) which provide forage opportunities and potential nesting sites (i.e. trees with large hollows) were also observed.

The DECCW website lists the following threats to the Glossy black-cockatoo:

- Reduction of suitable habitat through clearing for development;
- Loss of tree hollows;
- Excessively frequent fire which reduces the abundance and recovery of she-oaks and also may destroy nest trees; and
- Illegal bird smuggling and egg-collecting.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Grass owl

Extent of local population

The NPWS database contained eighteen 18) records of this species within 10km of the site and twenty-five (25) sightings within the Byron Shire LGA. There are four (4) records within the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' (i.e. a trampled platform in a large tussock or other heavy vegetative growth). If disturbed they burst out of cover and fly low and slowly, before dropping straight down again into cover. They always breeds on the ground and nests are found in trodden grass which is usually accessed by tunnels through the vegetation (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Grass owl (DEC 2005):

- Loss of suitable habitat due to grazing, agriculture and development.
- Habitat disturbance and degradation by stock.
- Use of pesticides in agriculture to control rodent populations thereby limiting seasonal food sources for owls, reducing reproductive potential, and potentially poisoning owls.
- Frequent burning, which reduces ground cover needed for safe roosting and nesting, and can reduce prey abundance.

The proposed development will result in the reduction of forage habitat for this species (i.e. approximately 14ha) and the loss of marginal roosting/resting habitat. Extensive areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Greater broad-nosed bat

Extent of the local population

The NPWS database contained three (3) records of this species within 10km of the site and five (5) sightings within the Byron Shire LGA. There are no records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Greater broad-nosed bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest. It is most commonly found in tall wet forest. The species usually roosts in tree hollows but has also been found in buildings. It forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects. This species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January. Prior to birth, females congregate at maternity sites located in suitable trees and exclude males during the birth and raising of the single young (DECC 2005).

Direct and indirect Impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Greater broad-nosed bat (DEC 2005): disturbance to roosting and summer breeding sites; loss of foraging and roosting habitat from vegetation clearing; a reduction in the availability of insects, or the accumulation of toxic residues in bats' fat stores due to the use of pesticides and herbicides; and an alteration to food resources due to changes in water regimes (DECC 2005).

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Grey-headed flying-fox

Extent of local population

The NPWS database contained forty-three (43) records of this species within 10km of the site, and 259 sightings in the Byron Shire LGA. There are four (4) records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life- cycle

The Grey-headed flying fox can be found in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating,

birth and the rearing of young. Annual mating commences in January and a single young is born each October or November. Site fidelity to camps is high with some camps being used for over a century. This species will travel up to 50 km to forage, feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. They also forage in cultivated gardens and fruit crops and can inflict severe crop damage (DECC 2005).

Direct and Indirect impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Grey-headed flying fox (DEC 2005): loss of foraging and roosting habitat due to vegetation clearing; death and/or injury from unregulated shooting; electrocution on powerlines; and disturbance to roosting sites.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Koala

Extent of local population

The NPWS database contained 1254 records of this species within 10km of the site and 1478 recorded sightings in the Byron LGA. There are three (3) records from the TNR. This species was recorded on the subject site **(FIGURE 24 – VOLUME 1)**. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site.

Habitat and Life-cycle

Koalas inhabit eucalypt woodlands and forests. They feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will search for preferred browse species. They are often observed being inactive for most of the day, feeding and moving mostly at night. They spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. They are generally non-gregarious, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year (DEC 2005).

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following direct and indirect impacts as threats to the survival of the Koala (DEC 2005): Human-induced climate change, especially in the form of prolonged drought; loss, modification and fragmentation of

existing habitat; predation by feral and domestic dogs; intense fires that scorch or kill the tree canopy of preferred nesting and feeding trees. Death as a result of motor vehicles is another listed threat.

The proposed development will add to the ongoing reduction and fragmentation of habitat for this species, and will result in the loss of approximately 0.5 ha of wet sclerophyll forest in which the preferred Koala food tree Swamp mahogany and Scribbly gum occur, and 0.22 hectares of dry sclerophyll forest dominated by the preferred Koala food tree Scribbly gum. Koala habitat will, however, be retained within the environmental protection area and Koala food trees will be replaced at a ratio of 2:1.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species. Conversely, the proposed revegetation and regeneration practices outlined in this report could embellish the amount of suitable habitat which occurs on the subject site.

Large-footed myotis

Extent of the local population

The NPWS database contained 208 records of this species within 10km of the site, and 217 sightings in the Byron Shire LGA. There is one (1) recording from the TNR.

This species has been recorded along Simpsons Creek adjacent to the sewage treatment plant. Both AKF (1995) and WWC (1996) have recorded the species foraging along similar tidal creeks in the Shire.

The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

Habitat and Life-cycle

The Large footed myotis generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. It will forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December (DEC 2005).

Direct and indirect impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Large footed myotis (DEC 2005):

- Reduction in stream water quality affecting food resources
- Loss or disturbance of roosting sites.

- Clearing adjacent to foraging areas.
- Application of pesticides in or adjacent to foraging areas.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Little bent-wing bat

Extent of the local population

The NPWS database contained 101 records of this species within 10km of the site and one hundred and twenty-eight (128) sightings in the Byron Shire LGA. There is one (1) record from the TNR. This species was recorded on the subject site by the 1996 (WWC) survey. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

Habitat and life-cycle

The Little bent-wing bat shows a preference for well timbered areas including rainforest, wet and dry sclerophyll forest, Melaleuca swamps and dense coastal banksia scrub. They roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common bent-wing bat (*M. schreibersii*) and, in winter, the two species may form mixed clusters.

Direct and indirect impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Little bent-wing bat (DEC 2005): death and/or injury from predation by foxes and feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges; disturbance of colonies, especially in nursery or hibernating caves; destruction of caves that provide seasonal or potential roosting sites; changes to habitat, especially surrounding maternity/nursery caves and winter roosts; and death and/or disease from the use of pesticides.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species.

Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Long-nosed potoroo

Extent of the local population

The NPWS database contained fifteen (15) records of this species within 10 kms of the site, and twenty (20) sightings in the Byron Shire LGA. Two (2) records occur approximately 2 kms south of the subject site. There are eleven (11) records from the TNR. The Long-nosed potoroo was not recorded in recent fauna surveys.

The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

The Long-nosed potoroo inhabits coastal heaths and dry and wet sclerophyll forests. They are also found in areas of dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. They often digs small holes in the ground in a similar way to bandicoots.

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Long-nosed potoroo (DEC 2005): habitat loss and fragmentation from land clearing for residential and agricultural development; predation from foxes, dogs and cats; and logging regimes or other disturbances that reduce the availability and abundance food resources, particularly hypogeous fungi, and ground cover

The slashing of heathland communities on the site over a long period of time has significantly reduced suitable habitat for the Long-nosed potoroo, however some suitable habitat occurs in the east of the site. The proposed development is unlikely to significantly reduce suitable habitat for this species, although it will reduce opportunities for movement, and increase the risks of predation from straying dogs.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Magpie goose

Extent of the local population

The NPWS database contained one (1) record of this species within 10km of the site which also occurs within the Byron Shire LGA. There are no records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and Life-cycle

Magpie geese are found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. They are equally at home in aquatic or terrestrial habitats and are often seen walking and grazing on land. They feed on grasses, bulbs and rhizomes. Breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level. Most breeding now occurs in monsoonal areas in northern Australia (DEC 2005).

Direct and indirect impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Magpie goose (DEC 2005):

- Drainage of swamps, ponds, dams and other wetlands;
- Degradation of habitat through pollution;
- Changing water flow in and from wetlands;
- Disturbance to breeding and feeding sites; and
- Fox predation on eggs and goslings.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Mangrove honeyeater

Extent of the local population

The NPWS database contained three (3) records of this species within 10km of the site which comprises of all the records within the Byron Shire LGA. There are no records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and Life-cycle

The primary habitat of the species is mangrove woodlands and shrublands but Mangrove honeyeaters also range into adjacent forests, woodlands and shrublands, including Casuarina and Paperbark swamp forests and associations dominated by eucalypts or banksias. They occasionally forage in parks and gardens of coastal towns and villages. The Mangrove honey eater usually builds a nest in a densely foliaged mangrove tree and breeds in late winter and early summer. Mangrove honeyeaters eat nectar, from flowers, and invertebrates, including marine snails and crabs. They generally forage in mangroves, mainly taking food from among the foliage but also feeding at flowers, and from the trunks and roots. They also sometimes forage among flowering trees and shrubs in adjacent habitats (DEC 2005).

Direct and indirect impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Mangrove honey eater (DEC 2005):

- The unknown but apparently small population of this species in NSW, restricted to a few known sites, leaves the mangrove Honeyeater vulnerable to declines resulting from unpredicted and random events.

- Clearing of mangroves, especially old stands, and adjoining forest and woodland vegetation, for residential, infrastructure or tourism, development, or for aesthetic reasons associated with such development.

- Use of herbicides and pesticides in agriculture and to protect tourist and residential areas that may affect habitat of the species or prey densities.

- Pollution of estuaries and mangrove vegetation and accumulation of herbicide and pesticide residues resulting from agricultural, tourism and residential use of pesticides.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Osprey

Extent of the local population

The NPWS database contained thirty-two (32) records of this species within 10km of the site and fifty-three (53) within the Byron Shire LGA. There is one (1) record from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

Habitat and life-cycle

Ospreys forage for fish in fresh, brackish or saline waters of rivers, lakes, estuaries and inshore coastal waters. A breeding pair requires a suitable foraging area with nesting sites nearby. The nest is a large bulky structure of dead sticks, often located in a tall dead tree or on artificial structures such as power transmission poles or towers. It is used year after year for as long as it lasts (Marchant and Higgins 1993; DEC 2005).

Direct and Indirect Impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Osprey (DEC 2005): loss of potential nest trees near the coast due to coastal urban development; disturbances and degradation to water quality from the disposal of treated effluent or stormwater runoff (e.g. increases in turbidity); disturbance from human activity to areas of any potential nest sites; disturbance from straying domestic pets and death and/or disease from the ingestion of fish containing discarded fishing tackle.

Simpson's Creek (i.e. forage area for the Osprey adjacent to the subject site) will not be affected by the proposed development. There may be minor indirect impacts to this species with the removal of potential nest trees.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

Swift Parrot

Extent of local population

The NPWS database contained one (1) record of this species within 10km of the site, and one (1) sighting in the Byron Shire LGA. There are no records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and Life-cycle

The Swift parrot migrates to the Australian south-east mainland between March and October. On the mainland they generally occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Preferred feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta)*, Spotted Gum (*Corymbia maculata)*, Red Bloodwood (*C. gummifera)*, Mugga Ironbark (*E. sideroxylon*, and White Box (*E. albens)*. Commonly used lerp infested trees include Inland Grey Box (*E. macrocarpa)*, Grey Box (*E. moluccana)* and Blackbutt (*E. pilularis)*. Some individuals have been recorded returning to foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum (*Eucalyptus globulus)*.

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following impact as being the major threat to the survival of the Swift parrot (DEC 2005): clearing and degradation of rainforest remnants.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species. Conversely, the proposed revegetation and regeneration practices outlined in this report could embellish the amount of suitable habitat which occurs on the subject site.

Wallum froglet

Extent of the local population

The NPWS database contained fifty-two (52) records of this species within 10km of the site and 107 sightings of this species in the Byron Shire LGA. There are seventeen (17) records from the TNR. This species was recorded on the subject site **(FIGURE 21 – VOLUME 1).**

The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

Habitat and life-cycle

Wallum froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country. The species is a late winter breeder. Males call in choruses from within sedge tussocks or at the water edge (DECC 2005).

Direct and indirect Impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Wallum froglet (DEC 2005):

- Impact of pest vertebrate species
- Destruction and degradation of coastal wetlands as a result of roadworks, coastal developments and sandmining.
- Reduction of water quality and modification to acidity in coastal wetlands.
- Grazing and associated frequent burning of coastal wetlands.

Wallum froglets have been recorded within the drainage lines on the subject site and adjacent vegetation. Approximately 0.50 ha of suitable Wallum froglet habitat will be lost and the proposed development is likely to have a minor impact on the froglet population. However, Wallum habitat will be retained on site in addition to incorporating Wallum froglet habitat into the site Storm Water Management Plan. This will result in a net gain of 0.70ha of Wallum froglet habitat. A substantial population of this species occurs to the east and south of the site in TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

<u>Wallum sedge-frog</u>

Extent of the local population

The NPWS database contained twenty-four (24) records of this species within 10km of the site and thirty (30) sightings of this species in the Byron Shire LGA. There are twelve (12) records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Habitat and life-cycle

Paperbark swamps and sedge swamps of the coastal "wallum" country. Wallum is a Banksia dominated lowland heath ecosystem characterised by acidic water bodies. Olongburra Frogs are usually found amongst sedges and rushes in coastal wetlands (DECC 2005).

Direct and indirect Impacts

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Wallum sedge frog (DEC 2005):

- Predation by vertebrate pest species.
- Destruction and degradation of coastal wallum and coastal wetlands for roadworks, coastal developments and sand mining.
- Reduction of water quality and changes to acidity in coastal wetlands.
- Grazing and associated frequent burning of coastal wetlands.

Approximately 0.50 ha of suitable habitat for this species will be lost. However, this is considered to be a minor impact in the context of the large areas of quality habitat to the east and south of the site in TNR. In addition the Wallum sedge-frog will benefit from the compensatory habitat planned for the Wallum froglet.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

White-eared monarch

Extent of local population

The White-eared monarch is endemic to the coastal lowlands and eastern slopes of the Great Divide of eastern Australia, extending from Cape York Peninsula south to north-eastern NSW. In NSW, White-eared Monarchs are generally found from the Queensland border south to Iluka at the mouth of the Clarence River, and inland as far as the Richmond Range. There are occasional records south of the Clarence River, near Woolgoolga and around Port Macquarie.

The NPWS database contained nine (9) records of this species within 10km of the site and 171 sightings of this species in the Byron Shire LGA. There are no records from the TNR. The local population for this species is considered to comprise of all individuals that are likely to occur on the subject site as well as any individuals within contiguous habitat, which could reasonably be expected to be mating with individuals on the subject site, including those individuals utilising the TNR.

This species was not recorded on the subject site but is considered to be a possible occurrence over time.

Life-cycle attributes

The White-eared monarch is highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees. They are usually observed high in the canopy or sub-canopy. They eat insects, but their diet is not well studied. They breed from about September to March, usually nesting high in the canopy, and often at the edge of patches of rainforest. In NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads.

Potential impacts of the proposed development

The NSW National Parks and Wildlife Service consider the following, direct and indirect impacts, as threats to the survival of the Wallum sedge frog (DEC 2005):

- Predation by vertebrate pest species
- Destruction and degradation of coastal wallum and coastal wetlands for roadworks, coastal developments and sand mining.
- Reduction of water quality and changes to acidity in coastal wetlands.
- Grazing and associated frequent burning of coastal wetlands.

The development will not result in the loss of any potential habitat for this species. In addition, substantial areas of similar or better habitat occur in the 7(a) & 7(b) zone and to the east and south within the TNR.

Likelihood of local extinction

The proposed development is not considered to represent a significant impact in relation to the distribution of habitat, in the locality, for the local population of this species. Therefore, it is considered that the proposed development is unlikely to result in the extinction, either in the short- or long-term, of the local population of this species.

The long term viability of any of the above discussed fauna on the subject site will not be reduced by the proposed development.

The Proposal is unlikely to accelerate the extinction or place at risk the threatened fauna species recorded on the subject site.

2. *Will the proposal adversely affect critical habitat?*

Critical habitats are areas of land that are critical to the survival of a particular threatened species, population or ecological communities. Critical habitat areas are listed under the Threatened Species Conservation Act (1995). There is currently no critical habitat listed or recommend for any of the species or EEC's found on the subject site.

APPENDIX 5
WALLUM FROGLET COMPENSATORY HABITAT

WALLUM FROGLET COMPENSATORY HABITAT

1. Background

Few attempts to replicate or re-instate breeding areas for 'Acid frogs' have been undertaken and documented in Australia. It is recognised, however, that the Wallum froglet will rapidly re-colonise disturbed areas previously containing 'Wallum' vegetation. In these instances common attributes are shallow water bodies in sandy soils and of low pH and electrical conductivity (Ecosense Consulting Pty Ltd, 2005).

Compensatory habitat for 'Acid frog' species was created during the construction of the Tugun Bypass. The relevant sections of the Compensatory Habitat Plan prepared for the Tugun Bypass are attached as **APPENDIX 5 – Volume 2.** The design requirements of the Tugun Bypass frog ponds were determined through consultation with a number of recognised authorities on 'Acid frogs'.

A number of recommendations were provided by these experts based on observations made during field & laboratory work (Ecosense Consulting Pty Ltd, 2005):

- Ponds should be constructed in sandy substrates (which previously contained 'Wallum') with an underlying organic hardpan;
- Ponds should generally be shallow and constructed in areas of high groundwater;
- Water quality should exhibit the following characteristics:
    - pH <5 (as influenced by humic soils);
    - hardness < 100 p.p.m;
    - salinity < 350 uS.cm^{-1};
- Ponds should be ephemeral to prevent habitation by fish but have a minimum hydro-period of 4-6 weeks for the Wallum froglet; and
- Pond fringes should be densely planted with emergent species to prevent predation by the Cane toad (*Bufo marinus*).

Four (4) frog ponds were constructed within compensatory habitat areas adjoining the Tugun Bypass. Both the Wallum froglet and the Wallum sedge frog (*Litoria olongburensis*) have been recorded within these constructed ponds (Pacific Alliance 2010). Furthermore, water treatment basins constructed around the bypass have had the added benefit of providing additional frog habitat. Wallum froglets have been recorded calling from several water treatment basins on numerous occasions during monitoring events (PacificLink Alliance, 2007).

The loss of Wallum froglet habitat **(FIGURE 27 – Volume 1)** will be mitigated through the creation of compensatory habitat areas**.** These areas will be designed to provide additional core habitat areas on the subject site and will be created in accordance with a Wallum Froglet Compensatory Habitat Plan (WFCHP).

TABLE 1 shows the net gain/loss of potential wallum froglet habitat after these proposed rehabilitation measures.

TABLE 1
NET GAIN OF POTENTIAL WALLUM FROGLET HABITAT AFTER REHABILITATION

Total Habitat (ha)	Habitat Retained (ha)	Total Habitat Lost (ha)	Constructed Wallum Frog Habitat (ha)	Net gain/loss (ha)
5.49	4.99	0.50	1.20	+0.70

The area designated as 'Proposed froglet habitat' on the plans will be subject to excavation prior to rehabilitation works **(FIGURE 30 – Volume 1).** Extensive engineering and revegetation is therefore likely to be required in establishing the acid frog habitat. It should be noted that acidic conditions within the 'proposed froglet habitat' need to be maintained in order to provide suitable habitat for acid frogs. Treatment with lime of Acid sulphate soils within and immediately adjacent to the 'proposed froglet habitat' area should therefore be avoided. Alternatively, stockpiles of acidic soil should be created during the initial excavations preceding the creation of the habitat area. This soil should be used to line pondage areas to ensure acidic conditions are created and maintained.

The specific details of the habitat design will be outlined in a Wallum Froglet Compensatory Habitat Plan (WFCP) to be prepared at the DA stage. The following will be included in the plan:

- Creation of artificial ponds that are conducive to *C. tinnula* foraging through earthworks (e.g. excavation). A number of small shallow scrapes and holes should be randomly excavated within the 'proposed froglet habitat' area resulting in the creation of isolated ponds allowing inundation by rain/flooding.
- The ponds may need to be clay lined to avoid drawdown by infiltration. The ponds should be ephemeral in nature but need to hold water for a minimum of 30 days after significant rainfall events to promote successful breeding;
- Control of exotic plant species through the use of best practice techniques;
- Regeneration/revegetation works (i.e. utilising suitable 'aquatic' and 'wallum' plant species);
- Pest control (i.e. Gambusia and Cane toads) of areas within and adjacent to the 'proposed froglet habitat'; and
- Provision of bollards (or similar) to exclude traffic.

2. Stormwater Management and Wallum Froglet Habitat Construction

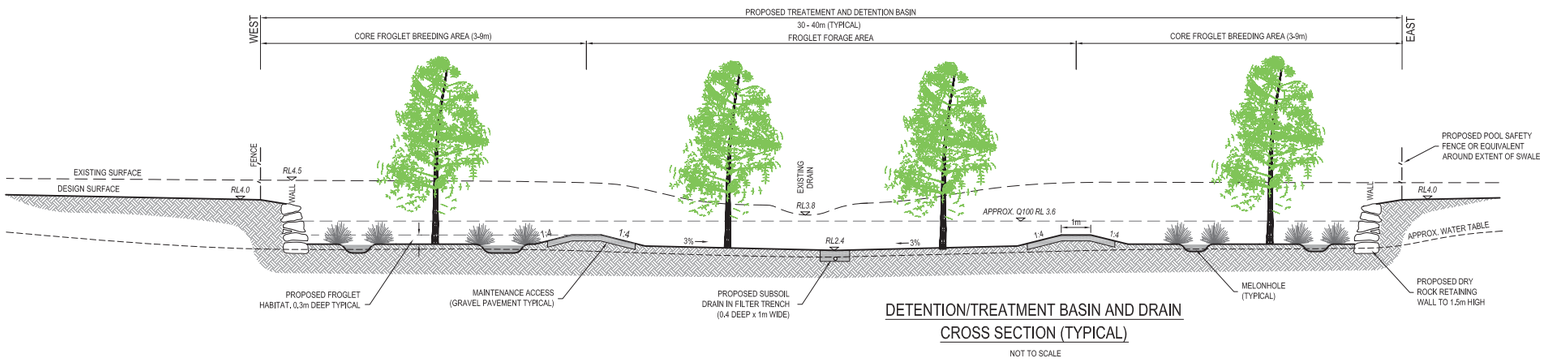
Stormwater management within the proposed development includes the regrading of the main drainage line through the centre of the site. This construction will involve the cut of material (for fill use on other parts of the site) to allow adequate stormwater drainage from the site. The drain area will then be re-contoured and Wallum froglet core and forage

habitat will be created within this stormwater management system (**FIGURE 30 – Volume 1**). It should be noted that Core wallum froglet habitat will also function as forage habitat. A typical section and plan view of the proposed stormwater treatment and frog habitat swale is provided in **FIGURE 1 – Volume 2.** The re-contoured central drainage line will be comprised of two parts:

1. Low flow channel (forage habitat)
   - conveys the first flush stormwater;
   - includes sub-soil drainage and a bio-filtration trench;
   - will be rehabilitated with Swamp sclerophyll vegetation which will eventually provide forage habitat for Wallum froglets during suitable conditions.
2. High flow channel (Core habitat)
   - Construction will create core Wallum froglet habitat on the slightly more elevated areas on either side of the low-flow channel (separated from the low-flow channel by earth berms);
   - These areas will receive pre-treated stormwater during 1 year (and greater) storm events;
   - The core Wallum froglet habitat will include the creation of melon holes by using an excavator bucket to form holes approximately 60cm deep by at least 1.8m long;
   - These holes will be created to intercept the water table to ensure water is available for an extended period of time and allow for successful breeding;
   - It would be expected that the water in these melon holes would evaporate during extended dry periods;
   - Dense plantings of Saw-sedge (*Gahnia* spp.), Curly sedge (*Baloskion* spp.) and Matrush (*Lomandra* spp.) will occur around the margins of these melon holes to ensure almost complete coverage of the hole by the sedges;
   - The narrow design of the melon holes, coupled with the dense planting of Rushes and Sedges, will assist in the prevention of mosquito breeding, protect tadpoles from predation and preclude the occurrence of Cane toads.

The entire central drainage area, including the low flow channel and the created core Wallum froglet habitat, will be planted with a combination of scattered Broad-leaved paperbarks (i.e. 12m centres) and Wet heath species.

Water quality will be the major determinant in the success of the compensatory habitat. In June and October 2009 water quality sampling was completed on the Bayside Brunswick site by Waste Solutions Australia Pty Ltd. Water samples taken from the main drainage line (i.e. the area where compensatory habitat is to be created) have revealed a pH ranging from 3.07 – 4.36, and electrical conductivity ranging from 129.6 $uS.cm^{-1}$ - 138 $uS.cm^{-1}$. No measurement of hardness was obtained, however due to the low pH readings it is likely that the hardness of the water is quite low.



DETENTION/TREATMENT BASIN AND DRAIN
CROSS SECTION (TYPICAL)

NOT TO SCALE

LEGEND

- Proposed Broad leaf paperbark - at 12m centres
- Proposed melanhole (0.6x1.8m TYP.) surrounded by Saw sedges
- Proposed dry rock retaining wall (1.5m high)

0 10m

1 : 250

SOURCE: Landpartners (Ref: LM080082-DR29B.pdf) amended by JWA

SCALE: 1 : 250 @ A3

JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

CLIENT
Codlea Pty Ltd

PROJECT
Ecological Assessment
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

VOLUME 2
FIGURE 1

PREPARED: BW
DATE: 07 November 2012
FILE: N97066_Frog Habitat.cdr

TITLE
TYPICAL WALLUM FROGLET HABITAT PLAN & SECTION

A comparison of the compensatory habitat proposed at Bayside Brunswick with the design criteria of the Tugun Bypass frog ponds is provided in **TABLE 2.**

TABLE 2
COMPARISON OF BAYSIDE BRUNSWICK & TUGUN BYPASS COMPENSATORY HABITAT

DESIGN CRITERIA FOR THE TUGUN BYPASS FROG PONDS	PROPOSED BAYSIDE BRUNSWICK COMPENSATORY HABITAT
Ponds should be constructed in sandy substrates (which previously contained 'Wallum') with an underlying organic hardpan;	The proposed compensatory habitat area occurs on a sandy substrate (Waste Solutions Australia Pty Ltd 2010) which historically contained 'Wallum' vegetation. If necessary, topsoil/organic material will be stockpiled during initial earthworks and used to line constructed frog habitat areas.
Ponds should generally be shallow and constructed in areas of high groundwater;	Constructed melon holes will be a maximum of approximately 60cm deep and will be created to intercept the water table.
Water quality should exhibit the following characteristics: o pH <5 (as influenced by humic soils); o hardness < 100 p.p.m; and o salinity < 350 uS.cm^{-1}.	Water quality results (Waste Solutions Australia Pty Ltd 2010) from the proposed compensatory habitat area are as follows: o pH of 3.07 – 4.36; o hardness has not been determined however the low pH readings are likely to result in a hardness < 100 p.p.m; o salinity of 129.6 uS.cm^{-1} - 138 uS.cm^{-1}.
Ponds should be ephemeral to prevent habitation by fish but have a minimum hydro-period of 4-6 weeks for the Wallum froglet; and	Proposed melon holes will be constructed to ensure water is available for an extended period of time and allow for complete metamorphosis of the tadpoles.
Pond fringes should be densely planted with emergent species to prevent predation by the Cane toad (*Bufo marinus*).	Dense plantings of Saw-sedge (*Gahnia* spp.), Curly sedge (*Baloskion* spp.) and Matrush (*Lomandra* spp.) will occur around the margins of the melon holes.

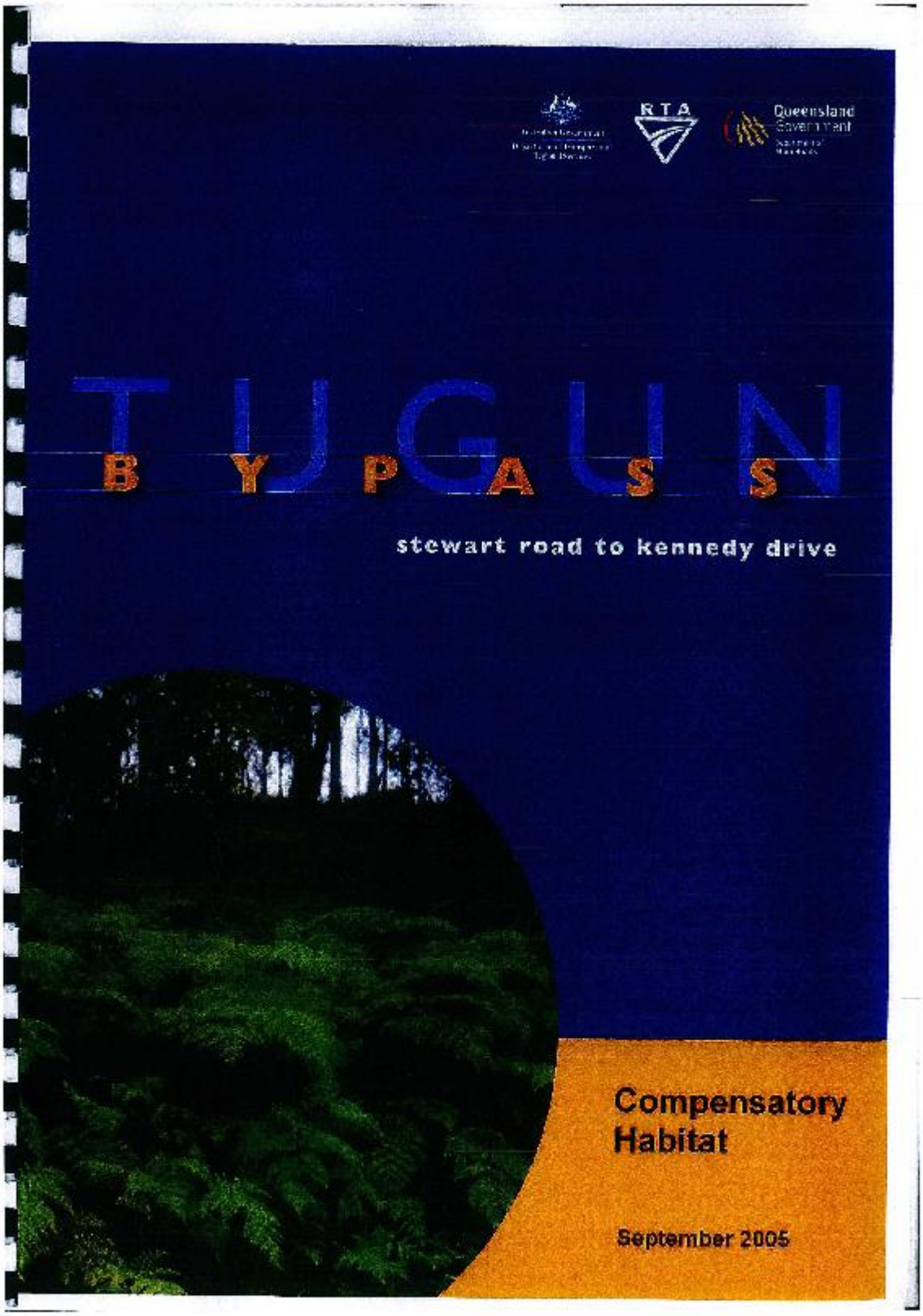
Further to the comparison above, which shows the similarities between the two compensatory habitat proposals, it is noted that the configuration of the frog ponds at the Tugun Bypass comprised a small number or larger ponds, whereas the Bayside Brunswick proposal provides a larger number of small ponds (melon holes). This design feature has been incorporated to discourage the use of the ponds by Mosquitoes. As the Tugun Bypass ponds are not immediately adjacent to a residential area, this would not likely have been a design consideration.

A Wallum Froglet Compensatory Habitat Plan (WFCHP) will be completed to guide the construction of the frog habitat during the completion of the earthworks. The plan will be

prepared in accordance with the National recovery plan for the wallum sedgefrog and other wallum-dependent frog species (Queensland Environmental Protection Agency 2006). The WFCHP will include (but not be limited to) the following:

- detailed frog pond design criteria;
- performance criteria;
- a detailed habitat and population monitoring program; and
- contingencies in the event that constructed habitats perform poorly.

APPENDIX 6
COMPENSATORY HABITAT PLAN
TUGUN BYPASS


RTA
Queensland Government
TUGUN
BYPASS
stewart road to kennedy drive
Compensatory Habitat
September 2005

8.0 List of Appendices

Appendix A *Frog Ponds*

Few attempts to replicate or reinstate breeding areas for 'acid frogs' have been undertaken and documented in Australia. It is well recognised however that the Wallum Froglet and to a lesser extent, the Wallum Sedge Frog will rapidly recolonise disturbed areas, previously described as 'Wallum'. In these instances common attributes are shallow water bodies in sandy soils and of low pH and electrical conductivity. It therefore anticipated that with careful and planned intent, artificial ponds can be constructed to replace those impacted by the proposed Tugun Bypass.

Consultation with recognised authorities on 'acid frogs' has been undertaken to determine the design requirements and location for artificial ponds. A list of these people is provided below.

Dr. Glen Ingram	Biodiversity Assessment and Management Pty Ltd
Dr. Michael Mahoney	University of Newcastle
Dr. Ed Meyer	Griffith University
Mr. Harry Hines	Queensland Parks and Wildlife Service
Mr. Robert Payne	Ecological Survey and Management
Mr. Ben Lewis	Lewis Ecological Surveys

A number of recommendations were provided during these discussions based on observations made during field and laboratory work. A summary of commonalities is provided below:

- ponds should be constructed in sandy substrates (which previously contained 'Wallum') with an underlying organic hardpan,
- ponds should generally be shallow and constructed in areas of high groundwater,
- water quality should exhibit the following characteristics:
  - pH < 5 (as influenced by humic acids)
  - hardness < 100 p.p.m.
  - salinity < 350 uS.cm^{-1}
- ponds should be ephemeral to prevent habitation by fish but have a minimum hydro-period of 4-6 weeks for the Wallum Froglet and 8 weeks for the Wallum Sedge Frog.
- pond fringes should be densely planted with emergent species to prevent predation by *Bufo marinus*,

In consideration of the above recommendations, the *Tugun Bypass Species Impact Statement* (2004) and Ingram (2005) the following locations and design criteria for ponds are proposed.

Location

- within the road corridor*, east and west of the proposed bypass (chainage 4500 – 5100 metres), and
- where required, within the catchment of ephemeral drainage lines (refer Figure 4).

* dependant on the retention of Block C, frog ponds may also be constructed in this location.

COMPENSATORY HABITAT – TUGUN BYPASS

Figure 4: Proposed locations of artificial frog ponds

Design criteria

a) 'above ground'

- a minimum of 1.5 meres deep with a gradient sloping to 0.3 metres at the pond edges,
- approximately 15 to 20 metres long and 5 to 10 metres wide,
- incorporate a slow release liner, similar to those used in dam construction and sedimentation traps or to increase the permanency of surface water (>80%),
- margins revegetated with species consistent with the local habitat requirements for the Wallum Sedge Frog, such as *Restio* spp.,
- utilise dense *Restio* stands that would be disturbed from within the footprint by a process of 'slabbing'. Slabbing depth should be a minimum depth of 30 cm to ensure organic layers are collected,
- Construction during a dry period (spring) leading to a pronounced rainfall period as to enable machinery to access the site with minimal damage and enhance the likelihood that transplanted vegetation would survive,
- Be interspersed with existing breeding ponds, thereby increasing the interconnectivity of aquatic habitats, and
- Where practical, connected by terrestrial vegetated corridors.

b) **'below ground'**

- be generally spoon shaped and constructed to a depth immediately above the organic hard pan layer or to a maximum depth of one (1) metre, which ever is the lesser,
- approximately 15 to 20 metres long and 5 to 10 metres wide,
- intersect a major ephemeral drainage line,
- revegetate the pond margins with species consistent with the local habitat requirements for the Wallum Sedge Frog, such as *Restio* spp...

If approved, ponds would be constructed as early within the Construction Phase as practically possible. Once constructed, ponds would be monitored and their performance evaluated. The following performance criteria, monitoring program and contingencies are proposed.

Performance Criteria

- ponds are to contain surface water for a period >10 weeks per annum, for at least two of the three year monitoring periods,
- waters within ponds are to have a pH < 5 and an electrical conductivity < 350 $uS.cm^{-1}$.
- ponds are to contain a margin of emergent macrophytes > 200 mm thick,
- ponds are not to contain fish.

Monitoring Program

- Post construction, frog survey shall be undertaken on a seasonal basis (four times a year) for the first two years and also include event (immediately after heavy rain) survey between April and August for the Wallum Froglet and between September and April for the Wallum Sedge Frog,
- During survey the following activities shall also be undertaken,
  i. water quality monitoring for the parameters of pH and electrical conductivity,
  ii. recording of water depth and general environmental conditions.

Contingencies

- ponds that contain fish shall be reduced in capacity and hydroperiod,
- restoration of macrophytes shall be undertaken where margins < 200 mm thick,
- new ponds shall be constructed when the water quality of existing ponds exceeds the designated performance criteria for two of the three year periods, and
- ponds shall be increased in capacity, have their liners checked or their catchment areas increased where the hydroperiod does not accord with the required performance criteria. Consideration shall however, be given to the seasonal conditions at those times.

APPENDIX 7
FLORA ASSESSMENT

FLORA ASSESSMENT

1. Introduction

This section discusses the methods used in the vegetation assessment and presents the results of the assessment.

2. Methods

2.1 NPWS Database Search

A search of the NPWS database was completed to find records of threatened plant species within 10 kms of the subject site.

2.2 Literature Review

A number of other surveys have been completed in the locality, including a 1996 survey of the subject site by Woodward Clyde **(SECTION 1.3).** These reports were reviewed for records of threatened flora species.

2.3 Site Survey

Initial site surveys were completed in September 2003 and January 2004. The site was traversed a number of times by foot by one scientist over a period of 8 hours and a general plant species list was compiled. Subsequent site visits were undertaken for cryptic orchid searches following a period of rain. Targeted searches were completed for all threatened flora species considered likely to occur on the site.

More recent visits to update vegetation communities and GPS potential habitat trees were undertaken in January, April and May 2009. During these visits one 10 x 10 m quadrat was placed in each community. All flora species within each quadrat was recorded and the structure of the vegetation described. This data was used to verify previous data collected and supplement where appropriate.

3. Results

3.1 NPWS Database Search

A search of the NPWS Database revealed twenty-five (25) threatened flora species within 10 kms of the subject site **(TABLE 1).**

TABLE 1
NPWS DATABASE RECORDS OF THREATENED FLORA SPECIES WITHIN 10 KM

Common Name	Botanical Name
Arrow-head vine	*Tinospora tinosporoides*
Ball nut	*Floydia praelta*
Basket fern	*Drynaria rigidula*
Brown fairy-chain orchid	*Peristeranthus hillii*
Corokia	*Corokia whiteana*
Crystal creek walnut	*Endiandra floydii*

Common Name	Botanical Name
Davidson's plum	*Davidsonia jerseyana*
Durobby	*Syzygium moorei*
Green-leaved rose walnut	*Endiandra muelleri* subsp. *bracteata*
Hairy joint grass	*Arthraxon hispidus*
Hairy quandong	*Elaeocarpus williamsianus*
Marblewood	*Acacia bakeri*
Native justicia	*Calophanoides hygrophiloides*
Pink nodding orchid	*Geodorum densiflorum*
Queensland xylosma	*Xylosma terrae-reginae*
Rough-shelled bush nut	*Macadamia tetraphylla*
Rusty rose walnut	*Endiandra hayesii*
Scented acronychia	*Achronychia littoralis*
Slender marsdenia	*Marsdenia longilobia*
Spiny gardenia	*Randia moorei*
Stinking cryptocarya	*Cryptocarya foetida*
Sweet myrtle	*Austromyrtus fragrantissima*
White lace flower	*Archidendron hendersonii*
Yiel yiel	*Grevilliea hilliana*

3.2 Threatened flora recorded from other sources

Numerous records of threatened flora exist from surveys completed within the locality **(TABLE 2)**[4]**.**

TABLE 2
ADDITIONAL RECORDS OF THREATENED FLORA SPECIES WITHIN 5 KMS OF THE SUBJECT SITE

Common Name	Botanical Name
Rusty rose walnut	*Endiandra hayesii*
Basket fern	*Drynaria rigidula*
Corokia	*Corokia whiteana*
Rough-shelled Bush nut	*Macadamia tetraphylla*
Bush sauropus	*Souropus albifloraus* subsp. *microcladus*
Arrow-head vine	*Tinospora tinosporoides*
Red boppel nut	*Hicksbeachia pinnatifolia*
Ball nut	*Floydia praealta*
Green-leaved rose walnut	*Endiandra muelleri* subsp. *bracteata*
Crystal Creek Walnut	*Endiandra floydii*
Hairy quandong	*Elaeocarpus williamsianus*
Small-leaved tamarind	*Diploglottus campbellii*
Red-fruited ebony	*Diospyros mabacea*

[4] Sources include: Woodward-Clyde (1996); JWA Reports; NRAC study (1995); Landmark Byron Fauna Study (1999); and NPWS Wildlife Atlas.

3.3 Community descriptions

Seven (7) broad vegetation communities were recorded **(TABLE 3; FIGURE 9 – VOLUME 1).** A description of these communities is provided in the following sections. The descriptions follow Walker & Hopkins (1990). Their conservation status is discussed with reference to the Comprehensive Regional Assessment (CRA) completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999). The RFA establishes the framework for the management of the forests of upper northeast and lower north-east regions. The RFA document sets out percentage reservation status of forest and non-forest Ecosystems in the CAR Reserve System based on vegetation modelling to establish the pre-1750 extent of forest ecosystems in the region.

A Byron Shire-based supplementary assessment was made using standard conservation assessments (Hager and Benson, Griffith etc.) in the Byron Shire Flora and Fauna Study (1999) providing descriptions and Conservation status of Plant communities and their listings within Byron Shire. These descriptions are utilised in the appraisal of the Conservation status of plant communities recorded on the subject site.

Three (3) Endangered Ecological Community (EECs) occurs on the site:

- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.
- Swamp Oak Floodplain Forest.
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions.

TABLE 3
VEGETATION COMMUNITIES PRESENT ON THE SUBJECT SITE

Community		Description
1	**Swamp sclerophyll communities**	
	1a	Tall closed forest (*Eucalyptus robusta*)
	1b	Tall closed woodland (*E. robusta*)
	1c	Tall closed forest (*Melaleuca quinquenervia*)
	1d	Tall closed forest (*E. signata* and *E. robusta*)
	1e	Tall closed forest (*E. robusta* and *M. quinquenervia*)
	1f	Mid closed forest (*E. robusta* and *M. quinquenervia*)
2	**Dry sclerophyll communities**	
	2a	Tall closed forest (*E. signata* and *Endiandra sieberi*)
	2b	Tall open forest (*E. signata, Allocasuarina littoralis* and *Banksia aemula*)
3	**Heath communities**	
	3a	Tall closed heath (*B. aemula* and *A. littoralis*)
	3b	Low closed dry heath (*Lepyrodia interrupta* and *Xanthorrhoea fulva)*
	3c	Low closed wet heath (*Monotoca elliptica*, *Caustis recurvata* and *Styphelia viridis)*
4	**Estuarine communities**	

	4a	Mid-high mid-dense forest (*Avicennia marina* and *Aegiceras corniculatum*)
	4b	Mid-high forest (*Casuarina glauca* and *M. quinquenervia)*
	4c	Closed rushland/fernland (*Juncus kraussii* and *Acrostichum speciosum*)
5	Tall closed grassland (*Andropogon virginicus*)	
7	Drainage lines	
6	Scattered trees (*E. robusta)*	

3.4 Community 1 - Swamp sclerophyll communities

Community 1a - Tall closed forest (*Eucalyptus robusta*)

Location and area

This community occurs as a small patch in the south-western corner of the subject site and extends across the southern boundary.

Description

This community is dominated by Swamp mahogany, with scattered Paperbark occurring within the midstorey. Other midstorey species include Blueberry ash, Green styphelia, Satinwood and Tea-tree. The ground layer consists of Saw sedge, Swamp water fern, Bracken and some sedges. An area of Sphagnum moss, sedge and Swamp water fern occurs within this community.

Conservation status

This community is best classified as CRA RFA Forest Ecosystem community 142 (Swamp mahogany). The Regional Forestry Agreement document (CRA Unit 1999) provides the following data on this ecosystem:

- The pre 1750 area of this ecosystem was estimated to be approximately 699 hectares. 578 hectares (82%) remains.
- This ecosystem is listed as **Rare**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has determined approximately 39.5 % of the remaining forest type is reserved within the CAR Reserve system. Approximately 25.7% is within dedicated reserves, 12.3% is within informal reserves and 1.4% is reserved in tabulated prescription reserves.
- Swamp mahogany communities have been identified as a high priority for conservation on private lands.

The Byron Shire Flora and Fauna Study (1999) describe this community as Swamp mahogany. In the Byron Shire, Swamp Mahogany forests occur mainly on aeolian sands with smaller areas mapped on metasediments and on alluvial soils.

The study (1999) lists the following data for this community:

- The area of this community remaining in Byron shire is estimated to be approximately 132.30 hectares, however this includes Swamp box community. This is estimated to constitute 35% of the Pre-1750 extent of this community type.
- This community is considered to be **inadequately conserved** north of the Evans River (Griffith 1993).
- A small area of this community is reserved in Billinudgel NR.

This community is representative of the EEC Swamp Sclerophyll Forest on Coastal Floodplain and, by definition, is of State significance.

Community 1 b - Tall closed woodland (*E. robusta*)

Location and area

This community occurs as a small patch in the north west of the site adjacent to a drainage line.

Description

This community consists of scattered Swamp mahogany adjacent to the drainline, along with the occasional Paperbark, Blueberry ash and Coast banksia. Midstorey elements (Green styphelia, Satinwood, Tea-tree) occur mostly around the bases of trees, as this community has been fragmented by slashing. The ground layer consists of Saw sedge, Bracken, Swamp water fern, Feather plant, Whiskey grass and Grass trees. Heath rush and Clubmosses occur in wetter parts of the community, particularly adjacent to the drain.

Conservation status

This community is best classified as CRA RFA Forest Ecosystem community 142 (Swamp mahogany). This Community is discussed for Community 1a.

The Byron Shire Flora and Fauna Study (1999) describe this community as Swamp mahogany. This Community is discussed for Community 1a.

This community is representative of the EEC Swamp Sclerophyll Forest on Coastal Floodplain and, by definition, is of State significance.

Community 1c – Tall closed forest (*Melaleuca quinquenervia*)

Location and area

This community occurs in two (2) main locations on the site:

i. as a long strip between the site and the Pacific Highway in the west of the site, and
ii. in the far east of the subject site occupying lowland between the Scribbly gum communities and the Mangrove complex that occurs on the Simpson's Creek estuary. The majority of this eastern Paperbark community occurs within the 7(b) zone, however there are some small areas that extend into the subject site.

Description

The western community consists of Paperbark forest to approximately 18m in height. The occasional Swamp mahogany occurs along the northern and eastern margin of this community. The mid-storey is sparse and contains occasional Blueberry ash and Satinwood.

The understorey is tall (to 2m) and dense. It consists of Fox-tail sedges, Native ginger, Twigrush and an occasional Midgenberry. Batswing coral fern, Swamp water fern and Red-fruited saw sedges also occur. Common silkpod and Sweet smilax are common vines. A single King fern was recorded in this community.

The eastern portion of this community consists of two main contiguous clumps. The southern-most clump is relatively undisturbed, its canopy is dense and around 16m in height, consisting almost entirely of Broad-leaved paperbark. The mid-storey is relatively dense, and dominated by Blueberry ash and an occasional Satinwood. The understorey is dominated by Feather plant, Twigrush and Red-fruited saw sedge.

The northern clump is smaller in size, less mature and more open (although there is evidence of regrowth). The occasional Lemon-scented tea-tree and Swamp box occurs.

Conservation status

This community type is best described by the CRA RFA Forest ecosystem type 112 (Paperbark). The Regional Forestry Agreement document (CRA Unit 1999) provides the following data on this ecosystem:

- The pre 1750 area of this ecosystem has not been calculated. The current area is calculated to be 28577 hectares.
- This ecosystem is listed as **Vulnerable**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.
- Paperbark communities have been identified as a high priority for conservation on private lands.

The Byron Shire Flora and Fauna Study (1999) describes this community as Paperbark. This community occurs on low-lying, regularly inundated acid peat areas of the region.
The study (1999) listed the following data for this community:

- The area of this community remaining in Byron shire is estimated to be 115.06 hectares, estimated to constitute 36% of the Pre-1750 extent.
- This community is considered to be adequately conserved (Hager and Benson 1994). However, the Paperbark - Bangalow palm complex was mapped in with this group, and is considered to be of Local Significance (Broadbent & Stewart 1986), limited in distribution to far north-eastern NSW (Harden 1991, 1993)
- A small area of this community is reserved in Billinudgel NR and Brunswick Heads NR.

This community is representative of the EEC Swamp Sclerophyll Forest on Coastal Floodplain and, by definition, is of State significance.

Community – 1d Tall closed forest (*E. signata* and *E. robusta*)

Location and area

This community occurs as a long narrow 'finger' extending in a roughly north-south direction, and is associated with a relatively deep (over 1m in places) wetland channel.

Description

This community is dominated by Swamp mahogany and Scribbly gums up to 22m in height. The mid-storey is varied from dense areas of Tea tree, to patchy areas of Blueberry ash, and occasional Satinwood.

The ground layer is generally dense and comprised of Saw sedge, along with some Swamp water fern and Feather plant. Dense areas of Pouched coral fern occur in the northern part of this community.

Conservation status

This community is best described as Forest ecosystem type 142 (Swamp mahogany). This community is discussed for Community 1a.

The Byron Shire Flora and Fauna Study (1999) describe this community as Swamp mahogany. This Community is discussed for Community 1a.

This community is representative of the EEC Swamp Sclerophyll Forest on Coastal Floodplain and, by definition, is of State significance.

Community – 1e Tall closed forest (*E. robusta* and *M. quinquenervia*)

Location and area

This community occurs along the eastern portion of the subject site, and occurs within lower-elevation areas.

Description

The occasional Scribbly gum and Swamp mahogany occur as emergents above a dense midstorey of Tea-tree (*L. petersonii*, *L. polygalifolium*) and some Broom heath. The occasional Blueberry ash and Satinwood occurs. Some Wallum banksias also occur. The ground layer consists of dense Saw sedge and some Swamp water fern, Common ground fern and sedges. In some areas closest to the north and near the 4wd track the mid-storey and ground cover have been slashed or are highly disturbed by human and vehicular traffic.

Conservation status

This complex contains elements of both CRA Forest Ecosystem 65 (Heathy Scribbly Gum) and Forest ecosystem 74 (Lowlands Scribbly Gum). The following data is available for these ecosystems:

Forest Ecosystem 65 (Heathy scribbly gum)

- The pre 1750 area of this ecosystem was estimated to be approximately 10544 hectares. 7758 hectares (73.6%) remains.
- This ecosystem is not considered Endangered, Vulnerable or Rare.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has determined approximately 39.9 % of the remaining forest type is reserved within the CAR Reserve system. Approximately 31.3% is within dedicated reserves, 5.8% is within informal reserves and 2.8% is reserved in tabulated prescription reserves.

Forest Ecosystem 74 (Lowlands Scribbly gum)

- The pre 1750 area of this ecosystem was estimated to be approximately 6783 hectares. 3496 hectares (51.5%) remains.
- This ecosystem is listed as **Vulnerable**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has determined approximately 29.7 % of the remaining forest type is reserved within the CAR Reserve system. Approximately 26.4% is within dedicated reserves, 1.0% is within informal reserves and 2.3% is reserved in tabulated prescription reserves.
- Lowlands Scribbly gum communities have been identified as a high priority for conservation on private lands.

The Byron Shire Flora and Fauna Study (1999) describe this community as Wallum banksia-Scribbly gum.

The Wallum banksia-Scribbly gum community occurs on sand substrates, on coastal (Holocene) sands and on Pleistocene sands.

The study (1999) lists the following data for the Wallum Banksia-Scribbly Gum community:

- 67.16 hectares of this community remains in Byron shire. A pre-1750 estimate of this community has not been made.
- The regional conservation status is **unknown**.
- This community is reserved in small areas in Tyagarah NR and in Brunswick NR.

This community is representative of the EEC Swamp Sclerophyll Forest on Coastal Floodplain and, by definition, is of State significance.

Community 1f – Mid closed forest (*E. robusta* and *M. quinquenervia*)

Location and area

This community occurs as a small patch in the western portion of the site almost connecting a patch of community 1b and 1c.

Description

Swamp mahogany and Scribbly gum occur as emergents above a dense midstorey of Tea-tree and Paperbark and some Broom heath. The occasional Blueberry ash and Satinwood occurs. Some Wallum banksias are also present. The ground layer consists of dense Saw sedge and some Swamp water fern, Common ground fern and sedges. In some areas

closest to the north and near the 4wd track the mid-storey and ground cover have been slashed or are highly disturbed by human and vehicular traffic.

Conservation status

This complex contains elements of both CRA Forest Ecosystem 65 (Heathy Scribbly Gum) and Forest ecosystem 74 (Lowlands Scribbly Gum). The following data is available for these ecosystems:

Forest Ecosystem 65 (Heathy scribbly gum)

- The pre 1750 area of this ecosystem was estimated to be approximately 10544 hectares. 7758 hectares (73.6%) remains.
- This ecosystem is not considered Endangered, Vulnerable or Rare.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has determined approximately 39.9 % of the remaining forest type is reserved within the CAR Reserve system. Approximately 31.3% is within dedicated reserves, 5.8% is within informal reserves and 2.8% is reserved in tabulated prescription reserves.

Forest Ecosystem 74 (Lowlands Scribbly gum)

- The pre 1750 area of this ecosystem was estimated to be approximately 6783 hectares. 3496 hectares (51.5%) remains.
- This ecosystem is listed as **Vulnerable**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has determined approximately 29.7 % of the remaining forest type is reserved within the CAR Reserve system. Approximately 26.4% is within dedicated reserves, 1.0% is within informal reserves and 2.3% is reserved in tabulated prescription reserves.
- Lowlands Scribbly gum communities have been identified as a high priority for conservation on private lands.

The Byron Shire Flora and Fauna Study (1999) describe this community as Wallum banksia-Scribbly gum.

The Wallum banksia-Scribbly gum community occurs on sand substrates, on coastal (Holocene) sands and on Pleistocene sands.

The study (1999) lists the following data for the Wallum Banksia-Scribbly Gum community:

- 67.16 hectares of this community remains in Byron shire. A pre-1750 estimate of this community has not been made.
- The regional conservation status is **unknown**.
- This community is reserved in small areas in Tyagarah NR and in Brunswick NR.

This community is representative of the EEC Swamp Sclerophyll Forest on Coastal Floodplain and, by definition, is of State significance.

3.5 Community 2 - Dry sclerophyll communities

Community 2a - Tall closed forest (*E. signata, Endiandra sieberi, Lophostemon confertus* and *E. intermedia)*

Location and area

This community occurs adjacent to Paperbark communities in the east of the subject site within the 7(b) zone.

Description

This community is co-dominated by Scribbly gum, Brushbox and Hard corkwood. The occasional Pink bloodwood also occurs. The midstorey is generally sparse, with Tea-tree (*Leptospermum polygalifolium*) and Blueberry ash commonly occurring. Other midstorey species include Beach acronychia, Denhamia, Mock olive, Coast banksia and Coast canthium.

The ground layer is relatively sparse and covered with a layer of leaf litter, however, Bracken, Feather plant, Spiny-headed matrush and Midyim occur occasionally. Smooth smilax is a common climber and is extremely dense in some parts of the midstorey.

Conservation status

The CRA classification most analogous to this community is Forest Ecosystem 74 (Lowlands Scribbly Gum), although it should be noted that the subject community has a more diverse canopy structure. This community is discussed for Community 1e.

The Byron Shire Flora and Fauna Study (1999) describe this community as Scribbly gum. This community was recorded mainly on rhyolitic soils with small areas recorded on basalt, metasediments and aeolian influenced soils. This community occurs on sand on the subject site.

The Byron Flora and Fauna study lists the following data for this community:

- The area of this community remaining in Byron shire is estimated to be 84.18 hectares, estimated to constitute 66% of the Pre-1750 extent.
- This community is considered to be well represented over parts of its range, but not in far north east NSW (Griffiths 1993).
- This community is reserved in the hinterland in Mt. Jerusalem NP and on the coast as small areas in Tyagarah NR and Brunswick NR.

This community is considered to have a moderate conservation value.

Community 2b - Tall open forest (*E. signata, Allocasuarina littoralis* and *Banksia aemula*)

Location and area

This community occurs as three fragmented patches to the east of the existing Crown Road, and further patch adjacent to the Paperbark swamp in the west of the site.

Description

This community is dominated by Scribbly gum and Black she-oak in addition to Wallum banksias. Black she-oak is limited to the southern portion of this community. The midstorey consists of a variety of species including Broom heath, Tea-tree, Egg and bacon peas, Sweet wattle, Coast banksia, Spiny banksias and Prickly moses. The ground layer consists of Heath rush, Sedges, Spiny-headed matrush, Blue flax lily and Climbing guinea flower.

There are areas particularly to the south and immediate west of the 4WD track which have been slashed or are highly disturbed.

Conservation status

This community is best described by CRA RFA Forest Ecosystem 65 (Heathy Scribbly Gum), described for Community 1e.

The conservation status of this community is relatively high in terms of species diversity and habitat. The level of disturbance is restricted to small areas within the community and the relatively undisturbed areas are dense and continuous (rather than fragmented).

The Byron Shire Flora and Fauna Study (1999) describe this community as Scribbly Gum and Wallum banksia-Scribbly gum. This community occurs on sand substrates, on coastal (Holocene) sands and on Pleistocene sands.

The study (1999) lists the following data for the Wallum Banksia-Scribbly Gum community:

- The area of this community remaining in Byron shire is estimated to be 67.16 hectares. A pre-1750 estimate of this community has not been made.
- The regional conservation status is unknown.
- This community is reserved in small areas in Tyagarah NR and in Brunswick NR.

This community is considered to have a moderate conservation value.

3.6 Community 3 - Heath communities

Community 3a - Tall closed heath (*B. aemula* and *A. littoralis*)

Location and area

This community occurs in the south east of the site adjacent to Simpson's Creek.

Description

This community is dominated by Tea-tree and Heath-leaved banksias, Coastal beard heath and Blueberry ash. The occasional immature Paperbark also occurs. Common understorey species include Feather plant, Red-fruited saw-sedge and grass trees.

Conservation status

This community is best described as Non-forest Ecosystem 64 (Heath). The following data is available for this ecosystem:

- The pre 1750 area of this ecosystem has not been calculated. The current area is estimated to be approximately 9805 hectares. No reserved areas of Type 64 (Heath) have been calculated.
- This ecosystem is listed as **Vulnerable**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.
- Heath communities have been identified as a high priority for conservation on private lands.

The Byron Shire Flora and Fauna Study (1999) describes this community as Tea-tree. This community was mapped mainly on aolian/estuarine-alluvium soils with smaller areas being mapped on sand, rhyolite/basalt, sediments and metasediments.

The study (1999) lists the following data for the Tea-tree community:

- The area of this community remaining in Byron shire is estimated to be approximately 46.10 hectares. A pre-1750 estimate of this community has not been made.
- The regional conservation status of Teatree is unknown.
- Reserved in Billinudgel NR, Tyagarah NR, and Brunswick Heads NR.

This community is considered to have a moderate conservation value.

Community 3b - Low closed dry heath (*Monotoca elliptica, Caustis recurvata* and *Styphelia viridis*

Location and area

This community cover large areas of the central portion of the site.

Description

This community occurs as a low, dense ground cover consisting of a wide diversity of heath species, and is regularly slashed. Common species include Broom heath, Curly sedge, Green styphelia, Tea-tree, Prickly moses, Coast banksia, Baeckia, Grass tree, Heath rush, Saw sedge, Rice flower and Beard heath.

Conservation status

This community is best classified as RFA Non-forest ecosystem type 64 (Heath), and is discussed for Community 3a.

The Byron Shire Flora and Fauna Study (1999) describe this community as Wallum banksia or Heathland shrubland (with Coast banksia/ Wallum banksia/ Dwarf banksia). These communities were mapped mainly on sand substrates on coastal (Holocene) sands and on

Pleistocene sands. The associations were also mapped on metasediments with smaller areas recorded on sandstone and alluvium in Byron Shire.

The study (1999) listed the following data for the Wallum banksia/Dwarf banksia /Heath community:

- The area of this community remaining in Byron shire is estimated to be approximately 533.78 hectares.
- Only small areas are reserved, the regional conservation status is **unknown**.
- Small areas also occur on private lands along the Brunswick river and also west of Brunswick Heads along Marshalls Creek.
- A small area of this community is reserved in Brunswick River NR.

The conservation status of this community is reduced by the current management practice of regular slashing.

Community 3c - Low closed wet heath (*Lepyrodia interrupta* and *Xanthorrhoea fulva*)

Location and area

This community occurs in low-lying areas throughout the central portion of the site.

Description

This community consists of slashed heath species with a few scattered trees (mainly Paperbark). Lowland wet areas are dominated by Heath rush, Twigrushes, sedges, Swamp Xanthorrhoea, Native lasiandra, Button grass, and low-nutrient bog plants such as Sundew, Native yam, Scrambling guinea flower, grass lilies and other forbs.

Slightly more elevated areas particularly toward the south of the Site are dominated by Rice flower, Zierias, stunted Geebung, Blue flax lily, some Bracken fern, Bottlebrush, Midgenberry, Pink beard heath and Spiny headed Matrush.

Conservation status

This community is best classified as RFA Non-forest ecosystem type 64 (Heath), and is discussed for Community 3a.

The Byron Shire Flora and Fauna Study (1999) describe this community as Wallum banksia or Heathland shrubland (with Coast banksia/ Wallum banksia/ Dwarf banksia). This is discussed for Community 3b.

The conservation status of this community is reduced by the current management practice of regular slashing.

3.7 Community 4 – Estuarine communities

Community 4a – Mid-high mid-dense forest (*Avicennia marina* and *Aegiceras corniculatum*)

Location and area

This community flanks the Simpson's Creek estuary to the north-east of the subject site, and occurs within the 7(b) zone.

Description

This community is dominated by Grey and River mangrove extending into the tidal zone of Simpsons Creek. Areas of Salt rush and Saltwater couch also occur.

Conservation status

Mangrove communities are classified by the CRA RFA (1999) as Non-forest ecosystem 77 (Mangrove). The following data is available for this ecosystem:

- The pre 1750 area of this ecosystem has not been calculated. The current area is estimated to be approximately 734 hectares. The reserved areas of Type 77 (Mangrove) have not been calculated.
- This ecosystem is listed as **Rare**.
- The extent present in the Comprehensive, Adequate and Representative (CAR) Reserve System has not been determined. However, NPWS (1995) note that analogous communities have been reserved in a number of conservation areas in upper North East NSW.
- Mangrove communities have been identified as a high priority for conservation on private lands.

The Byron Shire Flora and Fauna Study (1999) describe this community as Grey mangrove/River mangrove and Saltmarsh. Mangrove communities were mapped mainly on estuarine, alluvial and aolian influenced soils in Byron Shire, while Saltmarsh communities have not been assessed.

The study (1999) lists the following data for the Grey mangrove/River mangrove community:

- The area of this community remaining in Byron shire is estimated to be approximately 60.24 hectares. A pre-1750 estimate of this community has not been made.
- Only small areas are reserved, but Mangrove forest is reserved under SEPP 14 – Coast wetlands (Griffith 1993).
- A small area of this community is reserved in Brunswick River NR.

This community is considered to have a high conservation value.

Community 4b – Mid-high forest (*Casuarina glauca* and *M. quinquenervia)*

Location and area

This community occurs as small patch flanking the Simpson's Creek estuary to the north-east of the subject site, and occurs within the 7(b) zone.

Description

This community is dominated by *Casuarina glauca* with the presence of some Paperbarks.

Conservation status

There are no relevant classifications in the CRA RFA (1999) forest or non-forest community type classifications, or the Byron study (1999).

This community is considered to be representative of the EEC Swamp Oak Floodplain Forest and, by definition, is of State significance.

Community 4c – Closed rushland/fernland (*Juncus kraussii* and *Acrostichum speciosum*)

Location and area

This community occurs as two small patches, at the edge of the Mangrove forest, within the 7(b) zone.

Description

This community is dominated by Mangrove fern, with the presence of Crinum lily, Salt rush and Salt couch. At the time of the last survey (May 2009) this community was inundated with 2-3 inches of water.

Conservation status

There are no relevant classifications in the CRA RFA (1999) forest or non-forest community type classifications, or the Byron study (1999). The conservation status of this community is considered to be relatively low.

This community is considered to be representative of the EEC Coastal Salt Marsh and, by definition, is of State significance.

Community 5 - Tall closed grassland (*Andropogon virginicus*)

Location and area

This community occurs in the northern portion of the site adjacent to the residential development.

Description

This community is nearly completely dominated by Whiskey grass (up to 1 metre in height), although some Pigeon grass, Bracken, Mat rush and Saw sedge also occur. Several small 'islands' of vegetation occur within this community close to the Child care centre. These include Heath-leaved banksia, Satinwood, Blueberry ash, Narrow-leaved geebung, Sweet wattle and Black she-oak.

Conservation status

There are no relevant classifications in the CRA RFA (1999) forest or non-forest community type classifications, or the Byron study (1999). The conservation status of this community is considered to be relatively low.

Community 6 – Scattered trees

Scribbly gums occur throughout the central portion of the site, as single occurrences or as clumps with an undergrowth of grasses, *B. aemula* and Grass trees. The distribution of these trees has been maintained by the regime of slashing.

Conservation status

There are no relevant classifications in the CRA RFA (1999) forest or non-forest community type classifications, or the Byron study (1999). The conservation status of this community is considered to be relatively low.

This community is considered to have a moderate conservation value.

Community 7 - Drainage lines

Location and area

Several constructed drainage lines occur on the site, with a central drainage line running north south and another drainage line running east west.

Description

Drainage lines on the site maintain permanent (tannin-stained) freshwater and are poorly vegetated, with the occasional Water lilly, Water primrose and Pondweed occurring. Fringing vegetation includes Swamp water fern, Saw sedge, Pouched coral fern and Cyperus, while occasional scattered trees also occur, including immature Paperbark, Satinwood, Coast wattle and Heath-leaved banksias.

Conservation status

There are no relevant classifications in the CRA RFA (1999) forest or non-forest community type classifications, or the Byron study (1999).

The conservation status of drainage lines is relatively low due to the level of disturbance affecting this community, although these communities have a significant habitat value due to the occurrence of the threatened Wallum froglet.

3.8 Garden Weeds

There is a small area of dense weed species in the far north-west corner of the site, adjacent to residences at the end of Kingsford Drive. This area contains some weed species which are highly invasive and listed on the Byron Shire Council Undesirable Trees List. These species include:

- Umbrella tree (*Schefflera actinophylla*[5])
- Nasturtium (*Nasturtium* sp.)
- Camphor laurel (*Cinnamomum camphora*)
- Paspalum (*Paspalum* sp.)
- Happy plant (*Agave* sp.)
- Mickey mouse plant (*Ochna serrulata*)
- Aloe vera *(Aloe* sp.)
- Cocos palm (*Syagrus romanzoffiana*)
- Small-leaved privet (*Ligustrum sinense*)
- Cottoneaster (*Cottoneaster* sp.)
- Ground asparagus fern (*Asparagus aethiopicus*)
- Duranta (*Duranta* sp.)
- Mother of millions (*Bryophyllum* sp.)
- Groundsel (*Baccharis halimifolia*)
- Madeira vine (*Anredera cordifolia*)

3.9 Flora species list

In total 200 flora species were recorded at the subject site, including 164 native species and 36 weeds **(TABLE 4)**. No threatened or ROTAP (Rare or Threatened Australian Plant, Briggs & Leigh 1995) species were observed. Ticks along side each species indicates the vegetation communities in which they were commonly observed. Species not ticked were incidental observations from the site (i.e. outside vegetation quadrats).

[5] Native to north Queensland

TABLE 4
PLANT SPECIES LIST FOR EACH VEGETATION COMMUNITY

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7
Mosses																			
Lycopodiaceae	*Lycopodiella cernua*						✓												
Sphagnaceae	*Sphagnum cuspidatum*		✓			✓	✓												
Selaginellaceae	*Selaginella* sp.	Selaginella																	
Ferns and Fern Allies																			
Adiantaceae	*Pellaea falcata*	Sickle fern			✓														
Blechnaceae	*Blechnum indicum*	Swamp water fern	✓			✓	✓		✓										
Osmundaceae	*Todea barbara*	King fern					✓												
Aspleniaceae	*Asplenium australasicum*	Bird's nest fern					✓												
Blechnaceae	*Blechnum cartilagineum*	Grissle fern								✓	✓								
Blechnaceae	*Blechnum minus*	Soft water fern																	
Cyatheaceae	*Cyathea* sp.	Tree fern																	
Davalliaceae	*Nephrolepis cordifolia**	Fishbone fern																	
Dennstaedtiaceae	*Histiopteris incisa*	Batswing coral fern					✓												
Dennstaedtiaceae	*Pteridium esculentum*	Bracken fern	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓
Dicksoniaceae	*Calochlaena dubia*	Soft bracken					✓												
Glecheniaceae	*Gleichenia dicarpa*	Pouched coral fern				✓	✓												
Polypodiaceae	*Platycerium superbum*	Staghorn					✓												
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn fern																	
Schizaeaceae	*Schizaea dichotoma*	Branched coral fern				✓													
Schizaeaceae	*Lygodium microphyllum*	Climbing fern				✓													

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7
Monocotyledons																			
Agavaceae	*Agave* sp*																		
Agavaceae	*Dracaena fragrans**	Happy plant																	
Agavaceae	*Sanseviera trifasciata**	Mother-in-laws-tongue							✓	✓	✓								
Arecaceae	*Chrysanthemoides monilifera**	Bitou bush																	
Arecaceae	*Livistona australis*	Cabbage palm																	
Asphodelaceae	*Aloe* sp.*	Aloe																	
Commelinaceae	*Archontophoenix cunninghamiana*	Bangalow palm																	
Commelinaceae	*Commelina cyanea*	Native wandering jew																	
Cyperaceae	*Baumea muelleri*																		
Cyperaceae	*Baumea juncea*		✓																
Cyperaceae	*Caustis recurvata*	Curly sedge	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cyperaceae	*Cyperus difformis*	Rice sedge	✓																
Cyperaceae	*Cyperus exaltatus*		✓																
Cyperaceae	*Gahnia clarkei*	Saw sedge	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cyperaceae	*Gahnia sieberiana*	Tall saw sedge	✓			✓				✓									
Cyperaceae	*Schoenus brevifolius*	Zig-zag bog rush																	
Dioscoraceae	*Dioscorea transversa*	Native yam																	
Juncaceae	*Juncus kraussii*	Salt rush																	
Juncaceae	*Juncus usitatus*																		
Lomandraceae	*Lomandra laxa*																		
Lomandraceae	*Lomandra longifolia*	Long-leaved matrush				✓	✓		✓	✓									

Grouping/Family	Botanical Name	Common Name	**Vegetation Communities**																
			Swamp Sclerophyll						**Dry Sclerophyll**		**Heath**			**Estuarine**			**Grasslands**	**Drainage**	**Scattered Trees**
			1a	**1b**	**1c**	**1d**	**1e**	**1f**	**2a**	**2b**	**3a**	**3b**	**3c**	**4a**	**4b**	**4c**	**5**	**6**	**7**
Orchidaceae	*Cryptostylis erecta*					✓													
Orchidaceae	*Caladenia concinna*	Spider orchid																	
Orchidaceae	*Cymbidium madidum*				✓														
Orchidaceae	*Geodorum* sp.	Nodding orchard							✓										
Philydraceae	*Philydrum lanuginosum*	Frogsmouth																	
Phormiaceae	*Dianella caerulea*	Blue flax lily				✓				✓	✓	✓	✓						
Pittosporaceae	*Pittosporum revolutum*	Hairy pittosporum							✓										
Poaceae	*Andropogon virginicus**	Whiskey grass				✓				✓		✓					✓	✓	✓
Poaceae	*Axonopus affinus**	Narrow leafed carpet grass																	
Poaceae	*Cynodon dactylon*	Couch								✓	✓								
Poaceae	*Eleusine indica**	Crowsfoot grass																	
Poaceae	*Entolasia marginata*									✓	✓								
Poaceae	*Eragrostis* sp.	Love grass																	
Poaceae	*Imperata cylindrica*	Bladey grass								✓									
Poaceae	*Melinis repens**	Red natal grass																	
Poaceae	*Oplismenus hirtellus* ssp. *imbecillis*	Basket grass																	
Poaceae	*Paspalum wettsteinii**	Broad leafed paspalum	✓	✓	✓	✓	✓	✓	✓	✓	✓								
Poaceae	*Pennisetum alopecuroides*	Swamp foxtail							✓										
Poaceae	*Phragmites australis*	Phragmites																	
Poaceae	*Setaria* sp.*	Pigeon grass																	
Poaceae	*Sporobolus virginicus*	Saltwater couch																	
Poaceae	*Themeda triandra*	Kangaroo grass																	

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7
Restionaceae	*Baloskion tetraphyllum*	Feather plant				✓				✓		✓							
Restionaceae	*Empodisma minus*					✓													
Restionaceae	*Lepyrodia interrupta*	Heath rush																	
Restionaceae	*Baloskion pallens*					✓													
Restionaceae	*Sporadanthus interruptus*								✓		✓								
Smilacaceae	*Smilax australis*	Prickley smilax	✓	✓	✓	✓	✓	✓	✓	✓									
Smilacaceae	*Smilax glyciphylla*	Smooth smilax			✓														
Typhaceae	*Typha orientalis*	Broad-leaved cumbungi																	
Xanthorrhoeaceae	*Xanthorrhoea australis*	Grass tree				✓				✓	✓	✓	✓	✓					
Xanthorrhoeaceae	*Xanthorrhoea fulva*	Swamp grass tree							✓	✓			✓						
Xanthorrhoeaceae	*Xanthorrhoea johnsonii*	Grass tree								✓									
Zingiberaceae	*Alpinia caerulea*	Native ginger																	
Dicotyledons																			
Apiaceae	*Platysace ericoides*																		
Apocynaceae	*Parsonsia straminea*	Common silkpod	✓	✓	✓	✓	✓	✓	✓	✓									
Apocynaceae	*Vinca minor**	Periwinkle																	
Araliaceae	*Astrotricha longifolia*																		
Araliaceae	*Schefflera actinophylla**	Umbrella tree																	
Arecaceae	*Syagrus romanzoffiana**	Cocos palm																	
Asteraceae	*Ageratina adenophora**	Crofton weed																	✓
Asteraceae	*Ageratum houstonianum**	Blue billygoat weed																	
Asteraceae	*Baccharis halimifolia**	Groundsel																	
Asteraceae	*Taraxacum* sp.*	False dandelion																	

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																	
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees	
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7	
Baeckea linifolia	*Eugenia uniflora**	Brazilian cherry																		
Baeckea linifolia	*Baeckea linifolia*	Weeping baeckea								✓										
Basellaceae	*Anredera cordifolia**	Madeira vine																		
Bignoniaceae	*Pandorea pandorana*	Wonga vine								✓										
Casuarinaceae	*Allocasuarina littoralis*	Black she-oak				✓				✓	✓									
Casuarinaceae	*Casuarina glauca*	Swamp oak															✓			
Celastraceae	*Denhamia celastroides*	Denhamia							✓											
Convolvulaceae	*Ipomoea indica**	Coastal morning glory																		
Crassulaceae	*Bryophyllum delagoense**	Mother of millions																		
Cupressaceae	*Callitris columellaris*	Coastal cypress pine																		
Cyperaceae	*Scleria tricuspidata*					✓														
Dilleniaceae	*Hibbertia obtusifolia*										✓									
Dilleniaceae	*Hibbertia diffusa*									✓	✓									
Dilleniaceae	*Hibbertia scandens*	Climbing guinea flower	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓					
Droseraceae	*Drosera peltata*												✓							
Droseraceae	*Drosera sp.*												✓							
Droseraceae	*Drosera spathulata*												✓							
Ebenaceae	*Diospyros australis*	Black plum																		
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry ash	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	
Elaeocarpaceae	*Tetratheca thymifolia*	Black-eyed susan				✓			✓	✓	✓	✓								
Epacridaceae	*Epacris microphylla*	Coral heath	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	
Epacridaceae	*Melichrus procumbens*	Jam tarts																		
Epacridaceae	*Monotoca elliptica*	Broom heath																		

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7
Epacridaceae	*Monotoca scoparia*	Prickly-leaved monotoca								✓									
Epacridaceae	*Styphelia viridis*	Green styphelia	✓																
Epacridaceae	*Trochocarpa laurina*	Tree heath							✓										
Epacridaceae	*Woollsia pungens*																		
Ericaceae	*Leucopogon lanceolatus*																		
Ericaceae	*Leucopogon ericoides*	Pink beard heath																	
Ericaceae	*Leucopogon parviflorus*	Coastal beard heath																	
Ericaceae	*Leucopogon pimeleoides*									✓									
Ericaceae	*Ricinus communis**	Castor oil plant																	
Euphorbiaceae	*Chamaesyce hirta**	Asthma plant/Sand spurge							✓	✓	✓	✓	✓						
Euphorbiaceae	*Macaranga tanarius*	Macaranga								✓	✓								
Fabaceae	*Aotus ericoides*																		
Fabaceae	*Aotus lanigera*																		
Fabaceae	*Crotalaria incana**	Woolly rattlepod																	
Fabaceae	*Dillwynia retorta*	Egg & bacon pea							✓	✓	✓	✓	✓						
Fabaceae	*Gompholobium latifolium*									✓	✓								
Fabaceae	*Hardenbergia violacea*	False sarsparilla																	
Fabaceae	*Jacksonia scoparia*	Dogwood				✓				✓									
Fabaceae	*Jacksonia stackhousei*	Wallum dogwood																	
Fabaceae	*Kennedia rubicunda*	Red coral pea								✓									
Fabaceae	*Oxylobium robustum*	Tree shaggy pea																	
Fabaceae	*Pultenaea retusa*	Blunt bush pea																	

Grouping/Family	Botanical Name	Common Name	**Vegetation Communities**																
			Swamp Sclerophyll						**Dry Sclerophyll**		**Heath**			**Estuarine**			**Grasslands**	**Drainage**	**Scattered Trees**
			1a	**1b**	**1c**	**1d**	**1e**	**1f**	**2a**	**2b**	**3a**	**3b**	**3c**	**4a**	**4b**	**4c**	**5**	**6**	**7**
Fabaceae	*Pultenaea villosa*																		
Haemodoraceae	*Haemodorum austroqueenslandicum*																		
Lauraceae	*Cassytha glabella*	Devil's twine								✓									
Lauraceae	*Cinnamomum camphora**	Camphor laurel																	
Lauraceae	*Cryptocarya microneura*	Murrogan																	
Lauraceae	*Endiandra sieberi*	Hard corkwood				✓	✓			✓	✓	✓	✓				✓	✓	✓
Lobeliaceae	*Pratia purpurascens*	White root				✓													
Lycopodiaceae	*Lycopodiella cernua*																		
Malaceae	*Cotoneaster* sp.*	Cotoneaster																	
Melastomataceae	*Melastoma affine*	Native lasiandra																	
Meliaceae	*Dysoxylum mollissimum* ssp. *molle*	Red bean								✓	✓								
Menispermaceae	*Sarcopetalum harveyanum*	Pearl vine																	
Menispermaceae	*Stephania japonica*	Snake vine																	
Mimosaceae	*Acacia melanoxylon*	Blackwood wattle																	
Mimosaceae	*Acacia obtusifolia*	Stiff-leaf wattle																	
Mimosaceae	*Acacia sophorae*	Coastal wattle																	
Mimosaceae	*Acacia suaveolens*	Sweet wattle	✓	✓	✓		✓	✓	✓	✓	✓								
Mimosaceae	*Acacia ulicifolia*	Prickly moses	✓	✓	✓		✓	✓	✓	✓	✓								
Myrsinaceae	*Rapanea howittiana*	Brush muttonwood																	
Myrsinaceae	*Rapanea variabilis*	Muttonwood																	
Myrtaceae	*Acmena smithii*	Common lilly pilly																	
Myrtaceae	*Austromyrtus dulcis*	Midgenberry	✓	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7
Myrtaceae	*Baeckea frutescens*									✓									
Myrtaceae	*Baeckea virgata*																		
Myrtaceae	*Callistemon citrinus*	Crimson bottlebrush																	
Myrtaceae	*Corymbia intermedia*	Pink bloodwood																	
Myrtaceae	*Eucalyptus signata*	Scribbly gum	✓	✓	✓	✓	✓	✓	✓	✓	✓								✓
Myrtaceae	*Eucalyptus robusta*	Swamp mahogany	✓		✓	✓			✓	✓									
Myrtaceae	*Homoranthus virgatus*																		
Myrtaceae	*Leptospermum juniperinum*									✓									
Myrtaceae	*Leptospermum liversidgei*	Lemon-scented teatree				✓				✓									
Myrtaceae	*Leptospermum polygalifolium*	Teatree				✓				✓									
Myrtaceae	*Lophostemon confertus*	Brushbox					✓		✓	✓	✓								
Myrtaceae	*Lophostemon suaveolens*	Swamp box								✓	✓								
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved paperbark	✓	✓	✓	✓	✓	✓	✓	✓	✓								
Myrtaceae	*Melaleuca sieberi*	Sieber's paperbark																	
Myrtaceae	*Syzygium oleosum*	Blue lilly pilly																	
Ochnaceae	*Ochna serrulata**	Ochna																	
Oleaceae	*Ligustrum sinense**	Small-leaved privet																	
Oleaceae	*Notelaea johnstoni*	Large mock olive							✓										
Passifloraceae	*Passiflora edulis**	Passionfruit																	
Passifloraceae	*Passiflora foetida**	White passionfruit																	
Poaceae	*Trifolium subterraneum**									✓									

Grouping/Family	Botanical Name	Common Name	Vegetation Communities																
			Swamp Sclerophyll						Dry Sclerophyll		Heath			Estuarine			Grasslands	Drainage	Scattered Trees
			1a	1b	1c	1d	1e	1f	2a	2b	3a	3b	3c	4a	4b	4c	5	6	7
Proteaceae	*Banksia aemula*	Wallum banksia				✓			✓	✓	✓								
Proteaceae	*Banksia ericifolia*	Heath-leaved banksia																	
Proteaceae	*Banksia integrifolia*	Coast banksia		✓															✓
Proteaceae	*Banksia serrata*	Saw banksia																	
Proteaceae	*Banksia spinulosa* var. *spinulosa*																		
Proteaceae	*Hakea* sp.	Hakea																	
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung																	
Proteaceae	*Persoonia stradbrokensis*	Geebung				✓	✓		✓	✓	✓	✓							
Proteaceae	*Strangea linearis*																		
Rubiaceae	*Canthium coprosmoides*	Coast canthium																	
Rubiaceae	*Cyclophyllum longipetalum*	Coast canthium							✓										
Rutaceae	*Acronychia imperforata*	Beach acronychia							✓	✓									
Rutaceae	*Boronia rosmarinifolia*	Heath boronia																	
Rutaceae	*Phebalium squameum*	Satinwood	✓	✓	✓	✓	✓	✓	✓	✓	✓								
Rutaceae	*Zieria smithii*	Sandfly ziera							✓	✓	✓								
Santalaceae	*Exocarpos latifolius*	Broad-leaved Native Cherry																	
Santalaceae	*Leptomeria acida*	Currant bush								✓									
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	✓	✓	✓	✓	✓	✓	✓	✓							✓		✓
Sapindaceae	*Dodonaea triquetra*	Hopbush				✓			✓	✓									
Sapindaceae	*Guioa semiglauca*	Guioa							✓	✓									
Sapindaceae	*Jagera pseudorhus*	Foambark																	

Grouping/Family	Botanical Name	Common Name	**Vegetation Communities**																
			Swamp Sclerophyll						**Dry Sclerophyll**		**Heath**			**Estuarine**			**Grasslands**	**Drainage**	**Scattered Trees**
			1a	**1b**	**1c**	**1d**	**1e**	**1f**	**2a**	**2b**	**3a**	**3b**	**3c**	**4a**	**4b**	**4c**	**5**	**6**	**7**
Solanaceae	*Solanum capsicoides**	Devil's apple																	
Thymelaeaceae	*Pimelea latifolia*	Rice flower								✓									
Tropaeolaceae	*Tropaeolum majus**	Nasturtium																	
Verbenaceae	*Duranta erecta**	Sky flower																	
Verbenaceae	*Lantana camara**	Lantana																	
Viscaceae	*Notothixos* sp.	Mistletoe																	
Vitaceae	*Cissus hypoglauca*	Five-leaf water vine																	

* Introduced Species
[k] Koala feed trees as listed in Schedule 2 of SEPP 44 Policy

APPENDIX 8
TREE SURVEY

TREE SURVEY

1. Introduction

This section describes the survey of significant trees.

2. Methods

A tree location survey was completed by LandPartners in May 2010. In accordance with the Byron Shire Council Tree Preservation Order, all trees above 10cm dbh[6] and/or 3 m in height on the subject site were located by survey **(FIGURE 11 – Volume 1).** Numbered metal tags were placed on all surveyed trees with the exception of tree numbers 738 to 745 (i.e. Melaleucas in swamp). Information was collected as follows:

- common name;
- tree number;
- dbh;
- height; and
- spread.

JWA subsequently collected the following information for each surveyed tree above 200 mm dbh:

- scientific name;
- whether Koala food tree species and/or evidence of scratches on trunk or scats at the base;
- whether Glossy black cockatoo food trees species and/or evidence of chewed cones at the base; and
- evidence of characteristics indicating tree is a 'habitat tree' such as:
    - hollows,
    - peeling or creviced bark,
    - wide spreading canopies providing abundant blossom or foliage,
    - epiphytic or parasitic growths, and
    - trees with large diameters and large heights in relation to surrounding trees.

The data collected was then used to assign a 'significance ranking' to all surveyed trees. The environmental attributes used to determine the ranking are provided in **TABLE 1.**

[6] Diameter at breast height

TABLE 1
ENVIRONMENTAL ATTRIBUTES USED TO DETERMINE SIGNIFICANCE RANKING

Conservation Significance Category	Significance Ranking	Environmental attributes
Very high	1	• Old growth trees (i.e. >900mm dbh[7]) • Trees forming part of an Endangered ecological community
High	2	• Habitat trees (i.e. trees with obvious hollows, fissures, nests etc.) • Preferred Koala food trees showing evidence of activity (i.e. scats) • Preferred Glossy black-cockatoo food trees showing evidence of activity (i.e. chewed cones)
Moderate-High	3	• Mature preferred Koala food tree species (i.e. >300mm dbh) – no evidence of activity • Mature preferred Glossy black-cockatoo food trees (i.e. >300mm dbh) – no evidence of activity
Moderate	4	• Immature/sub-mature preferred Koala food tree species (i.e. <300mm dbh) – no evidence of activity • Immature/sub-mature preferred Glossy black-cockatoo food trees (i.e. <300mm dbh) – no evidence of activity
Low-Moderate	5	• Mature native tree species (i.e. >300mm dbh) not fulfilling any of the above criteria
Low	6	• Immature/sub-mature native tree species (i.e. <300mm dbh) not fulfilling any of the above criteria

3. Results

The following table sets out the trees surveyed, data used to assign significance ranking and the ranking **(TABLE 2).**

TABLE 2
DATA COLLECTED DURING ASSESSMENT OF TREE SIGNIFICANCE

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
1	*Eucalyptus signata*	1	15	5	1.1	Habitat tree + OLD GROWTH (>900mm)
12	*Eucalyptus signata*	1	15	5	1.3	Habitat tree + OLD GROWTH (>900mm)
67	*Eucalyptus signata*	1	15	3	1	Habitat tree + OLD GROWTH (>900mm)
88	*Eucalyptus signata*	1	15	5	1.5	Habitat tree + OLD GROWTH (>900mm)

[7] Diameter at breast height

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
92	*Eucalyptus signata*	1	15	4	1.2	Habitat tree + OLD GROWTH (>900mm)
104	*Eucalyptus signata*	1	15	4	0.9	Habitat tree + OLD GROWTH (>900mm)
157	*Eucalyptus signata*	1	15	5	0.9	Habitat tree + OLD GROWTH (>900mm)
160	*Eucalyptus signata*	1	15	5	0.9	Habitat tree + OLD GROWTH (>900mm)
161	*Eucalyptus signata*	1	15	5	1	Habitat tree + OLD GROWTH (>900mm)
412	*Eucalyptus signata*	1	15	5	1.2	Habitat tree + OLD GROWTH (>900mm)
413	*Eucalyptus signata*	1	15	5	1.2	Habitat tree + OLD GROWTH (>900mm)
469	*Eucalyptus signata*	1	15	4	1.2	Habitat tree + OLD GROWTH (>900mm)
472	*Eucalyptus signata*	1	15	5	1.5	Habitat tree + OLD GROWTH (>900mm)
483	*Eucalyptus signata*	1	12	3	1	Habitat tree + OLD GROWTH (>900mm)
559	*Eucalyptus signata*	1	15	5	1.5	Habitat tree + OLD GROWTH (>900mm)
560	*Banksia aemula*	1	15	3	1.5	Habitat tree + OLD GROWTH (>900mm)
656	*Eucalyptus signata*	1	15	4	1.2	Habitat tree + OLD GROWTH (>900mm)
808	*Eucalyptus signata*	1	15	4	1	Habitat tree + OLD GROWTH (>900mm)
1027	*Eucalyptus signata*	1	14	2	1.2	Habitat tree + OLD GROWTH (>900mm)
114	*Eucalyptus signata*	1	15	5	1.2	OLD GROWTH (>900mm)
163	*Eucalyptus signata*	1	15	5	1.3	OLD GROWTH (>900mm)
225	*Eucalyptus signata*	1	10	5	0.9	OLD GROWTH (>900mm)
226	*Eucalyptus signata*	1	10	5	0.9	OLD GROWTH (>900mm)
414	*Eucalyptus signata*	1	15	4	0.9	OLD GROWTH (>900mm)
502	*Banksia aemula*	1	10	4	0.9	OLD GROWTH (>900mm)
543	*Banksia aemula*	1	15	4	1.1	OLD GROWTH (>900mm)
565	*Eucalyptus signata)*	1	15	5	1.5	OLD GROWTH (>900mm)
575	*Banksia aemula*	1	15	3	1	OLD GROWTH (>900mm)
577	*Eucalyptus signata*	1	15	4	1	OLD GROWTH (>900mm)
626	*Eucalyptus signata*	1	15	5	1	OLD GROWTH (>900mm)
628	*Eucalyptus signata*	1	15	4	0.9	OLD GROWTH (>900mm)
636	*Banksia aemula*	1	15	4	0.9	OLD GROWTH (>900mm)
647	*Melaleuca quinquenervia*	1	15	5	1.5	OLD GROWTH (>900mm)
655	*Eucalyptus signata*	1	15	4	1	OLD GROWTH (>900mm)
657	*Eucalyptus signata*	1	15	4	1.2	OLD GROWTH (>900mm)
660	*Eucalyptus signata*	1	15	4	1	OLD GROWTH (>900mm)
664	*Eucalyptus signata*	1	15	2	1.5	OLD GROWTH (>900mm)
687	*Melaleuca quinquenervia*	1	15	3	1.1	OLD GROWTH (>900mm)
723	*Eucalyptus signata*	1	15	4	1.2	OLD GROWTH (>900mm)
727	*Eucalyptus signata*	1	15	4	1	OLD GROWTH (>900mm)
738	*Melaleuca quinquenervia*	1	15	4	1.2	OLD GROWTH (>900mm)
781	*Banksia aemula*	1	15	4	1	OLD GROWTH (>900mm)
802	*Eucalyptus signata*	1	12	2	1	OLD GROWTH (>900mm)
807	*Eucalyptus signata*	1	15	5	1.5	OLD GROWTH (>900mm)
870	*Melaleuca quinquenervia*	1	15	4	1.2	OLD GROWTH (>900mm)

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
890	*Eucalyptus signata*	1	15	3	1	OLD GROWTH (>900mm)
921	*Banksia aemula*	1	12	3	1	OLD GROWTH (>900mm)
954	*Eucalyptus signata*	1	15	3	1	OLD GROWTH (>900mm)
955	*Eucalyptus signata*	1	15	3	1	OLD GROWTH (>900mm)
1038	*Eucalyptus signata*	1	15	3	1.2	OLD GROWTH (>900mm)
1042	*Eucalyptus signata*	1	15	3	1.2	OLD GROWTH (>900mm)
1045	*Melaleuca quinquenervia*	1	15	3	0.9	OLD GROWTH (>900mm)
1071	*Eucalyptus signata*	1	15	4	1.2	OLD GROWTH (>900mm)
1072	*Eucalyptus signata*	1	15	4	1	OLD GROWTH (>900mm)
1179	*Melaleuca quinquenervia*	1	15	2	1	OLD GROWTH (>900mm)
1262	*Melaleuca quinquenervia*	1	6	2	1	OLD GROWTH (>900mm)
15	*Eucalyptus robusta*	1	10	2	0.25	Primary Koala food tree
16	*Eucalyptus robusta*	1	10	2	0.4	Primary Koala food tree
21	*Eucalyptus robusta*	1	15	3	0.4	Primary Koala food tree
28	*Eucalyptus robusta*	1	15	4	0.5	Primary Koala food tree
32	*Eucalyptus robusta*	1	10	3	0.3	Primary Koala food tree
54	*Eucalyptus robusta*	1	10	3	0.3	Primary Koala food tree
62	*Eucalyptus robusta*	1	15	4	0.45	Primary Koala food tree
64	*Eucalyptus robusta*	1	15	3	0.5	Primary Koala food tree
176	*Eucalyptus robusta*	1	10	1	0.2	Primary Koala food tree
181	*Eucalyptus robusta*	1	10	3	0.4	Primary Koala food tree
188	*Eucalyptus robusta*	1	10	2	0.4	Primary Koala food tree
288	*Eucalyptus robusta*	1	15	2	0.4	Primary Koala food tree
289	*Eucalyptus robusta*	1	15	2	0.4	Primary Koala food tree
290	*Eucalyptus robusta*	1	15	1	0.2	Primary Koala food tree
293	*Eucalyptus robusta*	1	15	3	0.4	Primary Koala food tree
294	*Eucalyptus robusta*	1	15	2	0.3	Primary Koala food tree
295	*Eucalyptus robusta*	1	15	4	0.6	Primary Koala food tree
296	*Eucalyptus robusta*	1	15	2	0.35	Primary Koala food tree
454	*Eucalyptus robusta*	1	14	3	0.6	Primary Koala food tree
455	*Eucalyptus robusta*	1	14	3	0.5	Primary Koala food tree
456	*Eucalyptus robusta*	1	14	3	0.5	Primary Koala food tree
457	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
458	*Eucalyptus robusta*	1	6	2	0.4	Primary Koala food tree
686	*Eucalyptus robusta*	1	12	1	0.4	Primary Koala food tree
706	*Eucalyptus robusta*	1	10	1	0.3	Primary Koala food tree
707	*Eucalyptus robusta*	1	12	2	0.6	Primary Koala food tree
712	*Eucalyptus robusta*	1	10	1	0.3	Primary Koala food tree
716	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
717	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
724	*Eucalyptus robusta*	1	12	2	0.6	Primary Koala food tree
812	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
813	*Eucalyptus robusta*	1	10	2	0.3	Primary Koala food tree
814	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
816	*Eucalyptus robusta*	1	12	2	0.5	Primary Koala food tree
819	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
820	*Eucalyptus robusta*	1	5	1	0.3	Primary Koala food tree
822	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
823	*Eucalyptus robusta*	1	10	2	0.3	Primary Koala food tree
824	*Eucalyptus robusta*	1	10	2	0.3	Primary Koala food tree

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
825	*Eucalyptus robusta*	1	10	2	0.3	Primary Koala food tree
826	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1219	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1221	*Eucalyptus robusta*	1	14	2	0.6	Primary Koala food tree
1228	*Eucalyptus robusta*	1	10	2	0.25	Primary Koala food tree
1231	*Eucalyptus robusta*	1	10	2	0.25	Primary Koala food tree
1232	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1233	*Eucalyptus robusta*	1	8	2	0.2	Primary Koala food tree
1237	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1238	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1239	*Eucalyptus robusta*	1	10	2	0.25	Primary Koala food tree
1246	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1247	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1248	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1250	*Eucalyptus robusta*	1	10	2	0.25	Primary Koala food tree
1263	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1264	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1267	*Eucalyptus robusta*	1	12	2	0.4	Primary Koala food tree
1269	*Eucalyptus robusta*	1	10	2	0.3	Primary Koala food tree
666	*Eucalyptus robusta*	1	15	2	1.2	Primary Koala food tree + OLD GROWTH (>900mm)
809	*Eucalyptus robusta*	1	15	5	1.5	Primary Koala food tree + OLD GROWTH (>900mm)
810	*Eucalyptus robusta*	1	15	4	1	Primary Koala food tree + OLD GROWTH (>900mm)
988	*Eucalyptus robusta*	1	15	3	1	Primary Koala food tree + OLD GROWTH (>900mm)
159	*Eucalyptus robusta*	1	10	3	0.4	Primary Koala food tree + SCATS
29	*Melaleuca quinquenervia*	1	10	3	0.3	
33	*Melaleuca quinquenervia*	1	10	3	0.3	
43	*Melaleuca quinquenervia*	1	12	3	0.25	
50	*Melaleuca quinquenervia*	1	10		0.2	
52	*Melaleuca quinquenervia*	1	10	2	0.25	
56	*Melaleuca quinquenervia*	1	15	3	0.3	
57	*Melaleuca quinquenervia*	1	15	3	0.25	
59	*Melaleuca quinquenervia*	1	15	3	0.3	
166	*Melaleuca quinquenervia*	1	10	1	0.3	
168	*Melaleuca quinquenervia*	1	10	2	0.3	
173	*Melaleuca quinquenervia*	1	10	2	0.45	
175	*Melaleuca quinquenervia*	1	10	2	0.35	
183	*Leptospermum polygalifolium*	1	10	2	0.35	
185	*Melaleuca quinquenervia*	1	10	2	0.25	
192	*Melaleuca quinquenervia*	1	10	2	0.25	
195	*Melaleuca quinquenervia*	1	10	2	0.3	
668	*Leptospermum polygalifolium*	1	12	1	0.4	
671	*Leptospermum polygalifolium*	1	12	1	0.4	
682	*Melaleuca quinquenervia*	1	8	1	0.2	
714	*Melaleuca quinquenervia*	1	14	2	0.7	
715	*Melaleuca quinquenervia*	1	8	1	0.2	
719	*Melaleuca quinquenervia*	1	10	2	0.3	

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
739	*Melaleuca quinquenervia*	1	8	1	0.2	
740	*Melaleuca quinquenervia*	1	8	1	0.2	
741	*Melaleuca quinquenervia*	1	8	1	0.2	
742	*Melaleuca quinquenervia*	1	8	1	0.2	
743	*Melaleuca quinquenervia*	1	8	1	0.2	
744	*Melaleuca quinquenervia*	1	8	1	0.2	
872	*Melaleuca quinquenervia*	1	3	1		
878	*Melaleuca quinquenervia*	1	12	2	0.6	
914	*Allocasuarina littoralis*	2	12	3	1	Glossy black-cockatoo food tree - MATURE + CHEWED CONES
66	*Eucalyptus signata*	2	15	3	0.8	Habitat tree
73	*Eucalyptus signata*	2	12	5	0.8	Habitat tree
74	*Eucalyptus signata*	2	12	5	0.7	Habitat tree
77	*Eucalyptus signata*	2	12	3	0.6	Habitat tree
89	*Eucalyptus signata*	2	15	3	0.4	Habitat tree
90	*Eucalyptus signata*	2	15	4	0.8	Habitat tree
98	*Eucalyptus signata*	2	15	3	0.8	Habitat tree
108	*Eucalyptus signata*	2	15	3	0.5	Habitat tree
109	*Eucalyptus signata*	2	15	3	0.5	Habitat tree
110	*Eucalyptus signata*	2	15	5	0.8	Habitat tree
291	*Eucalyptus signata*	2	15	2	0.35	Habitat tree
463	*Eucalyptus signata*	2	10	4	0.8	Habitat tree
480	*Eucalyptus signata*	2	10	4	0.8	Habitat tree
500	*Eucalyptus signata*	2	10	1	0.3	Habitat tree
535	*Eucalyptus signata*	2	10	2	0.3	Habitat tree
538	*Eucalyptus signata*	2	10	2	0.8	Habitat tree
546	*Eucalyptus signata*	2	5	2	0.4	Habitat tree
558	*Eucalyptus signata*	2	14	4	0.7	Habitat tree
562	*Banksia aemula*	2	10	2	0.8	Habitat tree
573	*Eucalyptus signata*	2	14	3	0.7	Habitat tree
574	*Eucalyptus signata*	2	14	3	0.7	Habitat tree
576	*Eucalyptus signata*	2	8	2	0.7	Habitat tree
644	*Eucalyptus signata*	2	12	3	0.5	Habitat tree
652	*Eucalyptus signata*	2	10	2	0.8	Habitat tree
654	*Eucalyptus signata*	2	12	2	0.4	Habitat tree
665	*Eucalyptus signata*	2	14	4	0.7	Habitat tree
722	*Eucalyptus signata*	2	12	2	0.4	Habitat tree
725	*Eucalyptus signata*	2	15	3	0.8	Habitat tree
750	*Eucalyptus signata*	2	8	1	0.2	Habitat tree
803	*Eucalyptus signata*	2	14	3	0.7	Habitat tree
805	*Eucalyptus signata*	2	14	2	0.6	Habitat tree
888	*Eucalyptus signata*	2	14	3	0.6	Habitat tree
903	*Eucalyptus signata*	2	10	1	0.3	Habitat tree
948	*Eucalyptus signata*	2	8	1	0.25	Habitat tree
952	*Eucalyptus signata*	2	15	3	0.8	Habitat tree
953	*Eucalyptus signata*	2	14	2	0.7	Habitat tree
956	*Eucalyptus signata*	2	14	2	0.6	Habitat tree
977	*Eucalyptus signata*	2	15	3	0.9	Habitat tree

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
978	*Eucalyptus signata*	2	15	3	0.9	Habitat tree
989	*Eucalyptus signata*	2	14	3	0.7	Habitat tree
990	*Eucalyptus signata*	2	14	2	0.7	Habitat tree
1024	*Banksia aemula*	2	12	1	0.4	Habitat tree
1029	*Eucalyptus signata*	2	15	3	0.8	Habitat tree
235	*Eucalyptus robusta*	2	10	3	0.7	Primary Koala food tree + SCATS
602	*Allocasuarina littoralis*	3	12	2	0.4	Glossy black-cockatoo food tree
608	*Allocasuarina littoralis*	3	12	2	0.4	Glossy black-cockatoo food tree
611	*Allocasuarina littoralis*	3	10	2	0.3	Glossy black-cockatoo food tree
612	*Allocasuarina littoralis*	3	10	1	0.3	Glossy black-cockatoo food tree
619	*Allocasuarina littoralis*	3	14	2	0.6	Glossy black-cockatoo food tree
620	*Allocasuarina littoralis*	3	10	1	0.3	Glossy black-cockatoo food tree
622	*Allocasuarina littoralis*	3	10	1	0.3	Glossy black-cockatoo food tree
1177	*Allocasuarina littoralis*	3	10	1	0.3	Glossy black-cockatoo food tree
511	*Allocasuarina littoralis*	3	4	1	0.4	Glossy black-cockatoo food tree - MATURE
641	*Allocasuarina littoralis*	3	8	1	0.7	Glossy black-cockatoo food tree - MATURE
764	*Allocasuarina littoralis*	3	10	2	0.3	Glossy black-cockatoo food tree - MATURE
830	*Allocasuarina littoralis*	3	12	2	0.5	Glossy black-cockatoo food tree - MATURE
832	*Allocasuarina littoralis*	3	5	1	0.3	Glossy black-cockatoo food tree - MATURE
833	*Allocasuarina littoralis*	3	15	2	0.7	Glossy black-cockatoo food tree - MATURE
835	*Allocasuarina littoralis*	3	12	2	0.5	Glossy black-cockatoo food tree - MATURE
837	*Allocasuarina littoralis*	3	8	2	0.6	Glossy black-cockatoo food tree - MATURE
840	*Allocasuarina littoralis*	3	14	2	1.2	Glossy black-cockatoo food tree - MATURE
850	*Allocasuarina littoralis*	3	10	2	0.4	Glossy black-cockatoo food tree - MATURE
857	*Allocasuarina littoralis*	3	10	2	0.8	Glossy black-cockatoo food tree - MATURE
859	*Allocasuarina littoralis*	3	12	2	0.5	Glossy black-cockatoo food tree - MATURE
860	*Allocasuarina littoralis*	3	10	2	0.8	Glossy black-cockatoo food tree - MATURE
917	*Allocasuarina littoralis*	3	12	3	1	Glossy black-cockatoo food tree - MATURE
926	*Allocasuarina littoralis*	3	12	3	1	Glossy black-cockatoo food tree - MATURE
20	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
22	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
23	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
162	*Eucalyptus robusta*	3	10	3	0.5	Primary Koala food tree
220	*Eucalyptus robusta*	3	10	1	0.25	Primary Koala food tree
243	*Eucalyptus robusta*	3	12	1	0.45	Primary Koala food tree

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
244	*Eucalyptus robusta*	3	12	2	0.45	Primary Koala food tree
245	*Eucalyptus robusta*	3	12	1	0.3	Primary Koala food tree
255	*Eucalyptus robusta*	3	15	3	0.5	Primary Koala food tree
264	*Eucalyptus robusta*	3	10	2	0.3	Primary Koala food tree
272	*Eucalyptus robusta*	3	15	3	0.6	Primary Koala food tree
275	*Eucalyptus robusta*	3	15	3	0.6	Primary Koala food tree
276	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
278	*Eucalyptus robusta*	3	15	3	0.5	Primary Koala food tree
279	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
280	*Eucalyptus robusta*	3	15	2	0.3	Primary Koala food tree
281	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
282	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
284	*Eucalyptus robusta*	3	15	5	0.8	Primary Koala food tree
286	*Eucalyptus robusta*	3	15	2	0.3	Primary Koala food tree
298	*Eucalyptus robusta*	3	15	3	0.6	Primary Koala food tree
300	*Eucalyptus robusta*	3	15	2	0.3	Primary Koala food tree
302	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
303	*Eucalyptus robusta*	3	15	2	0.3	Primary Koala food tree
304	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
313	*Eucalyptus robusta*	3	15	1	0.35	Primary Koala food tree
314	*Eucalyptus robusta*	3	15	3	0.5	Primary Koala food tree
315	*Eucalyptus robusta*	3	15	3	0.35	Primary Koala food tree
317	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
323	*Eucalyptus robusta*	3	15	1	0.5	Primary Koala food tree
328	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
329	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
333	*Eucalyptus robusta*	3	15	3	0.5	Primary Koala food tree
336	*Eucalyptus robusta*	3	10	1	0.8	Primary Koala food tree
357	*Eucalyptus robusta*	3	10	2	0.35	Primary Koala food tree
363	*Eucalyptus robusta*	3	10	4	0.7	Primary Koala food tree
364	*Eucalyptus robusta*	3	10	2	0.4	Primary Koala food tree
365	*Eucalyptus robusta*	3	15	4	0.7	Primary Koala food tree
366	*Eucalyptus robusta*	3	15	3	0.4	Primary Koala food tree
372	*Eucalyptus robusta*	3	15	3	0.5	Primary Koala food tree
373	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
385	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
386	*Eucalyptus robusta*	3	15	2	0.4	Primary Koala food tree
392	*Eucalyptus robusta*	3	15	2	0.5	Primary Koala food tree
402	*Eucalyptus robusta*	3	14	4	0.8	Primary Koala food tree
405	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
423	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
430	*Eucalyptus robusta*	3	10	1	0.3	Primary Koala food tree
442	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
443	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
444	*Eucalyptus robusta*	3	14	2	0.5	Primary Koala food tree
460	*Eucalyptus robusta*	3	10	1	0.3	Primary Koala food tree
482	*Eucalyptus robusta*	3	10	1	0.25	Primary Koala food tree
552	*Eucalyptus robusta*	3	15	4	0.8	Primary Koala food tree
553	*Eucalyptus robusta*	3	15	3	0.8	Primary Koala food tree
554	*Eucalyptus robusta*	3	15	3	0.8	Primary Koala food tree

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
568	*Eucalyptus robusta*	3	6	2	0.5	Primary Koala food tree
579	*Eucalyptus robusta*	3	15	3	0.8	Primary Koala food tree
580	*Eucalyptus robusta*	3	10	2	0.3	Primary Koala food tree
634	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
1160	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
1161	*Eucalyptus robusta*	3	14	3	0.7	Primary Koala food tree
1162	*Eucalyptus robusta*	3	12	2	0.5	Primary Koala food tree
1206	*Eucalyptus robusta*	3	6	1	0.4	Primary Koala food tree
1207	*Eucalyptus robusta*	3	12	2	0.5	Primary Koala food tree
1208	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
1212	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
1256	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
1266	*Eucalyptus robusta*	3	12	2	0.4	Primary Koala food tree
841	*Allocasuarina littoralis*	3	10	2	0.8	
842	*Allocasuarina littoralis*	3	10	2	0.8	
906	*Allocasuarina littoralis*	3	15	2	0.8	
910	*Allocasuarina littoralis*	3	14	2	0.6	
913	*Allocasuarina littoralis*	3	12	2	0.5	
916	*Allocasuarina littoralis*	3	10	1	0.4	
931	*Allocasuarina littoralis*	3	8	2	0.6	
939	*Allocasuarina littoralis*	3	15	3	0.8	
942	*Allocasuarina littoralis*	3	10	2	0.3	
24	*Eucalyptus robusta*	4	10	3	0.25	Primary Koala food tree
241	*Eucalyptus robusta*	4	12	2	0.25	Primary Koala food tree
257	*Eucalyptus robusta*	4	15	2	0.2	Primary Koala food tree
919	*Allocasuarina littoralis*	4	8	1	0.25	
868	*Eucalyptus signata*	5	14	4	0.8	Habitat tree
2	*Eucalyptus signata*	5	15	4	0.5	
3	*Eucalyptus signata*	5	12	4	0.35	
4	*Eucalyptus signata*	5	12	4	0.4	
5	*Banksia aemula*	5	5	3	0.4	
6	*Eucalyptus signata*	5	12	4	0.4	
7	*Eucalyptus signata*	5	15	4	0.6	
9	*Eucalyptus signata*	5	10	3	0.3	
10	*Eucalyptus signata*	5	15	5	0.7	
13	*Eucalyptus signata*	5	15	4	0.5	
17	*Eucalyptus signata*	5	12	2	0.35	
45	*Eucalyptus signata*	5	10	4	0.45	
61	*Lophostemon suaveolens*	5	15	4	0.5	
65	*Eucalyptus signata*	5	15	5	0.6	
72	*Eucalyptus signata*	5	12	4	0.5	
78	*Melaleuca quinquenervia*	5	12	2	0.5	
86	*Melaleuca quinquenervia*	5	8	2	0.35	
91	*Eucalyptus signata*	5	15	4	0.8	
93	*Eucalyptus signata*	5	15	3	0.8	
94	*Eucalyptus signata*	5	10	3	0.5	
95	*Eucalyptus signata*	5	10	3	0.5	
96	*Eucalyptus signata*	5	10	3	0.4	
97	*Eucalyptus signata*	5	10	4	0.5	
99	*Eucalyptus signata*	5	15	3	0.8	

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
100	*Eucalyptus signata*	5	15	3	0.5	
101	*Eucalyptus signata*	5	15	3	0.5	
102	*Eucalyptus signata*	5	15	3	0.5	
103	*Eucalyptus signata*	5	15	3	0.5	
105	*Eucalyptus signata*	5	15	3	0.5	
106	*Eucalyptus signata*	5	15	4	0.8	
107	*Eucalyptus signata*	5	15	3	0.5	
113	*Eucalyptus signata*	5	15	5	0.7	
116	*Eucalyptus signata*	5	15	5	0.8	
123	*Eucalyptus signata*	5	10	3	0.5	
125	*Melaleuca quinquenervia*	5	10	2	0.4	
127	*Melaleuca quinquenervia*	5	10	2	0.3	
128	*Melaleuca quinquenervia*	5	10	2	0.3	
135	*Melaleuca quinquenervia*	5	10	2	0.3	
140	*Melaleuca quinquenervia*	5	10	2	0.3	
142	*Melaleuca quinquenervia*	5	10	2	0.3	
143	*Melaleuca quinquenervia*	5	10	3	0.5	
146	*Melaleuca quinquenervia*	5	10	4	0.9	
158	*Eucalyptus signata*	5	10	3	0.4	
198	*Eucalyptus signata*	5	10	5	0.65	
223	*Eucalyptus signata*	5	10	3	0.3	
227	*Banksia aemula*	5	10	2	0.45	
239	*Eucalyptus signata*	5	15	3	0.7	
240	*Eucalyptus signata*	5	15	3	0.7	
250	*Acacia melanoxylon*	5	10	3	0.5	
312	*Eucalyptus signata*	5	15	2	0.35	
338	*Melaleuca quinquenervia*	5	10	2	0.4	
345	*Melaleuca quinquenervia*	5	10	2	0.4	
349	*Melaleuca quinquenervia*	5	10	1	0.4	
351	*Melaleuca quinquenervia*	5	10	2	0.5	
352	*Melaleuca quinquenervia*	5	10	2	0.4	
356	*Melaleuca quinquenervia*	5	10	2	0.6	
359	*Melaleuca quinquenervia*	5	10	2	0.4	
374	*Melaleuca quinquenervia*	5	15	2	0.4	
387	*Melaleuca quinquenervia*	5	15	2	0.4	
388	*Melaleuca quinquenervia*	5	15	2	0.4	
403	*Melaleuca quinquenervia*	5	14	2	0.8	
404	*Melaleuca quinquenervia*	5	12	1	0.4	
432	*Melaleuca quinquenervia*	5	10	2	0.3	
434	*Eucalyptus signata*	5	12	3	0.5	
435	*Melaleuca quinquenervia*	5	14	2	0.5	
439	*Melaleuca quinquenervia*	5	15	1	0.8	
452	*Eucalyptus signata*	5	14	3	0.5	
461	*Eucalyptus signata*	5	15	4	0.8	
464	*Banksia aemula*	5	4	1	0.3	
465	*Banksia aemula*	5	5	1	0.4	
466	*Banksia aemula*	5	5	1	0.4	
467	*Banksia aemula*	5	5	1	0.4	
468	*Banksia aemula*	5	10	1	0.3	
470	*Banksia aemula*	5	5	1	0.4	

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
471	*Banksia aemula*	5	12	1	0.4	
473	*Banksia aemula*	5	5	1	0.4	
474	*Banksia aemula*	5	4	1	0.3	
475	*Banksia aemula*	5	6	2	0.5	
476	*Banksia aemula*	5	5	1	0.4	
477	*Banksia aemula*	5	5	1	0.4	
478	*Banksia aemula*	5	6	2	0.5	
479	*Banksia aemula*	5	12	1	0.4	
481	*Banksia aemula*	5	12	2	0.4	
484	*Banksia aemula*	5	4	1	0.3	
485	*Banksia aemula*	5	5	1	0.4	
486	*Banksia aemula*	5	6	1	0.3	
490	*Banksia aemula*	5	4	1	0.3	
493	*Banksia aemula*	5	4	1	0.3	
495	*Banksia aemula*	5	4	1	0.3	
496	*Banksia aemula*	5	6	1	0.5	
497	*Eucalyptus signata*	5	10	1	0.3	
498	*Banksia aemula*	5	6	2	0.5	
499	*Banksia aemula*	5	5	2	0.4	
503	*Eucalyptus signata*	5	12	1	0.4	
504	*Eucalyptus signata*	5	10	1	0.3	
505	*Banksia aemula*	5	4	1	0.3	
506	*Banksia aemula*	5	6	2	0.5	
507	*Banksia aemula*	5	5	2	0.4	
508	*Banksia aemula*	5	5	2	0.4	
510	*Eucalyptus signata*	5	5	2	0.4	
512	*Eucalyptus signata*	5	12	1	0.4	
513	*Banksia aemula*	5	4	2	0.3	
514	*Eucalyptus signata*	5	10	2	0.3	
515	*Eucalyptus signata*	5	12	2	0.4	
518	*Eucalyptus signata*	5	10	2	0.3	
525	*Eucalyptus signata*	5	10	2	0.3	
526	*Eucalyptus signata*	5	10	2	0.3	
527	*Eucalyptus signata*	5	10	2	0.3	
529	*Banksia aemula*	5	10	2	0.3	
531	*Eucalyptus signata*	5	4	2	0.3	
532	*Eucalyptus signata*	5	12	2	0.4	
533	*Eucalyptus signata*	5	12	2	0.4	
534	*Eucalyptus signata*	5	10	2	0.3	
536	*Eucalyptus signata*	5	15	4	0.8	
537	*Banksia aemula*	5	12	2	0.4	
547	*Eucalyptus signata*	5	15	4	0.8	
555	*Eucalyptus signata*	5	12	2	0.4	
556	*Eucalyptus signata*	5	14	3	0.6	
557	*Eucalyptus signata*	5	14	3	0.5	
561	*Banksia aemula*	5	10	2	0.8	
563	*Banksia aemula*	5	8	2	0.7	
564	*Eucalyptus signata*	5	8	2	0.6	
566	*Banksia aemula*	5	15	3	0.8	
567	*Banksia aemula*	5	6	2	0.5	

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
570	*Eucalyptus signata*	5	12	2	0.4	
571	*Eucalyptus signata*	5	14	3	0.7	
572	*Eucalyptus signata*	5	10	2	0.3	
578	*Eucalyptus signata*	5	15	3	0.8	
601	*Melaleuca quinquenervia*	5	12	2	0.4	
603	*Melaleuca quinquenervia*	5	4	1	0.4	
605	*Eucalyptus signata*	5	12	2	0.4	
609	*Melaleuca quinquenervia*	5	10	2	0.3	
610	*Melaleuca quinquenervia*	5	12	2	0.4	
623	*Eucalyptus signata*	5	12	2	0.5	
624	*Melaleuca quinquenervia*	5	15	3	0.7	
625	*Eucalyptus signata*	5	13	2	0.5	
627	*Eucalyptus signata*	5	14	3	0.6	
629	*Eucalyptus signata*	5	14	4	0.7	
630	*Eucalyptus signata*	5	15	4	0.8	
631	*Eucalyptus signata*	5	14	4	0.7	
632	*Eucalyptus signata*	5	14	3	0.6	
633	*Eucalyptus signata*	5	14	3	0.6	
635	*Eucalyptus signata*	5	12	2	0.4	
637	*Banksia aemula*	5	8	3	0.7	
642	*Banksia aemula*	5	10	1	0.4	
643	*Eucalyptus signata*	5	8	2	0.6	
649	*Banksia aemula*	5	12	2	0.4	
650	*Banksia aemula*	5	8	2	0.7	
651	*Banksia aemula*	5	8	2	0.7	
653	*Eucalyptus signata*	5	15	3	0.8	
658	*Eucalyptus signata*	5	12	2	0.4	
659	*Eucalyptus signata*	5	15	4	0.7	
662	*Eucalyptus signata*	5	15	1	0.8	
720	*Eucalyptus signata*	5	10	2	0.3	
721	*Eucalyptus signata*	5	12	2	0.4	
728	*Eucalyptus signata*	5	12	2	0.4	
737	*Eucalyptus signata*	5	14	2	0.5	
746	*Eucalyptus signata*	5	8	1	0.2	
749	*Eucalyptus signata*	5	14	2	0.6	
751	*Eucalyptus signata*	5	14	3	0.8	
753	*Eucalyptus signata*	5	14	3	0.8	
761	*Banksia aemula*	5	14	2	0.6	
765	*Banksia aemula*	5	10	2	0.8	
767	*Eucalyptus signata*	5	10	1	0.4	
772	*Banksia aemula*	5	5	1	0.3	
774	*Banksia aemula*	5	12	2	0.4	
775	*Banksia aemula*	5	5	1	0.3	
777	*Eucalyptus signata*	5	8	2	0.6	
779	*Eucalyptus signata*	5	10	2	0.9	
782	*Banksia aemula*	5	10	2	0.8	
784	*Banksia aemula*	5	10	2	0.8	
791	*Banksia aemula*	5	10	2	0.8	
792	*Eucalyptus signata*	5	4	1	0.3	
793	*Eucalyptus signata*	5	8	2	0.7	

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
794	*Eucalyptus signata*	5	15	3	0.8	
795	*Eucalyptus signata*	5	14	2	0.5	
796	*Eucalyptus signata*	5	15	2	0.7	
797	*Eucalyptus signata*	5	14	2	0.6	
798	*Banksia aemula*	5	14	3	0.7	
799	*Banksia aemula*	5	14	3	0.7	
800	*Banksia aemula*	5	10	2	0.8	
801	*Eucalyptus signata*	5	10	2	0.8	
817	*Banksia aemula*	5	15	2	0.8	
829	*Banksia aemula*	5	12	2	0.5	
834	*Banksia aemula*	5	12	2	0.5	
838	*Banksia aemula*	5	12	1	0.5	
839	*Banksia aemula*	5	10	1	0.4	
844	*Banksia aemula*	5	10	1	0.4	
851	*Banksia aemula*	5	6	1	0.5	
856	*Banksia aemula*	5	10	1	0.4	
858	*Banksia aemula*	5	5	2	0.3	
864	*Eucalyptus signata*	5	12	2	0.5	
865	*Eucalyptus signata*	5	15	2	0.7	
866	*Eucalyptus signata*	5	14	4	0.8	
867	*Eucalyptus signata*	5	14	4	0.8	
869	*Xanthorrhoea johnsonii*	5	14	3	0.8	
873	*Eucalyptus signata*	5	8	1	0.2	
875	*Eucalyptus signata*	5	10	1	0.3	
876	*Eucalyptus signata*	5	10	2	0.3	
881	*Eucalyptus signata*	5	12	2	0.4	
883	*Eucalyptus signata*	5	12	1	0.4	
884	*Eucalyptus signata*	5	12	2	0.4	
885	*Eucalyptus signata*	5	14	3	0.6	
886	*Eucalyptus signata*	5	10	2	0.3	
889	*Eucalyptus signata*	5	14	2	0.6	
892	*Eucalyptus signata*	5	15	3	0.8	
893	*Eucalyptus signata*	5	10	2	0.3	
895	*Eucalyptus signata*	5	10	2	0.3	
900	*Eucalyptus signata*	5	15	3	0.8	
904	*Eucalyptus signata*	5	14	2	0.6	
905	*Eucalyptus signata*	5	15	3	0.8	
911	*Banksia aemula*	5	10	1	0.3	
915	*Banksia aemula*	5	10	1	0.3	
918	*Banksia aemula*	5	8	1	0.25	
935	*Eucalyptus signata*	5	10	2	0.4	
950	*Eucalyptus signata*	5	8	1	0.25	
987	*Eucalyptus signata*	5	15	3	0.8	
991	*Eucalyptus signata*	5	15	3	0.8	
1005	*Melaleuca quinquenervia*	5	15	3	0.8	
1020	*Melaleuca quinquenervia*	5	15	3	0.8	
1021	*Melaleuca quinquenervia*	5	14	2	0.5	
1022	*Eucalyptus signata*	5	12	1	0.4	
1025	*Eucalyptus signata*	5	14	2	0.6	
1028	*Eucalyptus signata*	5	12	2	0.5	

No.	*Species*	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Notes
1031	*Eucalyptus signata*	5	15	3	0.8	
1032	*Eucalyptus signata*	5	15	3	0.8	
1033	*Eucalyptus signata*	5	15	3	0.8	
1039	*Eucalyptus signata*	5	15	3	0.8	
1040	*Eucalyptus signata*	5	14	3	0.7	
1041	*Melaleuca quinquenervia*	5	14	2	0.6	
1043	*Eucalyptus signata*	5	13	1	0.6	
1047	*Eucalyptus signata*	5	10	2	0.8	
1049	*Eucalyptus signata*	5	12	1	0.5	
1050	*Eucalyptus signata*	5	14	3	0.7	
1051	*Banksia aemula*	5	14	3	0.6	
1062	*Banksia aemula*	5	6	1	0.5	
1063	*Banksia aemula*	5	12	2	0.6	
1064	*Eucalyptus signata*	5	8	1	0.6	
1065	*Eucalyptus signata*	5	8	1	0.6	
1066	*Eucalyptus signata*	5	14	2	0.7	
1067	*Eucalyptus signata*	5	14	3	0.7	
1101	*Melaleuca quinquenervia*	5	14	3	0.6	
1103	*Melaleuca quinquenervia*	5	14	2	0.7	
1109	*Melaleuca quinquenervia*	5	12	1	0.4	
1111	*Melaleuca quinquenervia*	5	14	2	0.7	
1114	*Melaleuca quinquenervia*	5	14	1	0.6	
1115	*Melaleuca quinquenervia*	5	14	2	0.7	
1123	*Melaleuca quinquenervia*	5	12	2	0.4	
1124	*Melaleuca quinquenervia*	5	13	2	0.6	
1128	*Melaleuca quinquenervia*	5	12	2	0.4	
1129	*Melaleuca quinquenervia*	5	10	1	0.3	
1130	*Melaleuca quinquenervia*	5	12	2	0.4	
1131	*Melaleuca quinquenervia*	5	10	1	0.3	
1132	*Melaleuca quinquenervia*	5	14	2	0.6	
1163	*Melaleuca quinquenervia*	5	14	2	0.6	
1164	*Melaleuca quinquenervia*	5	12	2	0.5	
1165	*Melaleuca quinquenervia*	5	12	1	0.4	
1166	*Melaleuca quinquenervia*	5	10	1	0.3	
1168	*Melaleuca quinquenervia*	5	12	2	0.4	
1169	*Melaleuca quinquenervia*	5	10	1	0.3	
1181	*Banksia ericifolia*	5	12	2	0.5	
46	*Eucalyptus signata*	6	10	2	0.2	
63	*Lophostemon suaveolens*	6	10	2	0.25	
76	*Eucalyptus signata*	6	12	1	0.2	
259	*Melaleuca quinquenervia*	6	15	1	0.2	
309	*Melaleuca quinquenervia*	6	15	1	0.2	
377	*Melaleuca quinquenervia*	6	15	1	0.25	
437	*Melaleuca quinquenervia*	6	10	1	0.25	
492	*Banksia aemula*	6	3	1	0.2	
780	*Banksia aemula*	6	8	1	0.2	
925	*Banksia aemula*	6	8	1	0.25	
937	*Eucalyptus signata*	6	8	1	0.2	
1120	*Melaleuca quinquenervia*	6	8	1	0.2	
1121	*Melaleuca quinquenervia*	6	8	1	0.2	

APPENDIX 9
TREE TABLE - RETAINED/REMOVED

TREE TABLE – RETAINED/REMOVED

No.	Species	Significance Ranking	Height (m)	Spread (m)	DBH (m)	Tree Notes	Tree Outcome
1	*Eucalyptus signata*	**1**	15	5	1.1	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
2	*Eucalyptus signata*	**5**	15	4	0.5		**Staying**
3	*Eucalyptus signata*	**5**	12	4	0.35		**Staying**
4	*Eucalyptus signata*	**5**	12	4	0.4		**Staying**
5	*Banksia aemula*	**5**	5	3	0.4		**Staying**
6	*Eucalyptus signata*	**5**	12	4	0.4		**Staying**
7	*Eucalyptus signata*	**5**	15	4	0.6		**Staying**
9	*Eucalyptus signata*	**5**	10	3	0.3		**Staying**
10	*Eucalyptus signata*	**5**	15	5	0.7		**Staying**
12	*Eucalyptus signata*	**1**	15	5	1.3	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
13	*Eucalyptus signata*	**5**	15	4	0.5		**Staying**
15	*Eucalyptus robusta*	**1**	10	2	0.25	Primary Koala food tree	**Staying**
16	*Eucalyptus robusta*	**1**	10	2	0.4	Primary Koala food tree	**Staying**
17	*Eucalyptus signata*	**5**	12	2	0.35		**Staying**
20	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Staying**
21	*Eucalyptus robusta*	**1**	15	3	0.4	Primary Koala food tree	**Staying**
22	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Staying**
23	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Staying**
24	*Eucalyptus robusta*	**4**	10	3	0.25	Primary Koala food tree	**Staying**
28	*Eucalyptus robusta*	**1**	15	4	0.5	Primary Koala food tree	**Staying**
29	*Melaleuca quinquenervia*	**1**	10	3	0.3		**Staying**
32	*Eucalyptus robusta*	**1**	10	3	0.3	Primary Koala food tree	**Staying**
33	*Melaleuca quinquenervia*	**1**	10	3	0.3		**Staying**
43	*Melaleuca quinquenervia*	**1**	12	3	0.25		**Staying**
45	*Eucalyptus signata*	**5**	10	4	0.45		**Staying**
46	*Eucalyptus signata*	**6**	10	2	0.2		**Staying**
50	*Melaleuca quinquenervia*	**1**	10		0.2		**Staying**
52	*Melaleuca quinquenervia*	**1**	10	2	0.25		**Staying**
54	*Eucalyptus robusta*	**1**	10	3	0.3	Primary Koala food tree	**Staying**

56	*Melaleuca quinquenervia*	**1**	15	3	0.3		**Staying**
57	*Melaleuca quinquenervia*	**1**	15	3	0.25		**Staying**
59	*Melaleuca quinquenervia*	**1**	15	3	0.3		**Staying**
61	*Lophostemon suaveolens*	**5**	15	4	0.5		**Staying**
62	*Eucalyptus robusta*	**1**	15	4	0.45	Primary Koala food tree	**Staying**
63	*Lophostemon suaveolens*	**6**	10	2	0.25		**Staying**
64	*Eucalyptus robusta*	**1**	15	3	0.5	Primary Koala food tree	**Staying**
65	*Eucalyptus signata*	**5**	15	5	0.6		**Going**
66	*Eucalyptus signata*	**2**	15	3	0.8	Habitat tree	**Going**
67	*Eucalyptus signata*	**1**	15	3	1	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
72	*Eucalyptus signata*	**5**	12	4	0.5		**Going**
73	*Eucalyptus signata*	**2**	12	5	0.8	Habitat tree	**Going**
74	*Eucalyptus signata*	**2**	12	5	0.7	Habitat tree	**Going**
76	*Eucalyptus signata*	**6**	12	1	0.2		**Going**
77	*Eucalyptus signata*	**2**	12	3	0.6	Habitat tree	**Going**
78	*Melaleuca quinquenervia*	**5**	12	2	0.5		**Going**
86	*Melaleuca quinquenervia*	**5**	8	2	0.35		**Going**
88	*Eucalyptus signata*	**1**	15	5	1.5	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
89	*Eucalyptus signata*	**2**	15	3	0.4	Habitat tree	**Going**
90	*Eucalyptus signata*	**2**	15	4	0.8	Habitat tree	**Going**
91	*Eucalyptus signata*	**5**	15	4	0.8		**Going**
92	*Eucalyptus signata*	**1**	15	4	1.2	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
93	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
94	*Eucalyptus signata*	**5**	10	3	0.5		**Going**
95	*Eucalyptus signata*	**5**	10	3	0.5		**Going**
96	*Eucalyptus signata*	**5**	10	3	0.4		**Going**
97	*Eucalyptus signata*	**5**	10	4	0.5		**Going**
98	*Eucalyptus signata*	**2**	15	3	0.8	Habitat tree	**Going**
99	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
100	*Eucalyptus signata*	**5**	15	3	0.5		**Going**
101	*Eucalyptus signata*	**5**	15	3	0.5		**Going**
102	*Eucalyptus signata*	**5**	15	3	0.5		**Going**
103	*Eucalyptus signata*	**5**	15	3	0.5		**Going**
104	*Eucalyptus signata*	**1**	15	4	0.9	Habitat tree + **OLD GROWTH** (>900mm)	**Going**

105	*Eucalyptus signata*	**5**	15	3	0.5		**Going**
106	*Eucalyptus signata*	**5**	15	4	0.8		**Going**
107	*Eucalyptus signata*	**5**	15	3	0.5		**Going**
108	*Eucalyptus signata*	**2**	15	3	0.5	Habitat tree	**Going**
109	*Eucalyptus signata*	**2**	15	3	0.5	Habitat tree	**Going**
110	*Eucalyptus signata*	**2**	15	5	0.8	Habitat tree	**Going**
113	*Eucalyptus signata*	**5**	15	5	0.7		**Going**
114	*Eucalyptus signata*	**1**	15	5	1.2	**OLD GROWTH** (>900mm)	**Going**
116	*Eucalyptus signata*	**5**	15	5	0.8		**Going**
123	*Eucalyptus signata*	**5**	10	3	0.5		**Going**
125	*Melaleuca quinquenervia*	**5**	10	2	0.4		**Going**
127	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
128	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
135	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
140	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
142	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
143	*Melaleuca quinquenervia*	**5**	10	3	0.5		**Going**
146	*Melaleuca quinquenervia*	**5**	10	4	0.9		**Going**
157	*Eucalyptus signata*	**1**	15	5	0.9	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
158	*Eucalyptus signata*	**5**	10	3	0.4		**Going**
159	*Eucalyptus robusta*	**1**	10	3	0.4	Primary Koala food tree + **SCATS**	**Staying**
160	*Eucalyptus signata*	**1**	15	5	0.9	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
161	*Eucalyptus signata*	**1**	15	5	1	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
162	*Eucalyptus robusta*	**3**	10	3	0.5	Primary Koala food tree	**Staying**
163	*Eucalyptus signata*	**1**	15	5	1.3	**OLD GROWTH** (>900mm)	**Staying**
166	*Melaleuca quinquenervia*	**1**	10	1	0.3		**Staying**
168	*Melaleuca quinquenervia*	**1**	10	2	0.3		**Staying**
173	*Melaleuca quinquenervia*	**1**	10	2	0.45		**Staying**
175	*Melaleuca quinquenervia*	**1**	10	2	0.35		**Staying**
176	*Eucalyptus robusta*	**1**	10	1	0.2	Primary Koala food tree	**Staying**
181	*Eucalyptus robusta*	**1**	10	3	0.4	Primary Koala food tree	**Staying**
183	*Leptospermum polygalifolium*	**1**	10	2	0.35		**Staying**
185	*Melaleuca quinquenervia*	**1**	10	2	0.25		**Staying**

188	*Eucalyptus robusta*	**1**	10	2	0.4	Primary Koala food tree	**Staying**
192	*Melaleuca quinquenervia*	**1**	10	2	0.25		**Staying**
195	*Melaleuca quinquenervia*	**1**	10	2	0.3		**Staying**
198	*Eucalyptus signata*	**5**	10	5	0.65		**Staying**
220	*Eucalyptus robusta*	**3**	10	1	0.25	Primary Koala food tree	**Going**
223	*Eucalyptus signata*	**5**	10	3	0.3		**Going**
225	*Eucalyptus signata*	**1**	10	5	0.9	**OLD GROWTH** (>900mm)	**Going**
226	*Eucalyptus signata*	**1**	10	5	0.9	**OLD GROWTH** (>900mm)	**Going**
227	*Banksia aemula*	**5**	10	2	0.45		**Going**
235	*Eucalyptus robusta*	**2**	10	3	0.7	Primary Koala food tree + **SCATS**	**Going**
239	*Eucalyptus signata*	**5**	15	3	0.7		**Going**
240	*Eucalyptus signata*	**5**	15	3	0.7		**Going**
241	*Eucalyptus robusta*	**4**	12	2	0.25	Primary Koala food tree	**Going**
243	*Eucalyptus robusta*	**3**	12	1	0.45	Primary Koala food tree	**Going**
244	*Eucalyptus robusta*	**3**	12	2	0.45	Primary Koala food tree	**Going**
245	*Eucalyptus robusta*	**3**	12	1	0.3	Primary Koala food tree	**Going**
250	*Acacia melanoxylon*	**5**	10	3	0.5		**Going**
255	*Eucalyptus robusta*	**3**	15	3	0.5	Primary Koala food tree	**Going**
257	*Eucalyptus robusta*	**4**	15	2	0.2	Primary Koala food tree	**Going**
259	*Melaleuca quinquenervia*	**6**	15	1	0.2		**Going**
264	*Eucalyptus robusta*	**3**	10	2	0.3	Primary Koala food tree	**Staying**
272	*Eucalyptus robusta*	**3**	15	3	0.6	Primary Koala food tree	**Going**
275	*Eucalyptus robusta*	**3**	15	3	0.6	Primary Koala food tree	**Going**
276	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
278	*Eucalyptus robusta*	**3**	15	3	0.5	Primary Koala food tree	**Going**
279	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
280	*Eucalyptus robusta*	**3**	15	2	0.3	Primary Koala food tree	**Going**
281	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Staying**
282	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
284	*Eucalyptus robusta*	**3**	15	5	0.8	Primary Koala food tree	**Going**
286	*Eucalyptus robusta*	**3**	15	2	0.3	Primary Koala food tree	**Staying**
288	*Eucalyptus robusta*	**1**	15	2	0.4	Primary Koala food tree	**Staying**
289	*Eucalyptus robusta*	**1**	15	2	0.4	Primary Koala food tree	**Staying**
290	*Eucalyptus robusta*	**1**	15	1	0.2	Primary Koala food tree	**Staying**

291	*Eucalyptus signata*	**2**	15	2	0.35	Habitat tree	**Staying**
293	*Eucalyptus robusta*	**1**	15	3	0.4	Primary Koala food tree	**Staying**
294	*Eucalyptus robusta*	**1**	15	2	0.3	Primary Koala food tree	**Staying**
295	*Eucalyptus robusta*	**1**	15	4	0.6	Primary Koala food tree	**Staying**
296	*Eucalyptus robusta*	**1**	15	2	0.35	Primary Koala food tree	**Staying**
298	*Eucalyptus robusta*	**3**	15	3	0.6	Primary Koala food tree	**Going**
300	*Eucalyptus robusta*	**3**	15	2	0.3	Primary Koala food tree	**Going**
302	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Going**
303	*Eucalyptus robusta*	**3**	15	2	0.3	Primary Koala food tree	**Staying**
304	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Staying**
309	*Melaleuca quinquenervia*	**6**	15	1	0.2		**Going**
312	*Eucalyptus signata*	**5**	15	2	0.35		**Going**
313	*Eucalyptus robusta*	**3**	15	1	0.35	Primary Koala food tree	**Going**
314	*Eucalyptus robusta*	**3**	15	3	0.5	Primary Koala food tree	**Going**
315	*Eucalyptus robusta*	**3**	15	3	0.35	Primary Koala food tree	**Going**
317	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
323	*Eucalyptus robusta*	**3**	15	1	0.5	Primary Koala food tree	**Going**
328	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Going**
329	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Going**
333	*Eucalyptus robusta*	**3**	15	3	0.5	Primary Koala food tree	**Going**
336	*Eucalyptus robusta*	**3**	10	1	0.8	Primary Koala food tree	**Going**
338	*Melaleuca quinquenervia*	**5**	10	2	0.4		**Going**
345	*Melaleuca quinquenervia*	**5**	10	2	0.4		**Going**
349	*Melaleuca quinquenervia*	**5**	10	1	0.4		**Going**
351	*Melaleuca quinquenervia*	**5**	10	2	0.5		**Going**
352	*Melaleuca quinquenervia*	**5**	10	2	0.4		**Going**
356	*Melaleuca quinquenervia*	**5**	10	2	0.6		**Going**
357	*Eucalyptus robusta*	**3**	10	2	0.35	Primary Koala food tree	**Going**
359	*Melaleuca quinquenervia*	**5**	10	2	0.4		**Going**
363	*Eucalyptus robusta*	**3**	10	4	0.7	Primary Koala food tree	**Going**
364	*Eucalyptus robusta*	**3**	10	2	0.4	Primary Koala food tree	**Going**
365	*Eucalyptus robusta*	**3**	15	4	0.7	Primary Koala food tree	**Going**
366	*Eucalyptus robusta*	**3**	15	3	0.4	Primary Koala food tree	**Going**
372	*Eucalyptus robusta*	**3**	15	3	0.5	Primary Koala food tree	**Going**

373	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
374	*Melaleuca quinquenervia*	**5**	15	2	0.4		**Going**
377	*Melaleuca quinquenervia*	**6**	15	1	0.25		**Going**
385	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
386	*Eucalyptus robusta*	**3**	15	2	0.4	Primary Koala food tree	**Going**
387	*Melaleuca quinquenervia*	**5**	15	2	0.4		**Going**
388	*Melaleuca quinquenervia*	**5**	15	2	0.4		**Going**
392	*Eucalyptus robusta*	**3**	15	2	0.5	Primary Koala food tree	**Going**
402	*Eucalyptus robusta*	**3**	14	4	0.8	Primary Koala food tree	**Going**
403	*Melaleuca quinquenervia*	**5**	14	2	0.8		**Going**
404	*Melaleuca quinquenervia*	**5**	12	1	0.4		**Going**
405	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**
412	*Eucalyptus signata*	**1**	15	5	1.2	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
413	*Eucalyptus signata*	**1**	15	5	1.2	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
414	*Eucalyptus signata*	**1**	15	4	0.9	**OLD GROWTH** (>900mm)	**Going**
423	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**
430	*Eucalyptus robusta*	**3**	10	1	0.3	Primary Koala food tree	**Going**
432	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
434	*Eucalyptus signata*	**5**	12	3	0.5		**Going**
435	*Melaleuca quinquenervia*	**5**	14	2	0.5		**Going**
437	*Melaleuca quinquenervia*	**6**	10	1	0.25		**Going**
439	*Melaleuca quinquenervia*	**5**	15	1	0.8		**Going**
442	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**
443	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**
444	*Eucalyptus robusta*	**3**	14	2	0.5	Primary Koala food tree	**Going**
452	*Eucalyptus signata*	**5**	14	3	0.5		**Going**
454	*Eucalyptus robusta*	**1**	14	3	0.6	Primary Koala food tree	**Going**
455	*Eucalyptus robusta*	**1**	14	3	0.5	Primary Koala food tree	**Staying**
456	*Eucalyptus robusta*	**1**	14	3	0.5	Primary Koala food tree	**Going**
457	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
458	*Eucalyptus robusta*	**1**	6	2	0.4	Primary Koala food tree	**Staying**
460	*Eucalyptus robusta*	**3**	10	1	0.3	Primary Koala food tree	**Staying**
461	*Eucalyptus signata*	**5**	15	4	0.8		**Staying**
463	*Eucalyptus signata*	**2**	10	4	0.8	Habitat tree	**Staying**

464	*Banksia aemula*	**5**	4	1	0.3		**Staying**
465	*Banksia aemula*	**5**	5	1	0.4		**Staying**
466	*Banksia aemula*	**5**	5	1	0.4		**Staying**
467	*Banksia aemula*	**5**	5	1	0.4		**Staying**
468	*Banksia aemula*	**5**	10	1	0.3		**Staying**
469	*Eucalyptus signata*	**1**	15	4	1.2	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
470	*Banksia aemula*	**5**	5	1	0.4		**Staying**
471	*Banksia aemula*	**5**	12	1	0.4		**Staying**
472	*Eucalyptus signata*	**1**	15	5	1.5	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
473	*Banksia aemula*	**5**	5	1	0.4		**Going**
474	*Banksia aemula*	**5**	4	1	0.3		**Staying**
475	*Banksia aemula*	**5**	6	2	0.5		**Staying**
476	*Banksia aemula*	**5**	5	1	0.4		**Staying**
477	*Banksia aemula*	**5**	5	1	0.4		**Staying**
478	*Banksia aemula*	**5**	6	2	0.5		**Staying**
479	*Banksia aemula*	**5**	12	1	0.4		**Going**
480	*Eucalyptus signata*	**2**	10	4	0.8	Habitat tree	**Going**
481	*Banksia aemula*	**5**	12	2	0.4		**Going**
482	*Eucalyptus robusta*	**3**	10	1	0.25	Primary Koala food tree	**Going**
483	*Eucalyptus signata*	**1**	12	3	1	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
484	*Banksia aemula*	**5**	4	1	0.3		**Staying**
485	*Banksia aemula*	**5**	5	1	0.4		**Staying**
486	*Banksia aemula*	**5**	6	1	0.3		**Staying**
490	*Banksia aemula*	**5**	4	1	0.3		**Staying**
492	*Banksia aemula*	**6**	3	1	0.2		**Staying**
493	*Banksia aemula*	**5**	4	1	0.3		**Staying**
495	*Banksia aemula*	**5**	4	1	0.3		**Staying**
496	*Banksia aemula*	**5**	6	1	0.5		**Staying**
497	*Eucalyptus signata*	**5**	10	1	0.3		**Staying**
498	*Banksia aemula*	**5**	6	2	0.5		**Staying**
499	*Banksia aemula*	**5**	5	2	0.4		**Staying**
500	*Eucalyptus signata*	**2**	10	1	0.3	Habitat tree	**Going**
502	*Banksia aemula*	**1**	10	4	0.9	**OLD GROWTH** (>900mm)	**Staying**
503	*Eucalyptus signata*	**5**	12	1	0.4		**Staying**

504	*Eucalyptus signata*	**5**	10	1	0.3		**Staying**
505	*Banksia aemula*	**5**	4	1	0.3		**Staying**
506	*Banksia aemula*	**5**	6	2	0.5		**Staying**
507	*Banksia aemula*	**5**	5	2	0.4		**Staying**
508	*Banksia aemula*	**5**	5	2	0.4		**Staying**
510	*Eucalyptus signata*	**5**	5	2	0.4		**Staying**
511	*Allocasuarina littoralis*	**3**	4	1	0.4	Glossy black-cockatoo food tree - **MATURE**	**Staying**
512	*Eucalyptus signata*	**5**	12	1	0.4		**Staying**
513	*Banksia aemula*	**5**	4	2	0.3		**Staying**
514	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
515	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
518	*Eucalyptus signata*	**5**	10	2	0.3		**Going**
525	*Eucalyptus signata*	**5**	10	2	0.3		**Going**
526	*Eucalyptus signata*	**5**	10	2	0.3		**Going**
527	*Eucalyptus signata*	**5**	10	2	0.3		**Going**
529	*Banksia aemula*	**5**	10	2	0.3		**Going**
531	*Eucalyptus signata*	**5**	4	2	0.3		**Going**
532	*Eucalyptus signata*	**5**	12	2	0.4		**Going**
533	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
534	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
535	*Eucalyptus signata*	**2**	10	2	0.3	Habitat tree	**Staying**
536	*Eucalyptus signata*	**5**	15	4	0.8		**Going**
537	*Banksia aemula*	**5**	12	2	0.4		**Staying**
538	*Eucalyptus signata*	**2**	10	2	0.8	Habitat tree	**Staying**
543	*Banksia aemula*	**1**	15	4	1.1	**OLD GROWTH** (>900mm)	**Staying**
546	*Eucalyptus signata*	**2**	5	2	0.4	Habitat tree	**Going**
547	*Eucalyptus signata*	**5**	15	4	0.8		**Going**
552	*Eucalyptus robusta*	**3**	15	4	0.8	Primary Koala food tree	**Going**
553	*Eucalyptus robusta*	**3**	15	3	0.8	Primary Koala food tree	**Going**
554	*Eucalyptus robusta*	**3**	15	3	0.8	Primary Koala food tree	**Going**
555	*Eucalyptus signata*	**5**	12	2	0.4		**Going**
556	*Eucalyptus signata*	**5**	14	3	0.6		**Going**
557	*Eucalyptus signata*	**5**	14	3	0.5		**Going**

558	*Eucalyptus signata*	**2**	14	4	0.7	Habitat tree	**Going**
559	*Eucalyptus signata*	**1**	15	5	1.5	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
560	*Banksia aemula*	**1**	15	3	1.5	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
561	*Banksia aemula*	**5**	10	2	0.8		**Going**
562	*Banksia aemula*	**2**	10	2	0.8	Habitat tree	**Going**
563	*Banksia aemula*	**5**	8	2	0.7		**Going**
564	*Eucalyptus signata*	**5**	8	2	0.6		**Going**
565	*Eucalyptus signata*	**1**	15	5	1.5	**OLD GROWTH** (>900mm)	**Going**
566	*Banksia aemula*	**5**	15	3	0.8		**Staying**
567	*Banksia aemula*	**5**	6	2	0.5		**Staying**
568	*Eucalyptus robusta*	**3**	6	2	0.5	Primary Koala food tree	**Staying**
570	*Eucalyptus signata*	**5**	12	2	0.4		**Going**
571	*Eucalyptus signata*	**5**	14	3	0.7		**Staying**
572	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
573	*Eucalyptus signata*	**2**	14	3	0.7	Habitat tree	**Staying**
574	*Eucalyptus signata*	**2**	14	3	0.7	Habitat tree	**Going**
575	*Banksia aemula*	**1**	15	3	1	**OLD GROWTH** (>900mm)	**Staying**
576	*Eucalyptus signata*	**2**	8	2	0.7	Habitat tree	**Staying**
577	*Eucalyptus signata*	**1**	15	4	1	**OLD GROWTH** (>900mm)	**Going**
578	*Eucalyptus signata*	**5**	15	3	0.8		**Staying**
579	*Eucalyptus robusta*	**3**	15	3	0.8	Primary Koala food tree	**Staying**
580	*Eucalyptus robusta*	**3**	10	2	0.3	Primary Koala food tree	**Staying**
601	*Melaleuca quinquenervia*	**5**	12	2	0.4		**Going**
602	*Allocasuarina littoralis*	**3**	12	2	0.4	Glossy black-cockatoo food tree	**Going**
603	*Melaleuca quinquenervia*	**5**	4	1	0.4		**Going**
605	*Eucalyptus signata*	**5**	12	2	0.4		**Going**
608	*Allocasuarina littoralis*	**3**	12	2	0.4	Glossy black-cockatoo food tree	**Going**
609	*Melaleuca quinquenervia*	**5**	10	2	0.3		**Going**
610	*Melaleuca quinquenervia*	**5**	12	2	0.4		**Going**
611	*Allocasuarina littoralis*	**3**	10	2	0.3	Glossy black-cockatoo food tree	**Going**
612	*Allocasuarina littoralis*	**3**	10	1	0.3	Glossy black-cockatoo food tree	**Going**
619	*Allocasuarina littoralis*	**3**	14	2	0.6	Glossy black-cockatoo food tree	**Going**
620	*Allocasuarina littoralis*	**3**	10	1	0.3	Glossy black-cockatoo food tree	**Going**
622	*Allocasuarina littoralis*	**3**	10	1	0.3	Glossy black-cockatoo food tree	**Going**

623	*Eucalyptus signata*	**5**	12	2	0.5		**Going**
624	*Melaleuca quinquenervia*	**5**	15	3	0.7		**Going**
625	*Eucalyptus signata*	**5**	13	2	0.5		**Going**
626	*Eucalyptus signata*	**1**	15	5	1	**OLD GROWTH** (>900mm)	**Going**
627	*Eucalyptus signata*	**5**	14	3	0.6		**Going**
628	*Eucalyptus signata*	**1**	15	4	0.9	**OLD GROWTH** (>900mm)	**Going**
629	*Eucalyptus signata*	**5**	14	4	0.7		**Going**
630	*Eucalyptus signata*	**5**	15	4	0.8		**Going**
631	*Eucalyptus signata*	**5**	14	4	0.7		**Going**
632	*Eucalyptus signata*	**5**	14	3	0.6		**Going**
633	*Eucalyptus signata*	**5**	14	3	0.6		**Staying**
634	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Staying**
635	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
636	*Banksia aemula*	**1**	15	4	0.9	**OLD GROWTH** (>900mm)	**Staying**
637	*Banksia aemula*	**5**	8	3	0.7		**Staying**
641	*Allocasuarina littoralis*	**3**	8	1	0.7	Glossy black-cockatoo food tree - **MATURE**	**Staying**
642	*Banksia aemula*	**5**	10	1	0.4		**Staying**
643	*Eucalyptus signata*	**5**	8	2	0.6		**Staying**
644	*Eucalyptus signata*	**2**	12	3	0.5	Habitat tree	**Staying**
647	*Melaleuca quinquenervia*	**1**	15	5	1.5	**OLD GROWTH** (>900mm)	**Staying**
649	*Banksia aemula*	**5**	12	2	0.4		**Going**
650	*Banksia aemula*	**5**	8	2	0.7		**Going**
651	*Banksia aemula*	**5**	8	2	0.7		**Going**
652	*Eucalyptus signata*	**2**	10	2	0.8	Habitat tree	**Going**
653	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
654	*Eucalyptus signata*	**2**	12	2	0.4	Habitat tree	**Staying**
655	*Eucalyptus signata*	**1**	15	4	1	**OLD GROWTH** (>900mm)	**Staying**
656	*Eucalyptus signata*	**1**	15	4	1.2	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
657	*Eucalyptus signata*	**1**	15	4	1.2	**OLD GROWTH** (>900mm)	**Staying**
658	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
659	*Eucalyptus signata*	**5**	15	4	0.7		**Staying**
660	*Eucalyptus signata*	**1**	15	4	1	**OLD GROWTH** (>900mm)	**Going**
662	*Eucalyptus signata*	**5**	15	1	0.8		**Going**

664	*Eucalyptus signata*	**1**	15	2	1.5	**OLD GROWTH** (>900mm)	**Going**
665	*Eucalyptus signata*	**2**	14	4	0.7	Habitat tree	**Going**
666	*Eucalyptus robusta*	**1**	15	2	1.2	Primary Koala food tree + **OLD GROWTH** (>900mm)	**Staying**
668	*Leptospermum polygalifolium*	**1**	12	1	0.4		**Staying**
671	*Leptospermum polygalifolium*	**1**	12	1	0.4		**Staying**
682	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
686	*Eucalyptus robusta*	**1**	12	1	0.4	Primary Koala food tree	**Staying**
687	*Melaleuca quinquenervia*	**1**	15	3	1.1	**OLD GROWTH** (>900mm)	**Staying**
706	*Eucalyptus robusta*	**1**	10	1	0.3	Primary Koala food tree	**Staying**
707	*Eucalyptus robusta*	**1**	12	2	0.6	Primary Koala food tree	**Staying**
712	*Eucalyptus robusta*	**1**	10	1	0.3	Primary Koala food tree	**Staying**
714	*Melaleuca quinquenervia*	**1**	14	2	0.7		**Staying**
715	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
716	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
717	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
719	*Melaleuca quinquenervia*	**1**	10	2	0.3		**Staying**
720	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
721	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
722	*Eucalyptus signata*	**2**	12	2	0.4	Habitat tree	**Staying**
723	*Eucalyptus signata*	**1**	15	4	1.2	**OLD GROWTH** (>900mm)	**Staying**
724	*Eucalyptus robusta*	**1**	12	2	0.6	Primary Koala food tree	**Staying**
725	*Eucalyptus signata*	**2**	15	3	0.8	Habitat tree	**Staying**
727	*Eucalyptus signata*	**1**	15	4	1	**OLD GROWTH** (>900mm)	**Staying**
728	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
737	*Eucalyptus signata*	**5**	14	2	0.5		**Staying**
738	*Melaleuca quinquenervia*	**1**	15	4	1.2	**OLD GROWTH** (>900mm)	**Staying**
739	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
740	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
741	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
742	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
743	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**

744	*Melaleuca quinquenervia*	**1**	8	1	0.2		**Staying**
746	*Eucalyptus signata*	**5**	8	1	0.2		**Staying**
749	*Eucalyptus signata*	**5**	14	2	0.6		**Staying**
750	*Eucalyptus signata*	**2**	8	1	0.2	Habitat tree	**Staying**
751	*Eucalyptus signata*	**5**	14	3	0.8		**Staying**
753	*Eucalyptus signata*	**5**	14	3	0.8		**Staying**
761	*Banksia aemula*	**5**	14	2	0.6		**Staying**
764	*Allocasuarina littoralis*	**3**	10	2	0.3	Glossy black-cockatoo food tree - **MATURE**	**Staying**
765	*Banksia aemula*	**5**	10	2	0.8		**Staying**
767	*Eucalyptus signata*	**5**	10	1	0.4		**Staying**
772	*Banksia aemula*	**5**	5	1	0.3		**Staying**
774	*Banksia aemula*	**5**	12	2	0.4		**Staying**
775	*Banksia aemula*	**5**	5	1	0.3		**Staying**
777	*Eucalyptus signata*	**5**	8	2	0.6		**Staying**
779	*Eucalyptus signata*	**5**	10	2	0.9		**Staying**
780	*Banksia aemula*	**6**	8	1	0.2		**Staying**
781	*Banksia aemula*	**1**	15	4	1	**OLD GROWTH** (>900mm)	**Staying**
782	*Banksia aemula*	**5**	10	2	0.8		**Staying**
784	*Banksia aemula*	**5**	10	2	0.8		**Staying**
791	*Banksia aemula*	**5**	10	2	0.8		**Staying**
792	*Eucalyptus signata*	**5**	4	1	0.3		**Staying**
793	*Eucalyptus signata*	**5**	8	2	0.7		**Staying**
794	*Eucalyptus signata*	**5**	15	3	0.8		**Staying**
795	*Eucalyptus signata*	**5**	14	2	0.5		**Staying**
796	*Eucalyptus signata*	**5**	15	2	0.7		**Staying**
797	*Eucalyptus signata*	**5**	14	2	0.6		**Staying**
798	*Banksia aemula*	**5**	14	3	0.7		**Staying**
799	*Banksia aemula*	**5**	14	3	0.7		**Staying**
800	*Banksia aemula*	**5**	10	2	0.8		**Staying**
801	*Eucalyptus signata*	**5**	10	2	0.8		**Staying**
802	*Eucalyptus signata*	**1**	12	2	1	**OLD GROWTH** (>900mm)	**Staying**
803	*Eucalyptus signata*	**2**	14	3	0.7	Habitat tree	**Staying**
805	*Eucalyptus signata*	**2**	14	2	0.6	Habitat tree	**Staying**

807	*Eucalyptus signata*	**1**	15	5	1.5	**OLD GROWTH** (>900mm)	**Staying**
808	*Eucalyptus signata*	**1**	15	4	1	Habitat tree + **OLD GROWTH** (>900mm)	**Staying**
809	*Eucalyptus robusta*	**1**	15	5	1.5	Primary Koala food tree + **OLD GROWTH** (>900mm)	**Staying**
810	*Eucalyptus robusta*	**1**	15	4	1	Primary Koala food tree + **OLD GROWTH** (>900mm)	**Staying**
812	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
813	*Eucalyptus robusta*	**1**	10	2	0.3	Primary Koala food tree	**Staying**
814	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
816	*Eucalyptus robusta*	**1**	12	2	0.5	Primary Koala food tree	**Staying**
817	*Banksia aemula*	**5**	15	2	0.8		**Staying**
819	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
820	*Eucalyptus robusta*	**1**	5	1	0.3	Primary Koala food tree	**Staying**
822	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
823	*Eucalyptus robusta*	**1**	10	2	0.3	Primary Koala food tree	**Staying**
824	*Eucalyptus robusta*	**1**	10	2	0.3	Primary Koala food tree	**Staying**
825	*Eucalyptus robusta*	**1**	10	2	0.3	Primary Koala food tree	**Staying**
826	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
829	*Banksia aemula*	**5**	12	2	0.5		**Staying**
830	*Allocasuarina littoralis*	**3**	12	2	0.5	Glossy black-cockatoo food tree - **MATURE**	**Staying**
832	*Allocasuarina littoralis*	**3**	5	1	0.3	Glossy black-cockatoo food tree - **MATURE**	**Staying**
833	*Allocasuarina littoralis*	**3**	15	2	0.7	Glossy black-cockatoo food tree - **MATURE**	**Staying**
834	*Banksia aemula*	**5**	12	2	0.5		**Staying**
835	*Allocasuarina littoralis*	**3**	12	2	0.5	Glossy black-cockatoo food tree - **MATURE**	**Staying**
837	*Allocasuarina littoralis*	**3**	8	2	0.6	Glossy black-cockatoo food tree - **MATURE**	**Staying**
838	*Banksia aemula*	**5**	12	1	0.5		**Staying**
839	*Banksia aemula*	**5**	10	1	0.4		**Staying**
840	*Allocasuarina littoralis*	**3**	14	2	1.2	Glossy black-cockatoo food tree - **MATURE**	**Staying**
841	*Allocasuarina littoralis*	**3**	10	2	0.8		**Staying**
842	*Allocasuarina littoralis*	**3**	10	2	0.8		**Staying**

844	*Banksia aemula*	**5**	10	1	0.4		**Staying**
850	*Allocasuarina littoralis*	**3**	10	2	0.4	Glossy black-cockatoo food tree - **MATURE**	**Staying**
851	*Banksia aemula*	**5**	6	1	0.5		**Staying**
856	*Banksia aemula*	**5**	10	1	0.4		**Staying**
857	*Allocasuarina littoralis*	**3**	10	2	0.8	Glossy black-cockatoo food tree - **MATURE**	**Staying**
858	*Banksia aemula*	**5**	5	2	0.3		**Staying**
859	*Allocasuarina littoralis*	**3**	12	2	0.5	Glossy black-cockatoo food tree - **MATURE**	**Staying**
860	*Allocasuarina littoralis*	**3**	10	2	0.8	Glossy black-cockatoo food tree - **MATURE**	**Staying**
864	*Eucalyptus signata*	**5**	12	2	0.5		**Staying**
865	*Eucalyptus signata*	**5**	15	2	0.7		**Staying**
866	*Eucalyptus signata*	**5**	14	4	0.8		**Staying**
867	*Eucalyptus signata*	**5**	14	4	0.8		**Staying**
868	*Eucalyptus signata*	**5**	14	4	0.8	Habitat tree	**Staying**
869	*Xanthorrhoea johnsonii*	**5**	14	3	0.8		**Staying**
870	*Melaleuca quinquenervia*	**1**	15	4	1.2	**OLD GROWTH** (>900mm)	**Staying**
872	*Melaleuca quinquenervia*	**1**	3	1			**Staying**
873	*Eucalyptus signata*	**5**	8	1	0.2		**Staying**
875	*Eucalyptus signata*	**5**	10	1	0.3		**Staying**
876	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
878	*Melaleuca quinquenervia*	**1**	12	2	0.6		**Staying**
881	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
883	*Eucalyptus signata*	**5**	12	1	0.4		**Staying**
884	*Eucalyptus signata*	**5**	12	2	0.4		**Staying**
885	*Eucalyptus signata*	**5**	14	3	0.6		**Staying**
886	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
888	*Eucalyptus signata*	**2**	14	3	0.6	Habitat tree	**Staying**
889	*Eucalyptus signata*	**5**	14	2	0.6		**Staying**
890	*Eucalyptus signata*	**1**	15	3	1	**OLD GROWTH** (>900mm)	**Staying**
892	*Eucalyptus signata*	**5**	15	3	0.8		**Staying**
893	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**
895	*Eucalyptus signata*	**5**	10	2	0.3		**Staying**

900	*Eucalyptus signata*	**5**	15	3	0.8		**Staying**
903	*Eucalyptus signata*	**2**	10	1	0.3	Habitat tree	**Staying**
904	*Eucalyptus signata*	**5**	14	2	0.6		**Staying**
905	*Eucalyptus signata*	**5**	15	3	0.8		**Staying**
906	*Allocasuarina littoralis*	**3**	15	2	0.8		**Staying**
910	*Allocasuarina littoralis*	**3**	14	2	0.6		**Staying**
911	*Banksia aemula*	**5**	10	1	0.3		**Staying**
913	*Allocasuarina littoralis*	**3**	12	2	0.5		**Staying**
914	*Allocasuarina littoralis*	**2**	12	3	1	Glossy black-cockatoo food tree - **MATURE + CHEWED CONES**	**Staying**
915	*Banksia aemula*	**5**	10	1	0.3		**Staying**
916	*Allocasuarina littoralis*	**3**	10	1	0.4		**Staying**
917	*Allocasuarina littoralis*	**3**	12	3	1	Glossy black-cockatoo food tree - **MATURE**	**Staying**
918	*Banksia aemula*	**5**	8	1	0.25		**Staying**
919	*Allocasuarina littoralis*	**4**	8	1	0.25		**Staying**
921	*Banksia aemula*	**1**	12	3	1	**OLD GROWTH** (>900mm)	**Staying**
925	*Banksia aemula*	**6**	8	1	0.25		**Staying**
926	*Allocasuarina littoralis*	**3**	12	3	1	Glossy black-cockatoo food tree - **MATURE**	**Staying**
931	*Allocasuarina littoralis*	**3**	8	2	0.6		**Staying**
935	*Eucalyptus signata*	**5**	10	2	0.4		**Staying**
937	*Eucalyptus signata*	**6**	8	1	0.2		**Staying**
939	*Allocasuarina littoralis*	**3**	15	3	0.8		**Staying**
942	*Allocasuarina littoralis*	**3**	10	2	0.3		**Staying**
948	*Eucalyptus signata*	**2**	8	1	0.25	Habitat tree	**Staying**
950	*Eucalyptus signata*	**5**	8	1	0.25		**Staying**
952	*Eucalyptus signata*	**2**	15	3	0.8	Habitat tree	**Staying**
953	*Eucalyptus signata*	**2**	14	2	0.7	Habitat tree	**Staying**
954	*Eucalyptus signata*	**1**	15	3	1	**OLD GROWTH** (>900mm)	**Staying**
955	*Eucalyptus signata*	**1**	15	3	1	**OLD GROWTH** (>900mm)	**Staying**
956	*Eucalyptus signata*	**2**	14	2	0.6	Habitat tree	**Staying**
977	*Eucalyptus signata*	**2**	15	3	0.9	Habitat tree	**Staying**
978	*Eucalyptus signata*	**2**	15	3	0.9	Habitat tree	**Staying**

987	*Eucalyptus signata*	**5**	15	3	0.8		**Staying**
988	*Eucalyptus robusta*	**1**	15	3	1	Primary Koala food tree + **OLD GROWTH** (>900mm)	**Going**
989	*Eucalyptus signata*	**2**	14	3	0.7	Habitat tree	**Staying**
990	*Eucalyptus signata*	**2**	14	2	0.7	Habitat tree	**Going**
991	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
1005	*Melaleuca quinquenervia*	**5**	15	3	0.8		**Going**
1020	*Melaleuca quinquenervia*	**5**	15	3	0.8		**Going**
1021	*Melaleuca quinquenervia*	**5**	14	2	0.5		**Going**
1022	*Eucalyptus signata*	**5**	12	1	0.4		**Going**
1024	*Banksia aemula*	**2**	12	1	0.4	Habitat tree	**Going**
1025	*Eucalyptus signata*	**5**	14	2	0.6		**Going**
1027	*Eucalyptus signata*	**1**	14	2	1.2	Habitat tree + **OLD GROWTH** (>900mm)	**Going**
1028	*Eucalyptus signata*	**5**	12	2	0.5		**Going**
1029	*Eucalyptus signata*	**2**	15	3	0.8	Habitat tree	**Going**
1031	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
1032	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
1033	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
1038	*Eucalyptus signata*	**1**	15	3	1.2	**OLD GROWTH** (>900mm)	**Going**
1039	*Eucalyptus signata*	**5**	15	3	0.8		**Going**
1040	*Eucalyptus signata*	**5**	14	3	0.7		**Going**
1041	*Melaleuca quinquenervia*	**5**	14	2	0.6		**Going**
1042	*Eucalyptus signata*	**1**	15	3	1.2	**OLD GROWTH** (>900mm)	**Going**
1043	*Eucalyptus signata*	**5**	13	1	0.6		**Going**
1045	*Melaleuca quinquenervia*	**1**	15	3	0.9	**OLD GROWTH** (>900mm)	**Going**
1047	*Eucalyptus signata*	**5**	10	2	0.8		**Going**
1049	*Eucalyptus signata*	**5**	12	1	0.5		**Going**
1050	*Eucalyptus signata*	**5**	14	3	0.7		**Going**
1051	*Banksia aemula*	**5**	14	3	0.6		**Going**
1062	*Banksia aemula*	**5**	6	1	0.5		**Going**
1063	*Banksia aemula*	**5**	12	2	0.6		**Going**
1064	*Eucalyptus signata*	**5**	8	1	0.6		**Going**
1065	*Eucalyptus signata*	**5**	8	1	0.6		**Going**
1066	*Eucalyptus signata*	**5**	14	2	0.7		**Going**

1067	*Eucalyptus signata*	**5**	14	3	0.7		**Going**
1071	*Eucalyptus signata*	**1**	15	4	1.2	**OLD GROWTH** (>900mm)	**Going**
1072	*Eucalyptus signata*	**1**	15	4	1	**OLD GROWTH** (>900mm)	**Going**
1101	*Melaleuca quinquenervia*	**5**	14	3	0.6		**Going**
1103	*Melaleuca quinquenervia*	**5**	14	2	0.7		**Going**
1109	*Melaleuca quinquenervia*	**5**	12	1	0.4		**Going**
1111	*Melaleuca quinquenervia*	**5**	14	2	0.7		**Going**
1114	*Melaleuca quinquenervia*	**5**	14	1	0.6		**Going**
1115	*Melaleuca quinquenervia*	**5**	14	2	0.7		**Going**
1120	*Melaleuca quinquenervia*	**6**	8	1	0.2		**Going**
1121	*Melaleuca quinquenervia*	**6**	8	1	0.2		**Going**
1123	*Melaleuca quinquenervia*	**5**	12	2	0.4		**Going**
1124	*Melaleuca quinquenervia*	**5**	13	2	0.6		**Going**
1128	*Melaleuca quinquenervia*	**5**	12	2	0.4		**Going**
1129	*Melaleuca quinquenervia*	**5**	10	1	0.3		**Going**
1130	*Melaleuca quinquenervia*	**5**	12	2	0.4		**Going**
1131	*Melaleuca quinquenervia*	**5**	10	1	0.3		**Going**
1132	*Melaleuca quinquenervia*	**5**	14	2	0.6		**Going**
1160	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**
1161	*Eucalyptus robusta*	**3**	14	3	0.7	Primary Koala food tree	**Going**
1162	*Eucalyptus robusta*	**3**	12	2	0.5	Primary Koala food tree	**Going**
1163	*Melaleuca quinquenervia*	**5**	14	2	0.6		**Going**
1164	*Melaleuca quinquenervia*	**5**	12	2	0.5		**Going**
1165	*Melaleuca quinquenervia*	**5**	12	1	0.4		**Going**
1166	*Melaleuca quinquenervia*	**5**	10	1	0.3		**Going**
1168	*Melaleuca quinquenervia*	**5**	12	2	0.4		**Going**
1169	*Melaleuca quinquenervia*	**5**	10	1	0.3		**Going**
1177	*Allocasuarina littoralis*	**3**	10	1	0.3	Glossy black-cockatoo food tree	**Going**
1179	*Melaleuca quinquenervia*	**1**	15	2	1	**OLD GROWTH** (>900mm)	**Going**
1181	*Banksia ericifolia*	**5**	12	2	0.5		**Going**
1206	*Eucalyptus robusta*	**3**	6	1	0.4	Primary Koala food tree	**Staying**
1207	*Eucalyptus robusta*	**3**	12	2	0.5	Primary Koala food tree	**Staying**
1208	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Staying**
1212	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**

1219	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1221	*Eucalyptus robusta*	**1**	14	2	0.6	Primary Koala food tree	**Staying**
1228	*Eucalyptus robusta*	**1**	10	2	0.25	Primary Koala food tree	**Staying**
1231	*Eucalyptus robusta*	**1**	10	2	0.25	Primary Koala food tree	**Staying**
1232	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1233	*Eucalyptus robusta*	**1**	8	2	0.2	Primary Koala food tree	**Staying**
1237	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1238	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1239	*Eucalyptus robusta*	**1**	10	2	0.25	Primary Koala food tree	**Staying**
1246	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1247	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1248	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1250	*Eucalyptus robusta*	**1**	10	2	0.25	Primary Koala food tree	**Staying**
1256	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Going**
1262	*Melaleuca quinquenervia*	**1**	6	2	1	**OLD GROWTH** (>900mm)	**Staying**
1263	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1264	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1266	*Eucalyptus robusta*	**3**	12	2	0.4	Primary Koala food tree	**Staying**
1267	*Eucalyptus robusta*	**1**	12	2	0.4	Primary Koala food tree	**Staying**
1269	*Eucalyptus robusta*	**1**	10	2	0.3	Primary Koala food tree	**Staying**

APPENDIX 10
LITERATURE REVIEW: BUFFERS

LITERATURE REVIEW: BUFFERS

Types of Buffers

A buffer may take any of a number of forms, depending upon the nature of the environmental value to be protected, the impacts associated with nearby land use and the interaction between these factors. The management context within which the buffer exists is also an important consideration. Examples of buffers include:

- Riparian buffers
- Vegetated barriers
- Filter strips
- Shelterbelts and windbreaks
- Distance buffers (i.e. open space)
- Restrictive barriers (i.e. fences, impenetrable vegetation, water etc.)

Purposes of Buffers

Buffers may be employed for a range of conservation purposes, to protect a specific environmental value (such as water quality in a stream) or a range of values (such as buffering an area of National Park from an urban area). In the majority of cases, buffers are used because of the multiple environmental benefits they provide.

Wetlands or vegetation communities subject to periodic inundation, in particular, can be subjected to a variety of stressors resulting from human actions. Stressors potentially occurring in these environments include:

- Enrichment/eutrophication
- Organic loading and reduced dissolved oxygen
- Contaminant toxicity
- Acidification
- Salinisation
- Sedimentation/burial
- Turbidity/shade
- Vegetation removal
- Thermal alteration
- Dehydration
- Inundation
- Fragmentation of habitat
- Other human presence

Examples of situations where buffers are used to protect specific environmental values are discussed in the following sections.

- Protection of Water Quality

  Buffer zones are often used to remove nutrients, sediment and/or contaminants from runoff, especially along the banks of watercourses or margins of wetlands. Riparian buffer zones improve water quality in different ways depending upon the pathway of delivery of water to the buffer (Correll 1997). Groundwater passing through the buffer zone may be cleansed of nitrate and acidity due to a combination of de-nitrification, bio-storage and changes in soil composition (Correll 1997). Overland storm flows entering laterally from uplands may be cleansed of suspended particulates, with adhering nutrients, inorganic toxins and pesticides as well as some dissolved nutrients and toxins (Correll 1997). When a stream is in flood, waters flooding out into the buffer zone may also be cleansed of sediments, nutrients and toxic materials as a result of particulate trapping and binding of materials on leaf litter and soils (Correll 1997). Correll (1997) notes a number of external and internal factors that limit the effectiveness of the functions of a riparian buffer zone. Factors external to the buffer zone include: watershed area and gradient; stream channel morphology, soil mineralogy and texture; bedrock type and depth and climate. Internal factors include: the width and type of vegetation, waterlogging and organic content of soils; hydraulic conductivity; soil nutrient content and geochemistry (Correll 1997).

  According to the US Department of Agriculture (NCBC 1999a), properly installed, well-maintained buffers can reduce nutrient and pesticide runoff into water bodies by 50% or more, sediment loadings by 75% and pathogen loadings by 60%.

  Leishman (1986) has shown that stormwater outlets are significant sources of high nutrient levels. This research also showed that water moving through a vegetated creek bank will drop most of its total phosphorus between 15 and 30 metres away form the pollutant source. The research also showed that water with 600ppm of total phosphorus at a road edge will drop to 250ppm 10 metres down slope of the road edges and to near background level 30metres down slope.

  The relationship between pollutant removal and buffer width is nonlinear, with ever greater width required to achieve ever smaller increases in pollutant removal efficiency (Desbonnet *et al* 1994). Desbonnet *et al* (1994) has shown that a 25 metre vegetated buffer will remove 80% of sediment, a 20 metre buffer will remove 70% of Suspend Solids, a 23 metre vegetated buffer will remove 70% of Nitrogen and a 35 metre buffer will remove 70% of Phosphorus. Their research also showed that vegetated buffers of 15-30 metres will protect wetland habitat from low-intensity disturbances whist a 30-45 metre vegetated buffer will protect wetland habitat from high intensity disturbances. According to the work of Desbonnet *et al* (1994) vegetated buffer width would need to be increased to 600 metres to achieve 99% sediment and pollutant removal.

  Correll (1997) cautions that the efficacy of Riparian Buffer Zones in removing pollutants from surface and groundwater is highly dependent upon hydrology. For effective removal of particulates, dissolved nutrients and toxic materials, surface flow must occur as sheet flow rather than highly focused flows and vegetation in the buffer zone must provide enough friction to surface flows.

  Additional benefits of riparian buffer zones include:

- Shading and evaporative cooling of the stream channel (Correll 1997);
- Provision of litter and large woody debris to stream channel communities (Correll 1997).
- Provision of unique habitat to wildlife (Belt *et al* 1992).

- Control of Human Access

  Buffers can be used to restrict access of people to areas of environmental value. Areas of open space provide a distance buffer and can provide a psychological and social restriction on negative human behaviours such as dumping of rubbish or weeds. Buffers can also be designed to provide a physical barrier to access through the use of fencing, impenetrable vegetation, areas of water and so on.

- Control of Animal Access

  Feral fauna species such as Dogs, Cats, Foxes and Cane toads are known to access new areas by utilising man-made and disturbed areas. A well managed native forested buffer zone may reduce access by these species to the main conservation zone.

- Protection of Significant Plants, Nests etc.

  Buffers may be used to protect a particular feature of environmental value, such as a significant plant or the nest of a significant bird. In this case, the buffer will have a number of purposes, such as restriction of access by humans or pets and reducing visual and aural disturbance to an acceptable level.

- Reduction of Edge Effect

  Three types of edge effects characterise the interface between remnant bushland and other land uses.

  1. Abiotic effects are those changes in light, temperature, humidity and wind that occur when a remnant edge is formed by the creation of new surrounding land uses, such as clearing land for grazing or agriculture.
  2. Direct biological effects include changes in the number and abundance of species brought about by changed environmental conditions. For example, the spread of species that adapt well to the altered climatic conditions, and the reduction in recruitment of species that do not prosper.
  3. Indirect biological effects are changes in the way species interact, in particular modified patterns of competition, pollination, and the dispersal of seeds (Donatiu 2001).

  Edges and canopy gaps in remnant forests are the sites where weed species are able to establish and persist. Lateral light penetration along the edges and increased light levels from canopy gaps can result in the establishment of early successional rainforest trees and weed species (Kooyman 1996).

  A vegetated buffer zone can reduce the impacts of edge effect on retained areas of vegetation.

- Visual and Noise Buffers

Buffers can be used to obscure incompatible scenery, such as areas of housing, from natural areas (Davies & Lane 1995). Vegetated buffers or other physical screens reduce the amount of visual (especially lighting) and noise disturbance to buffered habitats. These forms of disturbance can have a range of detrimental impacts to wildlife, including disruption of foraging, breeding and nesting and increases in stress levels. Distance buffers can be effective in reducing disturbance to wildlife sensitive to human intrusion, such as birds nesting on beaches.

- Spray Drift Buffers

  Marrs *et al* (1993) note an increasing need to protect semi-natural vegetation from the potential effects of herbicide drift. They note that earlier estimates using established perennials suggested zones needed to be 6-10m wide. Marrs *et al* (1993) found that seedlings of some species were affected at greater distances than established plants and, on sites where seedling establishment is an important mechanism for community regeneration, buffer zones may need to be 20m wide.

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APPENDIX 11
LITERATURE REVIEW: CORRIDORS & CONNECTIVITY

LITERATURE REVIEW: CORRIDORS & CONNECTIVITY

Based largely on the patch-matrix-corridor model of landscape ecology, wildlife corridors are a frequently discussed landscape feature and recommended management tool to enhance landscape connectivity (Bennett 1990).

Connectivity is a measurement of the relationships within and between areas of vegetation. These relationships exist in a continuum from high to isolated (also referred to as 'degree of connectedness'). Connectivity relates to physical features of the landscape and the behaviours of species dependant on that landscape, namely:

- The capacity of the area to provide a range of habitats for flora & fauna species;
- The capacity of flora and fauna species to travel within and between suitable habitats;
- the associated ecological processes;
- the distance between suitable habitats;
- the presence of interlinking or traversable habitats;
- the size and shape of habitat patches;
- the extent of physical barriers to movement of species;
- the extent of a species' range or territory and degree of mobility;
- the ability of a species to tolerate altered habitats and respond to disturbances such as changes to surrounding land uses; and
- species habitat requirements.

Some examples of connectivity along the continuum are provided in **TABLE 1.**

TABLE 1
EXAMPLES OF LEVELS OF CONNECTIVITY

High	Medium	Low/Reduced	Isolated
The vegetation forms an unbroken expanse and/or, although there may be a narrow gap (e.g. cleared fence line), adjoins vegetation on the adjacent property along most of its perimeter on that particular side, is in relatively good condition,	The vegetation forms an unbroken expanse, but is relatively small (reduced core environment), **OR** The vegetation is linked by a relatively narrow corridor. **OR** There is a break in the vegetation (e.g. fire management line, minor road or track) between the vegetation which could inhibit or restrict the movement of some species. **OR**	Vegetation is separated by a wide gap which would restrict the movement of some species and prohibit the movement of others due to the width of the gap. **OR** Vegetation patch is relatively small and provides no core habitat. **OR** Vegetation forms a "stepping stone" or part of a series of "stepping stones" linking otherwise isolated	The patch of vegetation is very small and isolated, with no other vegetation on the subject lot(s) or on any adjacent properties.

provides habitats for different species and would facilitate the movement of a range of flora and fauna species of different sizes and habitat requirements (core and edge environments) for which the vegetation provides habitat.	The condition of the vegetation community is reduced.	patches of vegetation. The size and condition of the patches of vegetation will also be a factor in determining the degree of connectivity.	

The fundamental question that must be asked in the discussion of such corridors is whether the particular corridor is capable of facilitating sufficient delivery of the target species to the recipient habitat patch(es). It is implicit that corridor capability can only be measured or evaluated on a site by site and species by species basis. A given strip of habitat may be effective for one species and completely ineffective for another.

Wildlife corridors are a frequently debated option to enhance landscape connectivity (e.g. Simberloff et al. 1992; Bennett 1990). In Australia, several studies have investigated the value of corridors for birds (Saunders and de Rebeira 1991). However, corridors will not always be synonymous with connectivity.

This is the case in particular for highly mobile species, which can move rapidly over extensive and often fragmented landscapes (Law et al. 1999). For such animals, patches of remnant vegetation in the matrix may act as stepping stones to aid their movement.

Depending on the relative size and condition, small and isolated areas of vegetation may still play a role in ecosystem processes—such as, hydrological processes, soil development, nutrient cycling, microclimate variation—although the role and contribution to biodiversity may be significantly reduced. Such patches of vegetation may still have a degree of internal connectivity and may support small populations of vertebrates and invertebrates, a reduced diversity (subset) of flora species typical of the ecosystem and may provide a refuge or "resting point" for more mobile animals such as birds, bats and migratory species.

There is no evidence in the scientific literature that suggests there is a minimum required corridor width to facilitate fauna movement. Rather, Bennett (1990) notes that the optimum corridor width depends upon the objectives of the corridor, the ecology and movements of the target species and the structure of the landscape in which the corridor is located. Although it is widely acknowledged that the wider the corridor the more effective it will be, there is evidence that linear habitats significantly less than 100m wide provide effective movement corridors for a range of species.

A summary of the habitat/movement requirements of fauna groups is presented in **TABLE 2** below.

TABLE 2

MOVEMENT REQUIREMENTS OF FAUNA GROUPS

Target Group or Species	Habitat/Movement Requirements
Amphibians	A narrow riparian corridor is sufficient for Amphibian movement habitat provided it: • Retains clean fresh water for up to 30 days on a seasonal basis; • Contains or is surrounded by native riparian/wetland vegetation.
Reptiles	• A diversity of habitats is required to allow the movement of sun-loving and shade-loving species. • Regular occurrences of rocks, holes, cavities, litter, dense grass/herbs for reptiles to seek shelter during their movements.
Birds (General)	• The mobility of birds enhances their capabilities in terms of dispersal and they are less reliant on contiguous tracts of habitat than all other fauna groups (with the exception of bats). • In grazing lands a densely vegetated corridor 50m wide is adequate to enable most birds to move between remnant habitat areas up to 1.2km apart.
Insectivorous birds	Insectivorous birds rely on habitats with insect generating features such as dense groundcover vegetation, flowering species and water bodies.
Nectarivorous birds	Nectarivorous birds rely on habitats that provide flowers as a forage resource.
Small - Medium terrestrial mammals	• Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure, particularly in areas with a dense understorey layer that provides shelter from predators and which offers nesting opportunities. However, some inhabit drier open forests. • Medium sized terrestrial species may disperse through more disturbed areas as they are less prone to predation than smaller mammals.
Macropods	• The Swamp wallaby requires dense habitats for shelter but will readily graze in open areas. • The Eastern grey kangaroo favours more open habitats but will move through dense vegetation if required. • Macropods may be sensitive to edge effects such as an increase in light, noise and activity. Minimisation of these effects will enhance the value of the corridor. • Minimisation of dog predation can enhance the value of corridors.
Common brushtail possum & Mountain brushtail possum	• The common brushtail is a highly adaptable species readily move through highly fragmented habitats and urban gardens. It does not appear to be sensitive to edge effects such as light noise and activity. Any form of revegetation will be of benefit to this species. • The Mountain Brushtail possum replaces the common brushtail in wet forest and rainforest but will sometimes range into open forest. • Minimisation of dog predation will enhance the value of the corridor for these species.
Koala	• Koalas will readily move along linear corridors (and include them as a component of a home range) if suitable habitat is present. • Any form of revegetation will be of benefit to Koalas. • Koalas can be sensitive to edge effects and predation by dogs.
Microchiropteran bats	• These species readily disperse through disturbed landscapes, although an open flyway of any structure will encourage movement between habitat areas. • Sub-canopy foragers will benefit from retention of canopy elements.

Target Group or Species	Habitat/Movement Requirements
Megachiropteran bats	• Megachiropteran bats use riparian corridors (amongst other features) for navigation. • Movements of this group are extensive and unrestricted by cleared or developed areas.

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APPENDIX 12
RESPONSES TO GOVERNMENT AUTHORITY AND PRIVATE SUBMISSIONS

TABLE 1
RESPONSES TO GOVERNMENT AUTHORITY AND PRIVATE SUBMISSIONS

GOVERNMENT AUTHORITY	RESPONSE (Referral to relevant Section)
DEPT OF PRIMARY INDUSTRIES (FISHERIES & AGRICULTURE) (9.12.11)	
• Recommend adoption of a 100 metre buffer from the outer edge of coastal wetland habitats such as the sedgelands and Saltmarsh. The 100 metre buffer and aquatic habitats they protect should be rehabilitated consistent with an agreed rehabilitation plan. It is noted that this is generally achieved.	A minimum buffer of 143 m will be provided to Coastal saltmarsh habitats as indicated in **FIGURE 20** – Vol. 1. A VMP will be completed for areas of retained vegetation (i.e. Environmental Protection Zones and SEPP 14 Wetlands). Refer to **SECTION 4.2.2.4** – Vol. 1.
OFFICE OF WATER (24.11.11)	
• Recommend 100 m buffer to estuarine aquatic vegetation.	See above comment.
• The extent of all required buffers should be shown on one of the existing drawings.	**FIGURE 20** – EA Vol. 1 indicates the location and extent of all proposed buffers.
• Applicant to take into account NOW's "Guidelines for Controlled Activities" including the minimum core riparian zone (CRZ) widths which should be adhered to. In addition to the CRZ widths, an additional vegetated buffer is to be provided on both sides of the water course.	On 1 July 2012, new rules commenced regarding controlled activities within riparian corridors. The CRZ and vegetated buffer have been combined into a single vegetated riparian zone (VRZ) (NOW 2012). There will be no infrastructure within the VRZ for Simpson's Creek. The proposed design of the central drainage reserve (including stormwater outlet structures and essential services) is considered to be in accordance with the *Water Management Act 2000*, subject to drainage work approval. See **SECTION 7.3**– EA Vol. 1.
• The APZ is not to form part of the CRZ. • Recommended conditions provided.	No Asset Protection Zones will be located within any Core Riparian Zone. However, the central drainage reserve will be revegetated with scattered trees (12m centres) and wet heath species and as such will be managed as an APZ.

<u>BYRON SHIRE COUNCIL</u> (7.11.11)	
• A number of elements of the proposed development are unreasonably and significantly detrimental to the site's ecological values and are not justified by the merits of the circumstance.	
• Location of Lots B3-B10 contains significant old growth koala food trees (*Eucalyptus signata)*. Residential development of these lots would generate vegetation loss from construction, residential land management, bushfire safety etc. The cumulative impact of these measures in this part of the site is not supported.	Some conservation significant trees (including old growth koala food trees) will be retained in the larger lots. The loss of old growth koala food trees will be offset through revegetation. Refer to EA Vol. 1, **SECTION 4.2.5.5.**
• Council supports this area (Lots B3-B10) becoming common land.	Not agreed. Refer **FIGURE 8** – EA Vol. 1 for revised lot layout.
• Lots B150-B155 – same general concerns as Lots B3-B10. Council supports this area becoming common land.	Lot B150 has been removed from the revised layout to enable the retention of some conservation significant trees and allow for the provision of a 21m APZ to lot B151.
• Lots B149-and B156 – these lots have high conservation status and should become common land.	Conservation significant trees (including those that constitute the EEC Swamp sclerophyll forest on coastal floodplain) in these lots will be protected through the use of a Section 88B instrument. The s.88B instrument will confine the location of the building envelope to unconstrained areas of lots B149 and B156 and prohibit any clearing of protected trees within these lots.
• P1 – Public Reserve – it would be acceptable for Council to take ownership of the reserve subject to a conservation agreement.	The Public Reserve P1 will be dedicated to the Byron Shire Council as a conservation area on completion of revegetation works. Refer to EA Vol. 1, **SECTION 1.1.**
• Loss of Wallum Froglet habitat – the existing N-S drainage pattern/vegetation running down the middle of the site should be retained "as is" and significant buffers provided. Not evident that Wallum Froglet habitat is secured. High nutrient loads are incompatible with the retention/creation of froglet habitat.	The compensatory habitat proposal is based on the successful Tugun bypass design (Refer to EA Vol. 2, **APPENDIX 5 & 6)** where *Crinia tinnula* were recorded calling from several different water treatment basins on numerous occasions during regular monitoring events (Pacific Alliance, 2010). Additionally, the created core-breeding habitat (melon holes) will be located outside of the low-flow drainage channel, which will convey the high nutrient load first flush stormwater (refer **FIGURE 1** – EA Vol. 2). The compensatory habitat proposal is therefore considered

	practicable.
• Not evident how Lots 118-122 can be created consistent with the establishment of an adequate wetland area that serves both stormwater treatment and viable Wallum Froglet habitat.	See above.
<u>OFFICE OF ENVIRONMENT & HERITAGE</u> (28.10.11) • OEH able to support proposal subject to amendments to the draft Statement of Commitments. These amendments relate to biodiversity values, Aboriginal cultural heritage and estuary & foreshore management and are summarised below (Note OEH has provided a report justifying these amendments which is attached). **Biodiversity Conservation Issues**	
1. The layout should be redesigned to ensure that key areas of Koala habitat and movement corridors in the north−west of the site, including primary Koala habitat, be maintained and re−established to ensure that direct, indirect and cumulative impacts on Koala are avoided.	The majority of Koala habitat in the north-west of the site is considered Secondary habitat. The loss of old growth koala food trees will be offset through revegetation. Refer to EA Vol. 1, **SECTION 4.2.5.5.** Connectivity throughout and in proximity to the site **(FIGURE 33)** will not be affected. Refer to EA Vol. 1, **SECTION 5.3**.
2. The layout should be redesigned to increase avoidance of significant tree removal by expanding proposed re-vegetated/rehabilitated conservation areas at both the east and west of the development area. The proposed retained rehabilitated/revegetated buffer to the large Swamp Schlerophyll Endangered Ecological Community (EEC) in the eastern portion should be expanded further to the west to incorporate the drainage line to the west and all trees indicated in the EA as being high to very high conservation value trees.	The conservation area in the west of the site has been expanded to include Lots B157, 158 & 159 (Refer to Lot B146 on **FIGURE 8**). Some small losses of the Swamp sclerophyll forest EEC are unavoidable in the east of the site. With the implementation of the VMP (see EA Vol.1, **SECTION 4.2.2.4**) there will be a long-term net gain of 1.33ha of Swamp sclerophyll forest.
3. The impact of the loss of any significant conservation value trees not avoided through layout redesign (see 2 above) should be calculated and a suitable offset determined.	Refer to EA Vol. 1, **SECTION 4.2.3**. **FIGURE 13** identifies the number and species of trees to be removed under the current layout. In total, 253 Conservation Significant trees will be removed, in addition to 332 trees mapped as 'No Conservation Significance'. Trees that are to be removed will be offset as part of rehabilitation works on the site at a minimum offset ratio of 2:1.
4. The establishment of a range of nest boxes should be a condition of approval for	Refer to EA Vol. 1, **SECTION 4.2.3.5**. Hollows contained within trees to

	any hollow bearing trees that cannot justifiably be avoided. These should be matched to an inventory of quantity and habitat qualities of any removed hollows at a minimum 2:1 ratio, located in strategically important connectivity corridors to be established as recommended above and below. This commitment should be incorporated within the proposed Vegetation Management Plan (VMP). The commitment should also be made in the VMP that any suitable hollows approved for removal are to be scattered throughout revegetation / conservation areas to function as potential habitat for ground dwelling fauna (particularly the *Planigale maculata)*.	be removed will be retained and placed within revegetation/ conservation areas to function as potential habitat for ground-dwelling fauna. Nest boxes will be strategically placed in retained trees to replace removed hollows at a 2:1 ratio.
5.	The development layout should be redesigned to protect and buffer all environmentally significant areas including threatened species, endangered ecological communities and their habitats with a minimum 50 metre vegetated buffer.	A minimum buffer width of 145m will be provided to Coastal saltmarsh communities on the site. Swamp oak floodplain forest will have a minimum buffer width of 243m. The minimum buffer width to Swamp sclerophyll forest on coastal floodplain will be 15 m, but buffers will generally exceed 30m as indicated in **FIGURE 20** – Vol. 1. Simpsons Creek will be buffered at a minimum of 162m, the. A minimum 8m buffer will be provided on either side of the central drainage channel, however, buffers to this channel are generally in excess of 10m in accordance with the NSW Water Management Act (2000) (**FIGURE 20 -** Vol. 1).
6.	Greater attention should be given in the overall layout to biodiversity connectivity within the site:	
	i. north–west to south–west (ie. Stage 4a corridor in Figure 33) – Further information should be provided before approval regarding the safeguards proposed within the 'environmental lifestyle' lots to ensure the environmental values are maintained in perpetuity, or alternatively, these lots should be rehabilitated and incorporated into an environmental protection zoning and dedicated to Byron Shire Council (subject to their approval) as a protected natural area. These two lots should be further connected and revegetated, incorporating any mapped primary koala habitat (Byron Shire Council mapping) and managed for conservation purposes.	Refer to **SECTION 5.3** and **FIGURE 8** - Vol. 1. Four (4) lots adjacent to the 'environmental lifestyle' lot (now B146) have been removed from the Stage 4a corridor. Environmental values in 'environmental lifestyle' lots (B146 & B156) will be maintained in perpetuity with a Section 88B instrument. The s.88B instrument will confine the location of the building envelope to unconstrained areas of these lots and prohibit any clearing of protected trees within these lots (refer to EA Vol. 1, **SECTION 4.2.3.4**).
	ii. South–west to south–east – The layout should incorporate a 50 metre vegetated buffer to the property to the south, to be provided from west to east (largely through natural but also assisted regeneration as appropriate), and managed to achieve improved landscape connectivity function for threatened mammals and other fauna known from the site.	Connectivity is provided from the west to east by the western corridor shown in **FIGURE 33** - Vol. 1**.** This vegetated corridor is immediately adjacent to the southern property boundary. No further requirements for the provision of corridors within the subject site are considered necessary. Refer to EA Vol. 1, **SECTION 5.3.5.5.**

7.	The layout should be redesigned to avoid impact on Wallum Froglets and their habitat, and include a naturally regenerated vegetated buffer of 50 metres either side of the central drainage channel, maintained in perpetuity in conservation tenure. Alternatively:	
	i. clarity should be sought in relation to the consistency of the current proposal and the proposed Wallum Froglet Compensatory Habitat Plan with the need to avoid impacting upon threatened species habitat and the alteration of natural waterways key threatening process; and	Discussion in WFCHP of this issue.
	ii. adequate alternative offsets should be provided to the satisfaction of OEH, following an assessment of impacts of the proposal using its biometric offset calculation tools (BBAM) or,	Refer to **SECTION 4.2.5.8** – Vol. 2. The loss of Wallum froglet habitat will be offset through the creation of compensatory habitat areas (**FIGURE 30** – Vol. 1). These areas will be designed to provide additional core breeding and forage habitat areas on the subject site and will be created in accordance with a Wallum Froglet Compensatory Habitat Plan (see **APPENDIX 5** – Vol. 2).
	iii. an independent assessment be made by a suitably qualified acid frog specialist as to the viability of the Wallum Froglet Compensatory Habitat proposal, with specific reference made to the results of data collected for the Tugun by–pass.	See above.
8.	The documentation provided should be made consistent and updated to reflect current taxonomic and distributional understanding in regard to the use of the terminology for 'scribbly gum' (ie. E. signata, rather than 'racemosa').	Agreed.
9.	It should be a condition of approval that the keeping of domestic animals is prohibited by any future residents upon this site, utilizing *a Section 88B instrument under the Conveyancing Act 1919.*	Cats will be prohibited from the development. Dogs will be permitted but controlled (i.e. contained within fenced yards at night and on leash when outside of yard etc.). Refer to **SECTION 8** – Vol. 1.
10.	A detailed plan for public amenities/facilities proposed near Simpsons Creek	There is no infrastructure proposed adjacent to Simpson's Creek. A

should be prepared and assessed in relation to potential impacts upon the foreshore and the Tyagarah Nature Reserve prior to determination of this proposal. Any facilities to be provided should be located away from the edge of the creek, ensuring pedestrian only access.	pedestrian only access track will be proved in the south- east portion of the site.
11. Rehabilitation proposals for the informal track within the road reserve (Concept Plan p122) should extend to all tracks not required to provide pedestrian access to Simpsons Creek within the land zoned for environmental protection and within the proposed adjacent parkland. This is to be reflected in the vegetation management plan.	Any works on this road reserve are subject to consent of the Crown. A Vegetation Management Plan cannot restrict legal public access and a road reserve cannot be considered an environmental offset are whilst it remains a public road,
12. Before approval is considered, more information should be provided about the intended land management regime applicable to the area described as Park 1 and the extent to which it will be rehabilitated/ revegetated for conservation purposes.	A Vegetation Management Plan (VMP) (see **SECTION 4.2.2.4** – Vol. 1) will be completed for the areas of retained vegetation and will include extensive details on the rehabilitation/ revegetation that will be undertaken. A draft VMP would be provided with the DA to be lodged with BSC following concept approval.
Aboriginal Cultural Heritage Issues	
1. The proponent must continue to consult with and involve all the registered local Aboriginal representatives for the project, in the ongoing management of the Aboriginal cultural heritage values. Evidence of this consultation must be collated and provided to the consent authority upon request.	Agree to all Aboriginal Cultural Heritage requirements.
2. The proponent is to provide fair and reasonable opportunities for the registered Aboriginal stakeholders to monitor any initial ground disturbance works associated with minor works or otherwise in the area identified as the *'Environmental Protection Zone'* associated with the project area. In the event that additional Aboriginal objects are uncovered during the monitoring program, the objects are to be recorded and managed in accordance with the requirements of sections 85A and 89A of the /National *Parks and Wildlife Act 1974*.	
3. In the event that surface disturbance identifies a new Aboriginal object, all works must halt in the immediate area to prevent any further impacts to the object(s). A suitably qualified archaeologist and the registered Aboriginal representatives must be contacted to determine the significance of the object(s). The site is to be registered in the Aboriginal Heritage Information Management System (AHIMS) (managed by OEH) and the management outcome	

for the site included in the information provided to the AHIMS. The proponent will consult with the Aboriginal community representatives the archaeologist and OEH to develop and implement management strategies for all objects/sites. 4. If human remains are located in the event that surface disturbance occurs, all works must halt in the immediate area to prevent any further impacts to the remains. The NSW Police are to be contacted immediately. No action is to be undertaken until police provide written notification to the proponent. If the skeletal remains are identified as Aboriginal, the proponent must contact OEH's Enviroline on 131555 and representatives of the local Aboriginal community. No works are to continue until OEH provide written notification to the proponent. 5. All reasonable efforts must be made to avoid impacts to Aboriginal cultural heritage at all stages of the development works. If impacts are unavoidable, mitigation measures are to be negotiated with the local Aboriginal community and OEH. All sites impacted must have an OEH Aboriginal Site Impact Recording (ASIR) form completed and be submitted to OEH's AHIMS Registrar within 3 months of completion of these works. 6. An Aboriginal Cultural Education Program must be developed for the induction of all personnel and contractors involved in the construction activities on site. Records are to be kept of which staff/contractors were inducted and when for the duration of the project. The program should be developed and implemented in collaboration with the local Aboriginal community.	
Flooding, Coastal Hazard and Estuary Management Issues • DoPi must ensure, in conjunction with NPWS/OEH, Marine Parks Authority and Byron Shire Council, that there is appropriate planning for and provision of ongoing mechanisms that will minimize public access impacts to the Simpsons Creek area. Long term maintenance of any approved public access infrastructure that achieves this also needs to be ensured and provided for.	Only low impact public access will be provided to the Simpson's Creek area. This will include pedestrian only access to Simpsons Creek along with advisory/ regulatory signage and a small car parking facility adjacent to the proposed perimeter road (i.e. situated at a suitable distance from Simpson's Creek to minimise disturbance). Refer to **SECTION 6.4** – Vol. 1.
MARINE PARKS AUTHORITY (20.10.11) • MPA normally requires a minimum buffer of 50 metres between new developments and the marine park.	All buffers to be provided to Simpson's Creek (marine park) are greater than 162m. Refer to **FIGURE 20** - Vol. 1.

• Car parking and access to Simpsons Creek – must be considered in the context of the high degree of protection in force and presence of Tyagarah Nature Reserve opposite. Any proposals would need to be low impact. Provision of advisory and regulatory signage would be required.	See above comments.
• Proximity of nature reserve – unsuitable for dogs and domestic animals.	Cats will be prohibited from the development. Dogs will be permitted but controlled (i.e. contained within fenced yards at night and on leash when outside of yard etc.). Refer to **SECTION 8** – Vol. 1.
NSW RURAL FIRE SERVICE (5.10.11)	
• Lot B160 & B167 – no revegetation shall occur within or east of the APZ (Dwg. No. LM080082-DR21B).	Revegetation will only occur within the APZ of lot B146 (was B160) and will include only fire sensitive vegetation planted at 12m centres. Refer to **FIGURE 11** – Vol. 1.
• Public Reserve P1 shall be managed as an APZ, excluding the EEC.	The Public Reserve P1 will be revegetated to offset vegetation loss as a result of the proposed development (**FIGURE 11** – Vol. 1.). There will be a 27m APZ provided adjacent to this area, utilising the road reserve and building setbacks within the relevant lots.
• Drainage Reserve P2 shall be managed as an APZ.	The Drainage Reserve P2 will be revegetated with fire sensitive vegetation (i.e. scattered trees and shrubs only) to enable this area to be managed as an APZ. Refer **APPENDIX 5** – Vol. 2.
• All other residential lots shall be managed as an APZ until further developed.	Residential lots shall be maintained and managed as an APZ until developed.
DEPT OF PRIMARY INDUSTRIES (CATCHMENT & LANDS) (10.10.11)	
• DPI Crown Lands support the dedication of Eastern Bushland park to the public but does not register an interest in managing this area.	The Public Reserve P1 will be dedicated to the Byron Shire Council as a conservation area on completion of revegetation works. Refer **SECTION 1.1** – Vol. 1.
• The development raises significant issues in terms of its relationship to the crown road	Codlea Pty Ltd are currently negotiating options for the future of the crown road reserve with the DPI Crown Lands.

reserve. Concern that these haven't been addressed in the subdivision design, future public access requirements, the VMP or future management options being considered for the Eastern Bushland park precinct.	
• The following points are relevant:	
1. Crown road provides legal access through the site by right. Provides legal access to a number of land holdings in the south but doesn't give access to Simpsons Creek. The unmade gravel track may have value as a recreation access corridor;	Low impact recreation access to Simpsons Creek will be provided. See above comments. Legal access to land holdings to the south will be maintained.
2. Any works on the road are subject to consent of the Crown;	Agreed. See comments above.
3. Any section of road incorporated as part of the constructed road network should be transferred to the control of the BSC under S.151 of the Road Act 1993;	Agreed. See comments above.
4. The road contains part of an EEC which is to be regenerated;	Agreed. A Vegetation Management Plan (VMP) (see **SECTION 4.2.2.4** – Vol. 1) will be completed to guide the rehabilitation/ revegetation of the EEC located on the crown road.
5. A VMP cannot restrict legal public access and a road reserve cannot be considered an environmental offset area whilst it remains a public road;	See comments above.
6. The rationale for the designed street layout fails to effectively address the existing road reserve. Insufficient attempt has been made to integrate the road reserve and/or continuity of north/south access in the proposed development;	The proposed development is designed in order to provide an adequate buffer for the Swamp Sclerophyll EEC and to minimise the need to remove significant trees for the construction of roads.
7. In view of constraints closure and/or realignment of the road reserve may be more practical option. The provision of continuity of legal access for recreational or other purposes by instruments other than a public road ??? be considered; and	See comments above.
8. Future of the road reserve needs to be considered in 'conjunction' with any negotiated dealings in the adjoining land to achieve integrated public land management outcomes.	See comments above.
• The CP should be modified to address the above points in consultation with DPI-Crown Lands.	

ROADS & TRAFFIC AUTHORITY (29.9.11) • No objections.	
PLANNING & INFRASTRUCTURE (30.01.12) • Wallum Froglet - Further surveying should be conducted & justification provided that suitably addresses the EPA's concerns regarding the extent of the species habitat. Also concerned with the feasibility of the proposed compensatory habitat. • Development layout should be amended so that north/south channel remains in its natural state and that a 50 metre buffer should be located along other side of the drainage channel. Stormwater treatment measures should be located outside the drainage channel. • Koala - Further assessment and redesign required. • Public Reserves – details of the design of the public reserve should be included.	There was an error in the original plan detailing the extent of Wallum froglet habitat. An amended plan is included in the Revised EA (**FIGURE 21** – Vol. 1.). The compensatory Wallum froglet habitat is in accordance with the methodology and design used successfully as part of the Tugun Bypass development. See above comments. This channel is a first order stream as classified under the Strahler System. In accordance with the *Water Management Act (2000)* a 10m VRZ will be provided on either side of the channel. Stream realignment of 1st Order Streams is permissible with consent. Alteration of this minor drainage line will be minimal and natural hydrologic and ecological functions will be maintained or restabilised. Refer to **SECTION 3.3** – Vol. 1. Stormwater will be pre-treated (gross pollutant traps) prior to entering the central drainage channel. Refer to **SECTION 6.4** – Vol. 1. The majority of Koala habitat in the north-west of the site is considered Secondary habitat. The loss of old growth koala food trees will be offset through revegetation. Refer to EA Vol. 1, **SECTION 4.2.5.5**. Connectivity throughout and in proximity to the site (**FIGURE 33**) will not be affected. Refer to EA Vol. 1, **SECTION 5.3.** Further assessment and redesign is considered unnecessary. A Vegetation Management Plan (VMP) (see **SECTION 4.2.2.4** – Vol. 1) will be completed for the areas of retained vegetation and will include extensive details on the design of the public reserve and the associated rehabilitation and revegetation. See above comments.
PRIVATE SUBMISSIONS (See Submissions Table)	**RESPONSE (See section)**

• Loss of core koala habitat (Issue identified in 3 submissions: 4, 14, 29)	Koala food trees will be planted at a 2:1 ratio to offset any losses as a result of clearing for the proposed development. Refer to EA Vol. 1, **SECTION 4.2.5.5.**
• Preparation of a Koala Management Plan and Vegetation Management Plan (Issue identified in 1 submission: 4)	A SEPP 44 Koala Habitat Assessment is included in EA Vol. 1, **SECTION 3.2.** There is no requirement for the preparation of a Plan of Management. A VMP will be completed for areas of retained vegetation (i.e. Environmental Protection Zones and SEPP 14 Wetlands). Refer to EA Vol. 1, **SECTION 4.2.2.4.**
• Loss of Wallum Froglet habitat (Issue identified in 15 submissions: 4, 5, 7, 8, 11, 14, 16, 17, 18, 19, 20, 27, 28, 29, 33)	The loss of Wallum froglet habitat will be offset through the creation of compensatory habitat areas. Refer to EA Vol. 1, **SECTION 4.2.5.8.**
• Impact on Flora and Fauna (Issue identified in 20 submissions: 5, 6, 7, 8, 10, 13, 16, 17, 18, 19, 20, 23, 24, 27, 28, 29, 31, 32, 33, 38)	Refer to the mitigation and offsets described in the EA Vol. 1, **SECTION 4.2 & SECTION 8.** A Vegetation Management Plan will also be prepared for the Subject site, which will address further mitigation and management strategies.
• Impact on Endangered Ecological Communities (Issue identified in 4 submissions: 5, 27, 28, 29)	As detailed in EA Vol. 1, **SECTION 4.2.4**, no areas of Swamp oak floodplain forest or Coastal saltmarsh EEC will be affected. Furthermore, no development will occur within 243 m and 143 m of the Swamp Oak forest and the Coastal Saltmarsh respectively. Some small losses of the Swamp sclerophyll forest EEC are unavoidable. With the implementation of the VMP (see **SECTION 4.2.2.4**) there will be a long-term net gain of 1.87 ha of Swamp sclerophyll forest.
• Ban on cats and dogs (Issue identified in 9 submissions: 6, 10, 13, 16, 19, 20, 31, 32, 38)	Cats will be prohibited from the development. Dogs will be permitted but controlled (i.e. contained within fenced yards at night and on leash when outside of yard etc.) Refer to **SECTION 8** – Vol. 1.
• Stormwater quality and impacts on habitat areas (Issue identified in 4 submissions: 10, 13, 17, 20)	All houses will have rainwater storage tanks to comply with BASIX requirements. Lots B146 & B151-B156 will utilise lot specific infiltration swales. There will also be larger infiltration swales located within lot B156 and P1 Public Reserve (**FIGURE 29**). It is proposed that all headwall outlets have an Ecosol Net Tech Solid Pollutant Filter to remove and retain gross pollutants from stormwater flows. Temporary dry sediment basins and straw bale filters will be utilised for erosion and sediment

	control (**FIGURE 28**). Refer to EA Vol.1, **SECTION 6.4.**
• Impacts on wildlife corridors and habitat areas (Issue identified in 8 submissions: 11, 16, 17, 19, 20, 24, 28, 29)	Habitat loss will be compensated for at a ratio of 2:1. Connectivity throughout and in proximity to the Subject site (**FIGURE 33**) will not be affected. Refer to EA Vol. 1, **SECTION 5.3**.
• Compensatory habitat proposal (Issue identified in 1 submission: 14)	The compensatory habitat proposal is based on the successful Tugun bypass design (Refer to EA Vol. 2, **APPENDIX 5 & 6)** where *Crinia tinnula* were recorded calling from several different water treatment basins on numerous occasions during regular monitoring events (Pacific Alliance, 2010). The compensatory habitat proposal is therefore considered feasible and likely to be successful.
• Impact on nature reserves (Issue identified in 4 submissions: 20, 31, 32, 38)	Refer **FIGURE 20** – Vol. 1, for details of proposed buffers.

APPENDIX 13
ATTEMPTS TO PROVIDE AN APPROPRIATE OFFSET SITE

ATTEMPTS TO PROVIDE AN APPROPRIATE OFFSET SITE

1. Introduction

This section discusses the attempts made by Codlea Pty Ltd to secure an appropriate offset site, to offset the unavoidable impacts of the proposed development. Details are also provided regarding the reasons why each potential offset site was not approved by the Office of Environment and Heritage (OEH).

2. Proposed offset sites

TABLE 1 details the offset sites proposed by Codlea Pty Ltd and the reasons these offsets were not accepted.

TABLE 1: Proposed offset sites.

Offset site	Size	Site description	Reason not approved
Polepic Pty Ltd land, Lot 51 on DP 850090, North Ocean Shores	3.5ha	In a letter to OEH dated 23 March 2009, this land was identified as a potential offset area. This land has an existing development approval (with commencement) and adjoins Billinudgel Nature Reserve (**FIGURE 1)**. Vegetation at this site consists of Wet Sclerophyll and Paperbark forest.	OEH did not approve this land as an offset for the proposed Bayside Brunswick development, presumably because of differences in vegetation type between the two sites.
South of Bayside Brunswick Lot 4 on DP 576360	40ha	Undeveloped land immediately to the south of the subject site (**FIGURE 2)**. Contains intact Wallum vegetation including likely core Wallum froglet habitat. In addition, this site contains Primary Koala habitat and potential Glossy black cockatoo habitat.	OEH expressed concerns on 19 April 2012 that the current and future environmental protection zoning upon this lot would affect the assessment of the relative value of this offset proposition. It was also specified that all drainage from the development site not be directed into the proposed offset site, although it has been agreed with Byron Shire Council that the only viable option for stormwater disposal was via this lot.
North Byron Parklands, Tweed Valley Way, Yelgun	259ha overall land holding	This site has been approved for use as a cultural event venue. Approximately two thirds of the site is pasture land used for grazing (**FIGURE 3)**. A portion of the property adjoins the Billinudgel Nature	OEH advised on 3 May 2012 that this site was not acceptable for use as an offset as there are already rehabilitation orders in place and areas already proposed to be restored and dedicated to

N

Legend
Lot 51 on DP850090, North Ocean Shores

0 150m
1 : 5000

SOURCE: Google Earth July 2012 Aerial Photo

SCALE: 1 : 2000 @ A3

JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

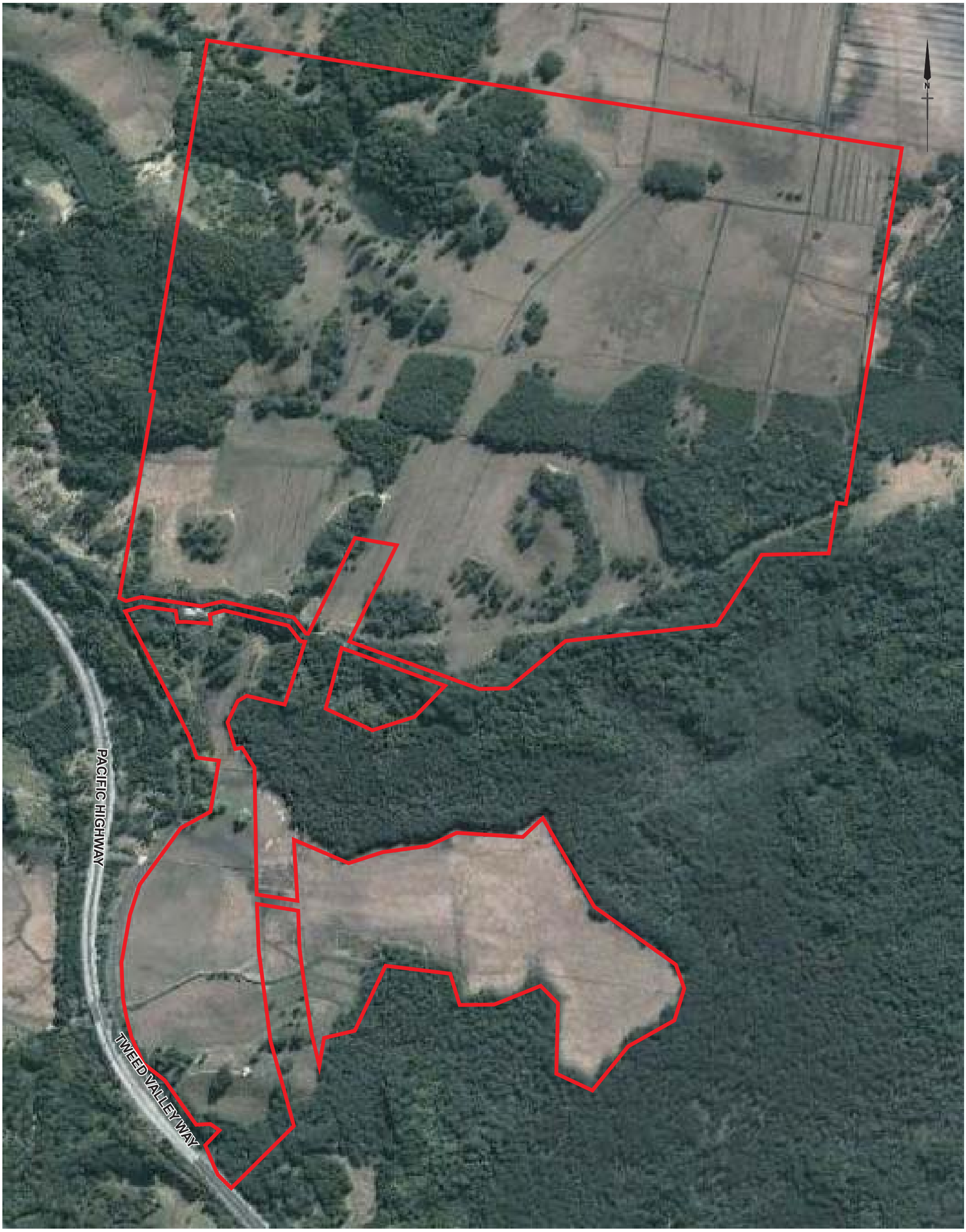
CLIENT
Codlea Pty Ltd

PROJECT
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

APPENDIX 13
FIGURE 1

PREPARED: BW
DATE: 10 December 2012
FILE: N97066_N Ocean Shores.cdr

TITLE
LOT 51 ON DP850090, NORTH OCEAN SHORES



Legend
North Byron Parklands, Tweed Valley Way, Yelgun

0 100m 200m
1 : 8000

SOURCE: Design Team Link (Ref: S-PDF_Dec 05 201213-02-07.181.pdf); Google Earth July 2011 Aerial Photograph
SCALE: 1 : 8000 @ A3

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Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

APPENDIX 13
FIGURE 2
PREPARED: BW
DATE: 10 December 2012
FILE:N97066_N Byron Parklands.cdr

TITLE
NORTH BYRON PARKLANDS, YELGUN

N

Legend
Lot 4 on DP576360, Brunswick Heads
Bayside Brunswick Site Outline

0 150m
1 : 5000

SOURCE: Civil Tech (Ref: 1133-DR2A.pdf)

SCALE: 1 : 5000 @ A3

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PROJECT
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

APPENDIX 13
FIGURE 3
PREPARED: BW
DATE: 10 December 2012
FILE: N97066_Lot 4 Brunswick.cdr

TITLE
LOT 4 ON DP576360, BRUNSWICK HEADS

		Reserve.	OEH.
Lot 11 Terranora Road, Terranora	21.8ha	This land is owned by Codlea Pty Ltd and was put forward as a potential offset site on 25 June 2012. The site would have originally consisted of subtropical rainforest but is now heavily infested with Camphor laurels (**FIGURE 4)**. It was proposed that a calculated area of this site be rehabilitated and then dedicated to Council or the State.	In OEH correspondence dated 27 June 2012, it was declared that "*Wherever possible, offsets should be located in areas that have the same or similar ecological characteristics as the area affected by the development"* and that it would be unlikely that OEH would be supportive of such an offset.
Lot 11 Newrybar Swamp Road, Newrybar	38.5ha	This rural zoned land is currently used for agricultural purposes (**FIGURE 5).** There are a number of Wallum froglet records from within the SEPP 14 Wetlands approximately 300m to the east of the site.	OEH expressed concerns in an email dated 30 July 2012 that there are inherent uncertainties with the rehabilitation of this site, particularly in regard to surrounding land use (i.e. herbicide and pesticide use on neighbouring farms etc.)
Lot 6 Newrybar Swamp Road, Newrybar	42.6ha	As for Lot 11 above, this rural zoned land is currently used for agricultural purposes (**FIGURE 6).** There are a number of Wallum froglet records from within the SEPP 14 Wetlands approximately 2km to the south-east of the site.	OEH expressed concerns that there are inherent uncertainties with the rehabilitation of this site, particularly in regard to surrounding land use (i.e. herbicide and pesticide use on neighbouring farms etc.)

Legend
Lot 11 Terranora Road, Terranora

0 100m
1 : 3000

SOURCE: Near Map Nov 2011 Aerial Photograph

SCALE: 1 : 3000 @ A3

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Environmental Consultants

CLIENT
Codlea Pty Ltd

PROJECT
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

APPENDIX 13
FIGURE 4

PREPARED: BW
DATE: 10 December 2012
FILE: 97066_Lot 11 Terranora.cdr

TITLE
LOT 11 TERRANORA ROAD, TERRANORA

N

Legend
Lot 11 Newrybar Swamp Road, Newrybar

0 150m
1 : 5000

SOURCE: Near Map Feb 2012 Aerial Photograph

SCALE: 1 : 5000 @ A3

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PROJECT
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

APPENDIX 13
FIGURE 5

PREPARED: BW
DATE: 10 December 2012
FILE: N97066_Lot 11 Newrybar.cdr

TITLE

LOT 11 NEWRYBAR SWAMP ROAD, NEWRYBAR

Legend
Lot 6 Newrybar Swamp Road, Newrybar

0 150m
1 : 5000

SOURCE: Near Map Oct 2012 Aerial Photograph

SCALE: 1 : 5000 @ A3

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Codlea Pty Ltd

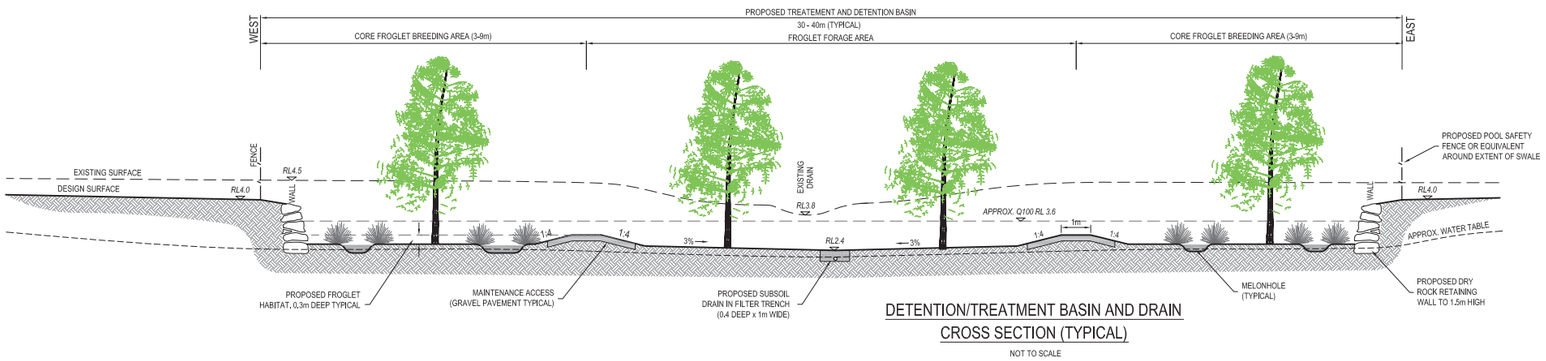
PROJECT
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

APPENDIX 13
FIGURE 6

PREPARED: BW
DATE: 10 December 2012
FILE: N97066_Lot 6 Newrybar.cdr

TITLE

LOT 6 NEWRYBAR SWAMP ROAD, NEWRYBAR



DETENTION/TREATMENT BASIN AND DRAIN
CROSS SECTION (TYPICAL)

NOT TO SCALE

LEGEND

- Proposed Broad leaf paperbark - at 12m centres
- Proposed melanhole (0.6x1.8m TYP.) surrounded by Saw sedges
- Proposed dry rock retaining wall (1.5m high)

0 10m

1 : 250

SOURCE: Landpartners (Ref: LM080082-DR29B.pdf) amended by JWA

SCALE: 1 : 250 @ A3

JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

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PROJECT
Ecological Assessment
Bayside Brunswick
Lot 73 on DP851902; Brunswick Heads, NSW
Shire of Byron

VOLUME 2
FIGURE 1

PREPARED: BW
DATE: 07 November 2012
FILE: N97066_Frog Habitat.cdr

TITLE
TYPICAL WALLUM FROGLET HABITAT PLAN & SECTION