ECOLOGICAL CONSTRAINTS ASSESSMENT

THE PITT STREET WATERFRONT PRECINCT AT CHATHAM (TAREE)

Prepared for
SKM Pty Ltd and Greater Taree Council

ECOTONE ECOLOGICAL CONSULTANTS Pty Ltd
39 Platt Street, Waratah NSW 2298
phone: (02) 4968 4901 fax: (02) 4968 4960
e-mail: ecotone@hunterlink.net.au
web: www.ecotoneconsultants.com.au

EEC PROJECT No. 0577SKM

30 November 2007

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 Background and Scope

This Ecological (Flora and Fauna) Constraints Assessment has been prepared at the request of Mr Brian Watson of SKM Pty Ltd on behalf of the Greater Taree City Council. It investigates the proposed rezoning of the Pitt Street Waterfront Precinct at Chatham near Taree on the mid-north coast of New South Wales.

The precinct is situated approximately 2 km north-east of the Taree central business district on the north passage of the Manning River and is approximately 20 ha in area. A rezoning planning group (RPG) has been established to allow communication between the landowners, Council and the wider community in order to resolve any rezoning issues.

It is proposed to redevelop the area to provide a mix of uses, including open space, residential, commercial, tourism and possibly a marina. These activities are hereafter referred to as *the proposal*.

The general aims of this assessment are to:

- describe the existing biological environment of the study area in relation to flora and fauna;
- discuss the potential impacts of the proposal on any threatened species that occur or potentially occur at the subject site;
- provide discussion on relevant legislation that may have a bearing on the final layout of the proposal.

The environmental studies have been conducted in three stages:

(a) the first stage being a review of available literature pertaining to the site and surrounding locality and preliminary habitat assessment of the subject site;

(b) the second stage being surveys to investigate the inherent biological attributes of the site; and

(c) the third stage being to identify impacts of the proposal on flora and fauna with regards to the relevant NSW and Commonwealth legislation and planning instruments in order to identify any constraints that may occur.

Within this report reference is provided to the relevant sections of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the NSW *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994*, *National Parks and Wildlife Act 1974* (NP&W Act), *Environmental Planning and Assessment Act 1979* (EP&A Act) and subsequent amendments to these. Specific consideration is given to Section 5A of the EP&A Act.

For this report,

- the *subject site* is defined as the land area directly affected by the rezoning proposal. In this case, this area will depend on the final masterplan chosen for the project.
- the *study area* consists of the subject site plus the immediately surrounding land potentially affected by the proposal; and

- the *study locality* is the area of land within a ten (10) kilometre radius of the centre of the subject site.

1.2 General Description of the Study Locality

The study locality is centred on Chatham, a suburb of Greater Taree and situated on the northern side of the Manning River (North Arm).

Land-use within the locality is primarily a mixture of urban residential/industrial uses, surrounded predominantly by rural/agricultural lands. Satellite urban areas occur at Cundletown to the east, Taree South and Purfleet to the south, Tinonee to the south-west and parts of Wingham to the west. Taree Airport occurs to the east of Taree and major roads include the Pacific Highway, Bucketts Way and Wingham Road. The main forested areas are Khappinghat Nature Reserve and Kiwarrak State Forest to the south and Yarratt State Forest to the north.

The topography of much of the locality is almost flat to gently undulating, with elevations ranging from sea level to rarely more than 60 m ASL on the extensive floodplains of the Manning River.

The study area is situated on sand/silt/mud and gravel sandstone and siltstone within a meandering alluvial plain of the Manning River, with a mixture of lithic sandstone, siltstone, tuff, shale and limestone on higher ground immediately to the north of the river (NSW Department of Mines, 1970 and visual observations).

The location of the study area within the study locality is shown in **Figure 1**.

1.3 Description of the Study Area and Subject Site

The subject site consists of a 1400 m section of land bordering the north arm of the Manning River. It is bounded to the north by Pitt Street in the western section and urban/industrial development adjoining Pioneer Street, Chatham Avenue, McRae Avenue and Manning River Drive in the eastern section. The boundaries of the subject site on an aerial photograph are shown in **Figure 2**. A watercourse occurs along the northern boundary in the centre of the site and this turns abruptly south to enter the Manning River approximately 200 m from the eastern boundary. Browns Creek enters the Manning River just to the west of the subject site.

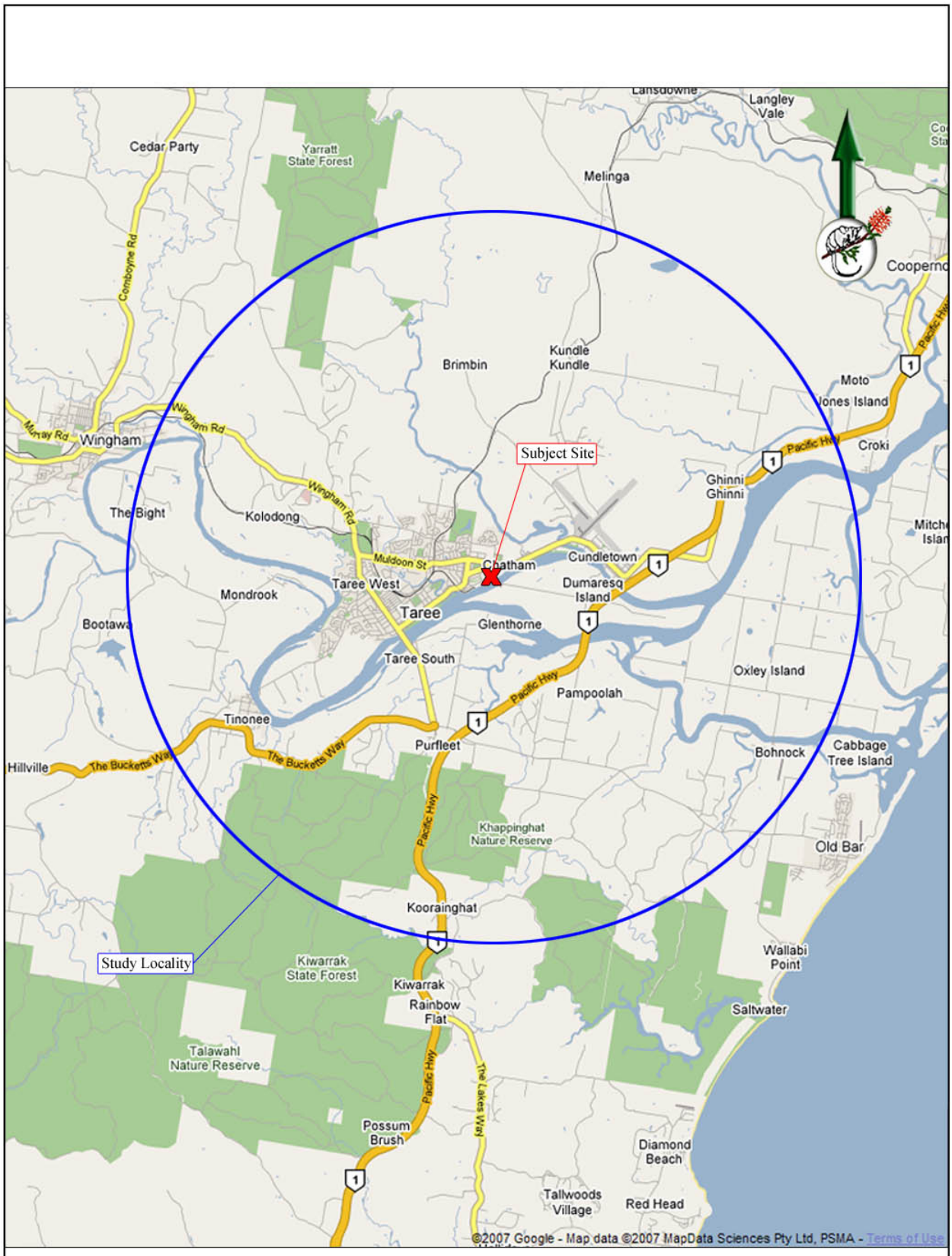
The majority of the site consists of cleared and disturbed industrial or agricultural land with all of the remnant native and exotic vegetation confined to narrow riparian strips along the creek line and banks of the Manning River. The agricultural floodplain in the centre of the site consists of alluvial sand and silt deposits, whereas the higher ground currently used for industrial purposes has gravelly brown soils with a clay/lateritic influence.

The subject site generally slopes gently southwards towards the Manning River, with elevation averaging between 1-8 m ASL.

1.4 Description of the Proposal

It is proposed to redevelop the Pitt Street Waterfront Precinct to provide a mix of uses, including open space, residential, commercial, tourism and possibly a marina. Areas of the Precinct are currently zoned 1(a) Rural General; 2(a) Residential; 4 Industrial; 5 Special Uses and 6(a) Open Space Recreation and therefore rezoning for mixed use is required.

Four planning companies have been invited to submit a masterplan for the project and one of these will be chosen as a preferred plan by the Rezoning Planning Group. These plans have now been submitted and all intend to revegetate/landscape the creek/drainage line in its entirety across the subject site, although one (LAB) appears to modify the tidal section which contains mangroves. There are also varying levels of disturbance along the river bank for boat moorings, wharfs and inlets in all of the masterplans and this will result in a loss of some riparian habitat, including mangroves.



Base Map Source: Google Maps http://maps.google.com.au

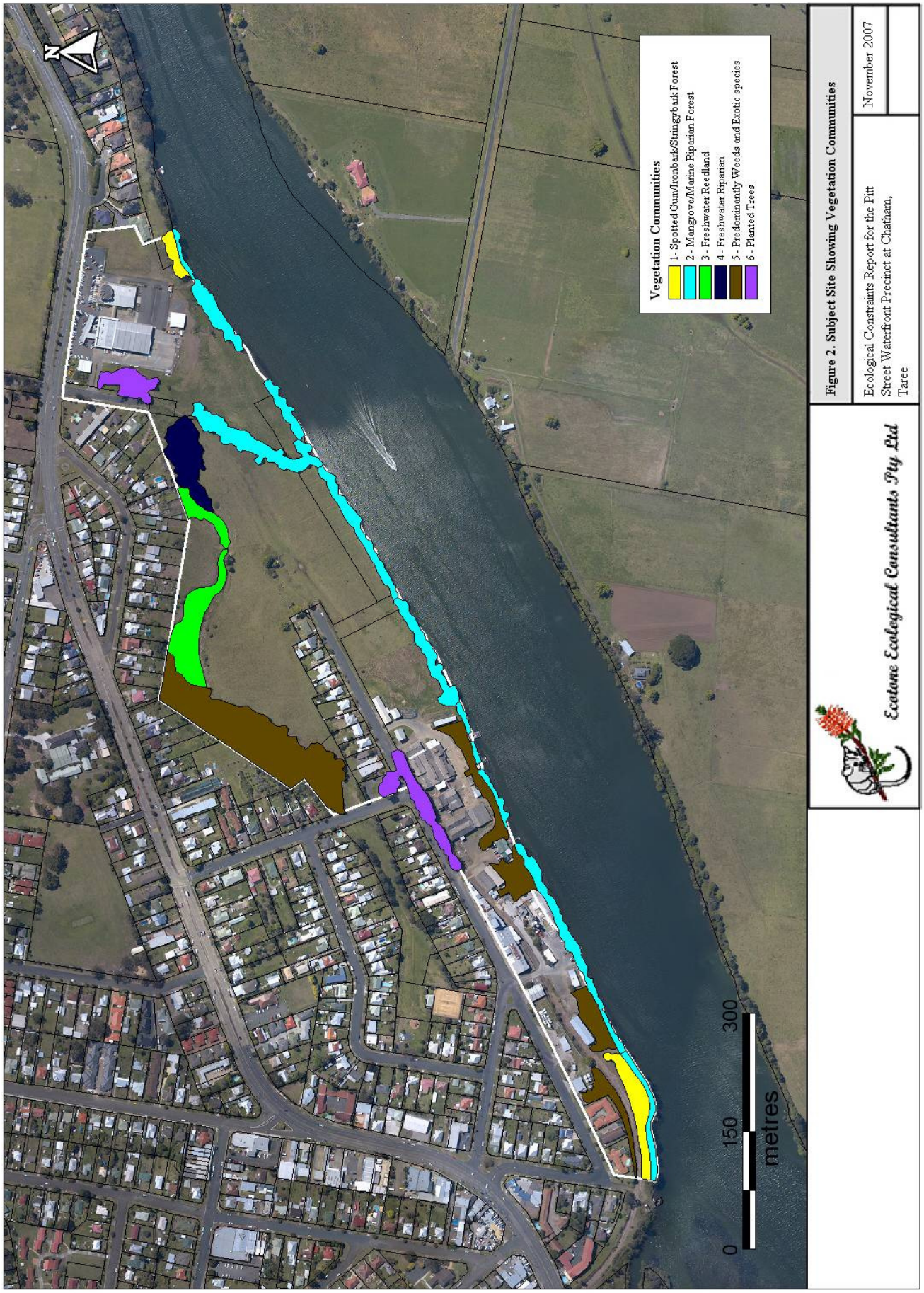
0 2 4km

Ecotone Ecological Consultants Pty Ltd

Figure 1. Study Locality

Ecological Constraints Report for the Pitt Street Waterfront Precinct at Chatham, Taree

November 2007


N
Vegetation Communities
1 - Spotted Gum/Ironbark/Stringybark Forest
2 - Mangrove/Marine Riparian Forest
3 - Freshwater Reedland
4 - Freshwater Riparian
5 - Predominantly Weeds and Exotic species
6 - Planted Trees
0
150
300
metres
Figure 2. Subject Site Showing Vegetation Communities
Ecological Constraints Report for the Pitt Street Waterfront Precinct at Chatham, Taree
November 2007
Ecotone Ecological Consultants Pty Ltd

2.0 FIRST STAGE ECOLOGICAL INVESTIGATION – PRELIMINARY ASSESSMENT

2.1 Review of Local Threatened Species and Other Records

A review of the documented records of the locations of threatened flora and fauna species within the study locality has been undertaken. Threatened species records were accessed from the DECC Atlas of NSW Wildlife Database for the Wingham (9334) and Camden Haven (9434) 1: 100 000 map sheets (updated to July 2007).

2.1.1 Flora

Rare or Threatened Flora

From the review, five rare or threatened flora species are known to occur within the study locality (**Table 1**). These five species are also listed under the national database known as ROTAP (*Rare or Threatened Australian Plants*) (Briggs & Leigh 1996).

Other rare or threatened species may have a potential to occur and suitable habitats may be present. The low number of records in the area may very well be a result of lack of survey work within the locality.

Table 1. Rare or Threatened Flora previously recorded within the Study Locality

Scientific Name	Status (TSC)	Status (EPBC)	ROTAP Code	Earliest / latest records	Number of records within 10 km of site	Number of records within 2 km
Diuris flavescens	E1	-	2K	1997-2006	2	0
Eucalyptus glaucina	V	V	3VCa	1904-2002	5	0
Eucalyptus seeana	E2	-		2002-2003	29	2
ROTAP Only Species						
Callistemon acuminatus	P13	-	3RC-	1996	1	0
Eucalyptus rudderi	U	-	3RC-	1896-1905	6	6
Grevillea granulifera	U	-	3KCa	1788-1996	1	0

Notes for Table 1:
451300 E and 6470300 N (GDA94) and 451200 6470100 (AGD66) are the closest coordinates to the centre of the subject site.
Nomenclature follows Harden (1990-1993) and Harden & Murray (2000).

Status (TSC): refers to the NSW *Threatened Species Conservation Act* 1995 (TSC)
- E1 Schedule 1, Part 1: Endangered Species
- E2 Schedule 1, Part 2: Endangered Population
- V Schedule 2: Vulnerable Species
- P13 Schedule 13 of the NPW Act 1974
- U Unprotected (not listed in Schedule 13 of the NPW Act 1974 or in the TSC Act 1995)

Status (EPBC): refers to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC)
- V Vulnerable Species

ROTAP Risk Code (Briggs and Leigh 1996)
- 2 Geographic range in Australia less than 100km
- 3 Geographic range in Australia greater than 100km
- E Endangered Species: at risk of disappearing from the wild within 10-20 years if present land use and other threats continue to operate
- V Vulnerable Species: not presently endangered, but possibly at risk in future due to continuing depletion or land-use change

R	Rare Species: rare in Australia, but currently without any identifiable threat
K	Poorly Known: taxon that is suspected, but not definitely known, to belong to one of the above categories. At present, accurate field information is inadequate
C	Reserved: indicates taxon has at least one population within a national park, or other proclaimed conservation reserve or in an area otherwise dedicated for the protection of flora
a	1000 plants or more are known to occur in a conservation reserve(s)
-	reserved population size is not accurately known

Please note: These records are based on information supplied by the NSW Department of Environment and Climate Change and other sources, and may contain errors or omissions.

Endangered Populations of Plants

- One Endangered population of *Eucalyptus seeana* is known from the locality, including within 2.5 km of site.

Endangered Ecological Communities and Critical Habitat

The following endangered ecological communities as listed by the *TSC Act 1995* could occur within the study locality:

- Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions
- Lowland Rainforest on Floodplain in the NSW North Coast Bioregion
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions

An assessment of the likely presence of any of these ecological communities in the study area is provided in **Section 3.1.2** of the report.

No Critical Habitat declared to date occurs within the study locality.

2.1.2 Fauna

Threatened Species

A total of 26 threatened terrestrial fauna species have previously been recorded within the study locality including 13 bird, five flying mammal, seven non-flying mammal and one frog species (Table 2). Of these, two species, (Black-necked Stork and Green and Golden Bell Frog), are currently listed as Endangered on Schedule 1, Part 1 of the *TSC Act 1995* and the remainder as Vulnerable on Schedule 2 of the Act. Six species are also listed in the Commonwealth EPBC Act (1999). The Spotted-tailed Quoll is listed as endangered; the Grey-headed Flying-fox, Long-nosed

Potoroo and Green and Golden Bell Frog as vulnerable and the Osprey and Terek Sandpiper as migratory).

There are nearby records (i.e. within 2 km of site) for the Black-necked Stork, White Tern and Osprey.

Table 2. Threatened Fauna previously recorded within the Study Locality

Scientific Name	Common Name	Status (TSC)	Status (EPBC)	Earliest / latest record	Number of records within 10 km of site	Number of records within 2 km of site
BIRDS						
Anseranas semipalmata	Magpie Goose	V	-	1990	1	0
Botaurus poiciloptilus	Australasian Bittern	V	-	1990	1	0
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	1982-2006	23	0
Ephippiorhynchus asiaticus	Black-necked Stork	E1	-	1972-2006	35	4
Gygis alba	White Tern	V	-	1976	2	2
Haematopus longirostris	Pied Oystercatcher	V	-	1996	1	0
Irediparra gallinacea	Comb-crested Jacana	V	-	1990-1995	2	0
Lophoictinia isura	Square-tailed Kite	V	-	2003	3	0
Ninox strenua	Powerful Owl	V	-	1989-2005	21	0
Pandion haliaetus	Osprey	V	Mi	1984-2005	13	2
Tyto novaehollandiae	Masked Owl	V	-	1975-2003	3	0
Tyto tenebricosa	Sooty Owl	V	-	1991	2	0
Xenus cinereus	Terek Sandpiper	V	Mi	1988	1	0
NON-FLYING MAMMALS						
Dasyurus maculatus	Spotted-tailed Quoll	V	E	1995	1	0
Petaurus australis	Yellow-bellied Glider	V	-	1991-1995	2	0
Petaurus norfolcensis	Squirrel Glider	V	-	1997-2006	5	0
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	1980-2006	19	0
Phascolarctos cinereus	Koala	V	-	1972-2006	60	0
Planigale maculata	Common Planigale	V	-	1990	1	0
Potorous tridactylus	Long-nosed Potoroo	V	V	1997	1	0
FLYING MAMMALS						
Miniopterus australis	Little Bent-wing Bat	V	-	1992-2006	12	0
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	1993-2006	11	0
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	1999-2006	6	0
Pteropus alecto	Black Flying-fox	V	-	2003	1	0
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	2001-2006	15	0
FROGS						
Litoria aurea	Green and Golden Bell Frog	E1	V	1999	3	0

Notes:
451300 E and 6470300 N (GDA94) and 451200E 6470100N (AGD66) are the closest coordinates of the study site.

Status (TSC): refers to the NSW *Threatened Species Conservation Act* 1995 (TSC)
E1 - Schedule 1, Part 1: Endangered Species; V - Schedule 2: Vulnerable Species

Status (EPBC): refers to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC)
E - Endangered Species; V - Vulnerable Species; Mi - Migratory Species

Please note: These records are based on information supplied by the NSW Department of Environment and Climate Change and other sources, and may contain errors or omissions.

Endangered Fauna Populations

One listed endangered populations of fauna may occur within the study locality.

- The Emu, *Dromaius novaehollandiae*, population in the NSW North Coast Bioregion and Port Stephens LGA.

Given the lack of records from the locality and the isolation by urban development of the study area from areas of habitat that may be suitable for the species, it is considered highly unlikely that this species would occur. Therefore, this endangered population will be excluded from further assessment within this and subsequent reports.

Fisheries Management Act, 1994

Under the Threatened Species Conservation provisions for this Act the following have been declared and listed;

- Threatened fish species and marine vegetation
- Endangered populations and ecological communities
- Key threatening processes

This is similar to the TSC Act 1995 and also provides for the identification of critical habitat of endangered species and the preparation of threat abatement plans and recovery plans.

The Act also allows for the creation of protected areas and aquatic reserves.

Threatened Fish and Marine Vegetation

The relevant aquatic habitats are marine and tidal in nature therefore only marine fish species are considered.

A search of BioNet data atlas for the Taree area indicates that only one threatened marine fish species listed in the Act has been recorded in the Taree region - Grey Nurse Shark *Carcharius taurus* (endangered).

Listed marine vegetation that is known or may occur in the study area are mangroves and seagrass beds

Endangered Populations and Ecological Communities

None are relevant to the study area.

Key Threatening Processes

Those most relevant to this proposal are the degradation of native riparian vegetation along NSW water courses and the removal of large woody debris from NSW rivers and streams.

Protected Areas and Aquatic Reserves

None are relevant to the study area.

2.1.3 EPBC Act Protected Matters Report

A review of Protected Matters under the Commonwealth EPBC Act for the study locality on the 1st August 2007 yielded a report listing the following matters that could potentially be relevant to the EPBC Act for activities within the study area. Note that the species listed have not necessarily been recorded in the locality and the determination whether the species or habitat is likely or may occur is often determined by computer modeling only, using the known habitat preference for the species.

Table 3. Summary of EPBC Act Protected Matters Report

Protected Matter	Potentially Relevant?	Details
Matters of National Environmental Significance		
World Heritage Properties	No	None listed
National Heritage Places	No	None listed
Wetlands of International Significance (Ramsar sites)	Yes	One listed in the locality: Myall Lakes. Impacts resulting from the proposal may need to be investigated
Commonwealth Marine Areas	No	None listed
Threatened Ecological Communities	Yes	None listed but still needs to be assessed in the field
Threatened Species - Flora	Yes	Two species: **Species or species habitat may occur within area according to EPBC modeling.** Leafless Tongue-orchid *Cryptostylis hunteriana* (**V**) **Species or species habitat likely to occur within area according to EPBC modeling.** White-flowered Wax Plant *Cynanchum elegans* (**E**) The likelihood of any of these species occurring in the study area on the basis of available habitat is assessed in **Table 5** (Section 2.3.1)
Threatened Species – Fauna (Terrestrial Species only)	Yes	Eleven species: **Species or species habitat may occur within area according to EPBC modeling.** Swift Parrot *Lathamus discolor* (**E, 0**) Australian Painted Snipe *Rostratula australis* (**V**) Large-eared Pied Bat *Chalinolobus dwyeri* (**V**) Spotted-tailed Quoll *Dasyurus maculatus* (**E**) Long-nosed Potoroo *Potorous tridactylus tridactylus* (**V**) Regent Honeyeater *Xanthomyza phrygia* (**E, Mi**) **Species or species habitat likely to occur within area according to EPBC modeling.** Green and Golden Bell Frog *Litoria aurea* (**V**) Stuttering Frog *Mixophyes balbus* (**V**) Southern Barred Frog *Mixophyes iteratus* (**E**) Hastings River Mouse *Pseudomys oralis* (**E**) **Roosting known to occur within area according to EPBC modeling.** Grey-headed Flying-fox *Pteropus poliocephalus* (**V**) The likelihood of any of these species occurring in the study area on the basis of available habitat is assessed in **Table 6** (Section 2.3.2).

Table3. continued

Protected Matter	Potentially Relevant?	Details
Matters of National Environmental Significance		
Migratory Species	Yes	Terrestrial species : **Species or species habitat likely to occur within area according to EPBC modeling.** White-bellied Sea Eagle *Haliaeetus leucogaster* (**Mi, O**) **Species or species habitat may occur within area according to EPBC modeling.** White-throated Needletail *Hirundapus caudacutus* (**Mi, O)** Rainbow Bee-eater *Merops ornatus* (**Mi**) Regent Honeyeater *Xanthomyza Phrygia* (**Mi, E**) **Breeding may occur within area according to EPBC modeling.** Black-faced Monarch *Monarcha melanopsis* (**Mi**) Rufous Fantail *Rhipidura rufifrons* (**Mi**) **Breeding likely to occur within area according to EPBC modeling.** Spectacled Monarch *Monarcha trivirgatus* (**Mi**) Satin Flycatcher *Myiagra cyanoleuca* (**Mi**) Wetlands Species **Species or species habitat may occur within are according to EPBC modeling.** Latham's Snipe *Gallinago hardwickii* (**Mi, O**) Great Egret *Ardea alba* (**Mi, O**) Cattle Egret *Ardea ibis* (**Mi, O**) Australian Painted Snipe *Rostratula australis* (**V**, **Mi, O**) The likelihood of any of these species occurring in the study area on the basis of available habitat is assessed in **Section 4.5.2**).
Other Matters Protected by the EPBC Act		
Commonwealth Lands	Yes	Five listed Commonwealth Lands identified within the study locality, however, these do not occur in the vicinity of the study area.
Commonwealth Heritage Places	No	None listed
Places on the Register of the National Estate	Yes (Natural places only)	One: Coocumbac Island Nature Reserve, NSW
Listed Marine Species	Yes	Terrestrial and wetland birds that over-fly marine areas only. See those marked (O) above as threatened and/or migratory species
Whales and Other Cetaceans	Yes	Whales and dolphins occasionally enter into the Manning River
Critical Habitats	No	None listed
Commonwealth Reserves	No	None listed
Extra Information		
State and Territory Reserves	Yes	Four: Brimbin Nature Reserve, NSW Coocumbac Island Nature Reserve, NSW Khappinghat Nature Reserve, NSW Talawahl Nature Reserve, NSW
Other Commonwealth Reserves	No	None listed
Regional Forest Agreements	No	One listed: Lower North East NSW RFA, New South Wales

Notes: **V** - Species listed as **Vulnerable** under the Commonwealth *EPBC Act*.
E - Species listed as **Endangered** under the Commonwealth *EPBC Act*.
Mi - Species listed as **Migratory** under the Commonwealth *EPBC Act*.
O - Species listed under the Commonwealth *EPBC Act* as "overfly marine area".

2.2 Habitat Assessment of the Study Area

Investigations for the preliminary habitat assessment comprised a site inspection on the 1st and 8th of August 2007, noting floral and faunal habitat types and features. The possible factors investigated and assessed for the study area are shown in **Table 4.**

From the site assessment it was possible to:

- identify those parts of the subject site that contain potentially significant habitats for threatened species and local biodiversity;
- determine the areas of the study area that required a more detailed future assessment;
- identify potential constraints from an ecological perspective within the subject site; and
- generate a list of local and regional threatened species regarded as subject species.

Table 4. Summary of habitat features within the study area

Habitat Feature	Habitat Description
1) Overall Type and Structure of Vegetation	a) Spotted Gum/Ironbark/Stringybark Forest to 22 metres height; b) Mangrove/Marine Riparian Forest c) Freshwater Reedland, weed infested; d) Freshwater Riparian weed infested habitat; e) Predominantly weeds and exotic species; f) Artificially planted landscaping vegetation; and g) Open cleared pasture and mown areas.
2) Dominant Species	a) Spotted Gum b) Grey Mangrove, River Mangrove, Tuckaroo, Creek Sandpaper Fig, Swamp Oak, Hairy Clerodendrum, Brown Birch c) Phragmites (native reed), Bullrush d) Camphor Laurel, Red Ash, Weeping Willow, Silky Oak e) Camphor Laurel, Coral Tree, Large-leaved Privet f) Planted native or exotic small trees and large shrubs g) Exotic grasses, weeds and scattered Camphor Laurel
3) Density of Shrub and Ground Cover	a) Moderate shrub and ground cover, some dense infestations of exotic vines and shrubs. b) Narrow strip shrub/ground cover along river/creek banks – mainly exotics and weeds. c) Moderate to dense ground cover to 2-3 m high. d) Moderate shrub cover, Acacia, Cheese Tree and exotics. Dense ground cover, mainly exotic grasses, reeds and vines. e) Dense shrub and ground layer, mostly exotics. f) Moderate shrub layer, sparse ground cover (heavily mulched). g) Dense ground cover, mainly pasture grasses and weeds.
4) Geology	The western and far eastern part of the subject site consists of gravelly brown soil and granitic clay with some lateritic influence. The low laying pasture land consists of alluvial sand, silt, mud and gravel.
5) Aspect and slope	The subject site is part of the Manning River floodplain with higher ground at the western and eastern ends, gently sloping to the river on the southern boundary.
6) Presence of: a) Large Mature Trees (>50 cm DBH), b) Dead Trees c) Hollow-bearing Trees d) Fallen Timber e) Rock Outcrops	 22 – mainly Spotted Gums on bank of Manning River plus an additional 13 planted fig trees on Pitt Street. Nil recorded 2 with large trunk hollows, 9 with small-med spouts or hollows and many small hollows/cracks in fig trees on Pitt Street Sparse fallen branches none

Table 4. continued

Habitat Feature	Habitat Description
f) Wet Areas or Waterbodies	Unnamed creek/drainage line with wet areas, (partly tidal), in the north-east, swampy ground in floodplain used for grazing and Manning River along the southern boundary.
7) Extent of Weed Invasion	The whole of the subject site is heavily weed infested where vegetation or pasture occurs.
8) Assessment of Previous and Present Land Use and Disturbance Regimes	The majority of land within and immediately surrounding the study area has been cleared for industrial, urban and agricultural use. A band of riparian vegetation, largely weed infested, follows the unnamed creek that winds through the subject site and a narrow strip of vegetation occurs along the bank of the Manning River.
9) Extent of Connectivity, Movement Corridors and Refugia	Connectivity to other habitat remnants is poor with the riparian strip along the Manning River providing a limited movement corridor to the Browns Creek corridor for mainly flying fauna. The riparian vegetation does provide some form of refugia, again mainly for flying species, although bandicoot diggings were noted along the edge of the freshwater riparian habitat.

The information compiled in relation to the floral and faunal habitats of the study site has been used in the determination of a list of threatened flora and fauna species that may be regarded as potential inhabitants of the site (i.e. potential subject species). This has been undertaken in Section 2.3.

As part of the habitat assessment, a habitat tree survey was conducted over the whole of the study area. The location of any trees with a DBH (diameter at breast height) greater than 50cms or trees with obvious hollows was recorded using a hand held GPS unit giving an accuracy of between 3-5m. The locations of these habitat trees are shown in **Figure 3** and full details of the tree attributes are given in **Appendix 1.**

In summary, 24 habitat trees were identified within the vegetated remnants. In addition to the 5 fig trees shown in Appendix 1, 13 fig trees planted as street trees along Pitt Street are all >50cms DBH and some provide hollows and fissures between inter-twinning branches. Tree hollows within remnant eucalypts were found to be scarce with only two trees, large Spotted Gums at the western (Tree 3) and eastern end (Tree 22) of the study area, having hollows >20cms entrance diameter, (see **Figure 3** for locations). Of the 9 trees identified as providing potential hollows, seven, including the two large trees mentioned above, were noted to have hollows <5cms entrance size and three trees have hollows with an entrance size of 5-10cms. Therefore, suitable nest/roost sites for hollow dependant fauna species are uncommon within the study area.

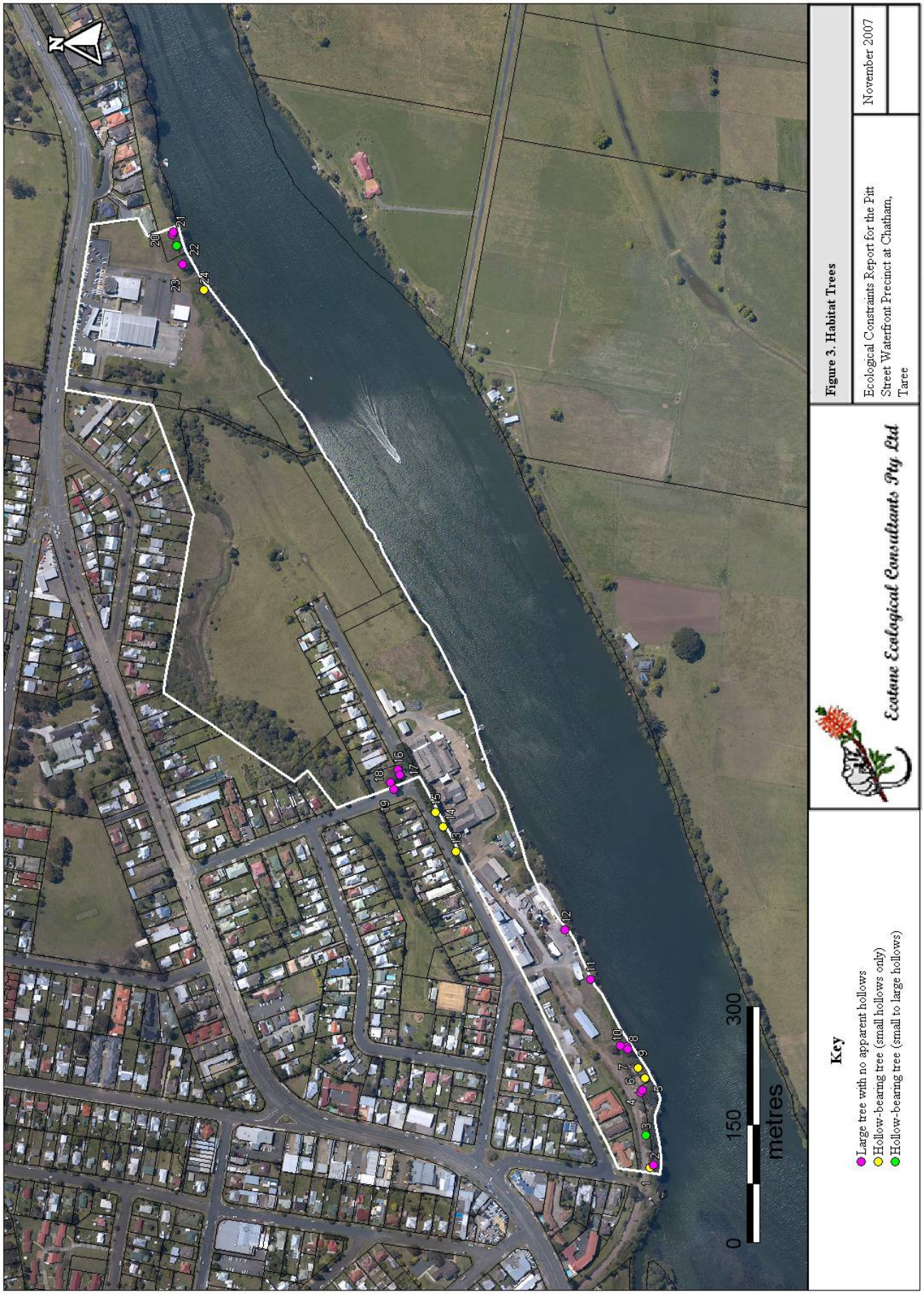
2.3 Determination of Local Threatened Flora and Fauna as Potential Subject Species

A list of potential subject species has been compiled. Subject species are defined as those threatened species considered likely to occur in the habitats present within the study area (NPWS 1996). Therefore, such species would be potentially impacted by the proposal.

2.3.1 Threatened Flora

An assessment of the relative likelihood of the threatened flora species previously recorded in the study locality occurring within the study area is provided in **Table 5**.

In this report, potential subject flora species are regarded as locally-occurring species listed on the TSC Act and/or EPBC Act that are rated as having at least a moderate likelihood of occurring in the study area. On this basis, only the endangered population of *Eucalyptus seeana* is considered to be a


N
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
0
150
300
metres
Key
Large tree with no apparent hollows
Hollow-bearing tree (small hollows only)
Hollow-bearing tree (small to large hollows)
Ecotone Ecological Consultants Pty Ltd
Figure 3. Habitat Trees
Ecological Constraints Report for the Pitt Street Waterfront Precinct at Chatham, Taree
November 2007

potential subject population based on the available habitat and presence of previous records in the locality.

A targeted search will be conducted for this species during the flora field survey. The rare species listed on the ROTAP database in Table 5 are not expected to occur.

Table 5. Potential for Local Rare or Threatened Flora Species to occur within the Study Area

Scientific Name	Latest Record	Records Within		Preferred Habitat and Comments*	Habitat available on site?	Potential to occur within study area	Subject Species
		10 km	2 km				
Cryptostylis hunteriana	-	-	-	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland.	Possibly marginal	Low	n
Cynanchum elegans	-	-	-	Rainforest gullies scrub and scree slopes; from the Gloucester district to the Wollongong area and inland to Mt Dangar.	Marginal	Low	n
Diurus flavescens	2006	2	0	Moist grassland in tall sclerophyll forest	No	Low	n
Eucalyptus glaucina	2002	5	0	Locally frequent but very sporadic. Grassy woodland on deep, moderately fertile and well-watered soil.	No	Low	n
Eucalyptus seeana	2003	29	2	Woodlands on low often swampy sandy soils in coastal districts	Possibly	Moderate	y
ROTAP Species							
Callistemon acuminatus	1996	1	0	Rocky dry slopes of coastal ranges from Port Stephens to the Clarence River	No	Minimal	
Eucalyptus rudderi	1905	6	6	Wet or dry sclerophyll forest on slopes with a medium fertility	Possibly	Low	
Grevillea granulifera	1996	1	0	Found in serpentinaceous soils or granitic sands on stony ridge-tops and slopes in open coastal forests	No	Minimal	

*Compiled primarily from Harden (1990-2002) and Harden & Murray (2000) with additional information from DECC Threatened Species Profiles http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx

Note – Species or populations rated as having a moderate or better likelihood of occurring are regarded as potential subject species if listed by legislation.

2.3.2 Threatened Fauna

An assessment of the likelihood of the threatened fauna species previously recorded in the study locality occurring within the subject site is provided in **Table 6**. Note that in some cases breeding, roosting and foraging habitat is shown to occur. However, as a result of other site features, such as small habitat remnant size, lack of connectivity to other known or potential habitat, lack of records in the locality and past and present disturbance regimes, the potential for the species to use the site may be considered to be low or highly unlikely. Therefore, targeted surveys for these species may be considered unwarranted.

Table 6. Potential for Local Threatened Fauna Species to occur within the Study Area

Common Name	Most Recent Record	Closest Records		Preferred Habitat and Comments*	Habitat available on site			Potential to utilise study area	Subject Species
		10 km	2 km		Breeding	Roosting	Foraging		
Magpie Goose	1990	1	0	Tropical wetlands, floodplains, dams, irrigated crops. Grazes in shallow water, usually in large flocks. Also grazes in pasture and crops. Creates a large floating nest on the water amongst emerging rushes or grasses. Only vagrants occur in the south.	N	N	Y	Low	-
Australasian Bittern	1990	1	0	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes *Typha* spp. and spikerushes *Eleoacharis* spp. Hides during the day amongst dense reeds or rushes and feeds 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; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds. Could potentially live in the riparian habitats within the study area, however, records from the locality are few.	Y	Y	Y	Moderate	√
Black-necked Stork	2006	35	4	Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water on a variety of prey including fish, frogs, eels, turtles, crabs and snakes. Breeds in late summer in the north, and early summer further south. A large nest, up to 2 m in diameter, is made in a live or dead tree, in or near a freshwater swamp. This species could occasionally forage along the edge of the Manning River and in the grassland/wetland in the study area and roost in the riparian remnants.	N	Y	Y	Moderate	√
Comb-crested Jacana	1995	2	0	Inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies. Pairs and family groups forage across floating vegetation. They feed primarily on insects and other invertebrates, as well as some seeds and other vegetation. Breeds in spring and summer in NSW, in a nest of floating vegetation.	N	N	N	Low	-
Australian Painted Snipe	-	-	-	Permanent and temporary shallow inland and coastal wetlands (can be freshwater or brackish), particularly where there is a cover of vegetation. Individuals have been known to use artificial wetlands (such as sewage ponds, dams and water-logged grasslands.	N	N	Y	Low	-
Pied Oystercatcher	1996	1	0	The Pied Oystercatcher favours ocean beaches and estuarine sand and mudflats Main prey appears to be molluscs, but also take marine worms and small fish. Nest is a scrape in sand on coastal or estuarine beaches.	N	N	Y	Low	-

Table 6 continued

Common Name	Most Recent Record	Closest Records		Preferred Habitat and Comments*	Habitat available on site			Potential to utilise study area	Subject Species
		10 km	2 km		Breeding	Roosting	Foraging		
White Tern	1976	2	2	Oceanic, usually far from land and feeds over open ocean. Inhabits lagoons and reefs around islands in breeding season. May occasionally forage along the Manning River	N	N	Y	Low	-
Terek Sandpiper	1988	1	0	The Terek Sandpiper has been recorded in Coastal mudflats, lagoons, creeks and estuaries, with a preference for mangroves. Worms, crustaceans, small shellfish, flies, beetles and water bugs are all included in the varied diet of this Sandpiper. Sandpipers feed whilst walking and pecking and probing with their beak into soft, wet mud, catching prey.	N	N	Y	Low	-
Glossy Black-Cockatoo	2006	23	0	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. Feeds almost exclusively on the seeds of she-oaks (Casuarina and Allocasuarina species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites.	N	N	Y	Low	-
Osprey	2005	13	2	Highly specialised fish catcher inhabiting coastal areas. Nests in trees, rocky outcrops, on the ground or in artificial towers (eg. electricity towers). Known to forage along the Manning River and could potentially nest or roost within the remnant riparian vegetation.	Y	Y	Y	Moderate -High	√
Square-tailed Kite	2003	3	0	Specialised canopy predator, feeding on small birds, eggs and insects. Primarily hunts over open forest, woodlands and mallee communities that are rich in passerines, as well as over adjacent heaths and other low scrubby habitats and in wooded towns. Appears to prefer a structurally diverse landscape.	N	N	Y	Low	-
Regent Honeyeater	-	-	-	Box-ironbark eucalypt associations, though uses other woodland types and wet lowland coastal forest in times of food shortage. The wandering nature of this species makes it difficult to assess. Known to frequent areas with densely blossoming winter-flowering trees (eg. Spotted Gum, Red Iron bark, Forest Red Gum and Swamp Mahogany) on an opportunistic basis along the coast and ranges of NSW. Limited foraging habitat occurs, however, no records could be found for the locality	N	N	Y	Low	-
Swift Parrot	-	-	-	The migratory nature of this species makes them difficult to assess. Known to frequent sclerophyll forest and woodlands with winter flowering trees (eg. Spotted Gum, Red Iron bark, *Eucalyptus crebra* and *E. siderophloia*, Forest Red Gum and Swamp Mahogany) on an opportunistic basis along the coast and ranges of NSW. Limited foraging habitat occurs, however, no records could be found for the locality	N	N	Y	Low	-

Table 6. continued

Common Name	Most Recent Record	Closest Records		Preferred Habitat and Comments*	Habitat available on site			Potential to utilise study area	Subject Species
		10 km	2 km		Breeding	Roosting	Foraging		
Powerful Owl	2005	21	0	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in adjacent fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense often riparian vegetation. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. Birds comprise about 10% of the diet, with flying foxes important in some areas. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400-1450 ha. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. During the breeding season, the male Powerful Owl roosts in a "grove" of up to 20-30 trees, situated within 100-200 metres of the nest tree where the female shelters. Although potential nest and roost sites occur within the subject site, it is considered unlikely to occur due to the limited size and isolation of the habitat available.	Y	Y	Y	Unlikely	-
Masked Owl	2003	3	0	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Although potential nest and roost sites occur within the subject site, it is considered unlikely to occur due to the limited size and isolation of the habitat available.	Y	Y	Y	Unlikely	-
Sooty Owl	1991	2	0	Large areas of tall open forest and woodland particularly in and around dense creek and gully areas. Nests in large hollows in rainforest trees and eucalypts. Suitable habitat for this species does not occur within the study area	N	N	N	Low	-
Large-eared Pied Bat	-	-	-	Range of well-wooded habitats, including dry sclerophyll forests and woodlands of coastal and semi-arid areas. Occasionally in sub-alpine woodlands and at the edge of rainforest and semi-arid areas. Reliant on suitable roosting habitat including caves and mine tunnels (though may use other structures, eg. abandoned Fairy Martin nests).	N	N	Y	Low	-

Table 6. continued

Common Name	Most Recent Record	Closest Records		Preferred Habitat and Comments*	Habitat available on site			Potential to utilise study area	Subject Species
		10 km	2.5 km		Breeding	Shelter	Foraging		
Little Bent-wing Bat	2006	12	0	Forages in a range of habitats, including forest, woodland, heath, coastal swamps and rainforest. A nightly foraging range of 20 km from roost sites has been reported. Reliant on suitable roosting habitat in caves and mine tunnels, though has been recorded roosting in hollowed out tree bases and dense foliage.	N	N	Y	Moderate	√
Eastern Bent-wing Bat	2006	11	0	Forages within a variety of habitat types including moist and dry eucalypt forest, woodland, rainforest, heath and open environments, including urban areas. Reliant on suitable roosting/breeding habitat in caves and mine tunnels, though will also roost in stormwater channels, road culverts and other comparable structures (including buildings). Estimated nightly foraging range of 20 kilometres.	N	Y	Y	Moderate	√
East Coast Freetail-bat	2006	6	0	The habitat preference of this species is unclear. It has been predominantly recorded in dry eucalypt forest and woodland, but also in moist and edge environments. The wing morphology indicates that this species is adapted to the more open habitats. This species primarily roosts in tree hollows, although the roofs of buildings are also used.	Y	Y	Y	Moderate	√
Grey-headed Flying-fox	2006	15	0	Regularly occurs along the eastern coastal plain through NSW. Roosts in camps, usually in dense riparian habitats. At dusk disperses in search of the preferred food source, mainly Eucalypt blossom and rainforest fruits. Long distances are covered (30+ km) in search of food. A permanent breeding camp occurs at Wingham Brush.	N	N	Y	High	√
Black Flying-fox	2003	1	0	Roost in large colonies, using camps in mangroves, rainforest, monsoon and paperbark forests. Travel up to 50 km from camp to a foraging area. Forage in a wide variety of habitats, with a preference for eucalypt blossom, however they will also eat nectar and fruit from other native and introduced trees. Most common in northern NSW and Queensland but known to roost in small numbers at the Wingham flying-fox camp in recent years	N	N	Y	Moderate	√
Koala	2006	60	0	Forest and woodland habitats that contain suitable regional eucalypt feed trees. In the locality, the Forest Red Gum, Grey Gum and Scribbly Gum are listed food trees in SEPP 44. Based on the location of known records for the Taree area the Koala is unlikely to occur however it will be assessed under SEPP 44.	N	N	Y	Low	-

Table 6. continued

Common Name	Most Recent Record	Closest Records		Preferred Habitat and Comments*	Habitat available on site			Potential to utilise study area	Subject Species
		10 km	2.5 km		Breeding	Shelter	Foraging		
Yellow-bellied Glider	1995	2	0	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Den, often in family groups, in hollows of large trees. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar.	N	N	N	Low	-
Squirrel Glider	2006	5	0	Usually inhabits dry open sclerophyll forest and woodlands, but has also been observed in moist regenerating forest and moist gullies. Forages on Acacia gum, Eucalypt sap, nectar, honeydew, manna invertebrates and pollen, utilising areas with an abundance of flowering eucalypts and tall shrubs (eg. Banksias). Acacia species are the preferred sap feeding trees. This species requires an abundance of suitably sized hollow-bearing trees. Given the disturbance, small fragments, low number of tree hollows and isolation of potential habitat within larger tracts of bushland, this species is considered unlikely to occur.	Y	Y	Y	Low	-
Brush-tailed Phascogale	2006	19	0	Nest in hollow trees. Use dry sclerophyll forests and woodlands, with a preference for sparse ground cover. Given the disturbance, small fragments and isolation of potential habitat, this species is unlikely to occur.	N	N	Y	Low	-
Spotted-tailed Quoll	1995	1	0	Inhabits a variety of habitat types from moist and wet sclerophyll through to dry forests and woodlands on the edge of open grasslands in large tract of bushland. Requires large hollow logs on the ground or standing trees for den sites.	N	N	N	Low	-
Long-nosed Potoroo	1997	1	0	Coastal heath and dry and wet sclerophyll forests - relatively thick ground cover is essential and it prefers areas with light, sandy soils.	N	N	N	Low	-
Hastings River Mouse	-	-	-	Known from habitat near creeklines within open eucalypt forest with dense ground cover of sedges, grasses and/ or ferns.	N	N	N	Low	-
Common Planigale	1990	1	0	A small marsupial occupying a range of habitats from rainforest, sclerophyll forest, grasslands, marshlands and rocky areas. Given the low number of reported records, past disturbance, small fragments of habitat and isolation from larger areas of potential habitat in the locality, this species is considered unlikely to occur.	Y	Y	Y	Unlikely	-

Table 6. continued

Common Name	Most Recent Record	Closest Records		Preferred Habitat and Comments*	Habitat available on site			Potential to utilise study area	Subject Species
		10 km	2.5 km		Breeding	Shelter	Foraging		
Stuttering Frog	-	-	-	Terrestrial inhabitants of rainforest, Antarctic Beech or wet sclerophyll forest along permanent streams.	N	N	N	Low	-
Southern (Giant) Barred Frog	-	-	-	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. They breed around shallow, flowing rocky streams from late spring to summer. Females lay eggs onto moist creek banks or rocks above water level and tadpoles drop into the water when hatched. Tadpoles grow to a length of 80 mm and take up to 14 months before changing into frogs. When not breeding the frogs disperse hundreds of metres away from streams. They feed primarily on large insects and spiders.	N	N	N	Low	-
Green and Golden Bell Frog	1999	3	0	Inhabits 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. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. Preyed upon by various wading birds and snakes. Water quality within the freshwater creek and the presence of the Plague Minnow reduces the likelihood of this species occurring.	Y	Y	Y	Moderate although Unlikely	√

*The following references may have been used to compile the habitat descriptions above: Australian Museum Fact Sheets; Barrett *et al.* 2003; Churchill, 1998; Cogger, 1995; Higgins, 1999; Higgins *et al.*, 2001; Morcombe, 2000; DECC Website; Robinson 1994; Simpson & Day, 2003 and Strahan, 1998. Nomenclature generally follows that given in Stanger *et al*, 1997

√ - High to moderate chance of occurring and therefore considered to be a potential subject species.

Of the 33 threatened fauna species assessed, nine are considered to be potential or likely subject species. One additional species not previously recorded within the locality (Southern Myotis *Myotis macropus*) is also considered to have potential to utilise the site, particularly foraging along the riparian vegetation of the Manning River.

2.3.3 Potential Subject Species, Populations and Ecological Communities to be assessed

The following listed species identified as having at least a moderate likelihood of occurrence in **Section 2.3.1** and **2.3.2** above are considered to be potential subject species for the purpose of this assessment.

Flora

- Endangered Population: *Eucalyptus seeana*

Fauna

The following species are most likely to at least forage within the study area;

- Grey-headed Flying-fox
- Black Flying-fox
- Little Bent-wing Bat
- Eastern Bent-wing Bat
- East-coast Freetail Bat
- Southern Myotis
- Osprey

The following have potential to forage/occur on site however, they are less likely to occur;

- Australasian Bittern
- Black-necked Stork
- Green and Golden Bell Frog

Endangered Ecological Communities

- Subtropical Coastal Floodplain Forest
- Swamp Sclerophyll Forest on Coastal Floodplains
- Swamp-oak Floodplain Forest
- River-flat Eucalypt Forest on Coastal Floodplain
- Hunter Lowland Redgum Forest
- Littoral Rainforest
- Lowland Rainforest
- Lowland Rainforest on Floodplain
- Coastal Saltmarsh
- Freshwater Wetlands

Field survey techniques to adequately target the subject fauna species will need to be carried out for the full assessment of the project. The potential impacts on these subject species and community as a result of the proposed development are presented in **Section 4.0** of this report.

3.0 SECOND STAGE ECOLOGICAL INVESTIGATION – FIELD SURVEYS

3.1 Floral Investigations

3.1.1 Methodology

Following a site inspection on 1st August 2007, a comprehensive flora field survey was undertaken over the study area on the 8th August 2007. The entire subject site was surveyed, with the riparian vegetated areas being examined in most detail.

The survey methodology involved two components:

- A series of traverses on foot throughout all vegetated parts of the subject site, to assess the range of floristic variation, vegetation structure, extent of modification, disturbance, weed invasion and condition of the vegetation generally;
- A targeted assessment of potentially suitable habitat for any rare or threatened flora species or populations previously recorded in the study locality that were regarded as having at least a moderate likelihood of occurring within the subject site. The possible presence of any rare or threatened species was also considered during the general foot traverse.

Small samples of any other plant species that could not be identified in the field were obtained for further examination and identification. Any unidentified material thought to be a threatened or regionally significant species would be sent to the National Herbarium, Royal Botanic Gardens.

3.1.2 Results

Vegetation Communities

Seven broad vegetation community types occur in the study area:

1. Spotted Gum/Ironbark/Stringybark Forest
2. Mangrove/Marine Riparian Forest
3. Freshwater Reedland, lightly weed infested
4. Freshwater Riparian, lightly weed infested
5. Weedy Wasteland with predominantly exotic species
6. Artificially landscaped areas with planted native or exotic trees and shrubs
7. Cleared pasture/mown grass

Community 1 occurs in two separate small areas adjacent to the river at the far eastern and western ends of subject site. Community 2 occurs as a narrow strip along the shoreline of the Manning River, and the tidal section of the creek through the eastern part of the site. Community 3 occupies the northern east-west section of the creek. Community 4 occurs as a patch by the creek immediately upstream of the weir. Community 5 occurs as along the western stretch of the creek and is also associated with derelict areas of the various industrial plants and the old dairy on the site. Community 6 occurs in two areas in the eastern part of the site and along the road in the central part of the site adjacent to the old dairy. Community 7 occupies the remainder of the site which represents the bulk of the site area.

Descriptions of the structure and floristics of the vegetation communities within the site are provided in **Table 7** and the location of each community within the study area is shown in **Figure 2**.

Table 7. Characteristics of the vegetation communities within the Study Area

Community 1: OPEN FOREST / WOODLAND – Spotted Gum/Ironbark/Stringybark (Non-EEC)

Stratum	Height	% cover*	Dominant species	Comments
Tree layer	20 - 22 m	20 - 40	*Corymbia maculata* *Eucalyptus eugenioides* *E. paniculata* *E. acmenoides*	Habitat: Occurs on the more elevated and well-drained parts of the site away from the low-lying floodplain areas. Structure/Characteristics: Generally intact open forest to woodland with natural shrub and ground layers present. Distribution within Study Area: Accounts for two small patches of remnant natural vegetation above the river bank at the far eastern and western ends of the subject site. Condition & Presence of Weeds: Mostly relatively natural and in moderate to good condition. The community has a relatively high native species diversity. Minor invasions of weeds occur in some parts of the community, particularly in edge areas, and physical soil disturbances are evident by the river bank. Conservation Status: This community has no particular conservation significance according to any relevant legislation. It has some affinities to the EEC 'Lower Hunter Spotted Gum – Ironbark Forest' as listed on the NSW TSC Act, but this only occurs in the lower Hunter Region and has a different species assemblage (NSW Scientific Committee 2005).
Sub-canopy layer	5 – 12 m	5 - 20	*Alphitonia excelsa* *Acacia implexa* *A. maidenii*	
Shrub layer	1 - 3 m	20 - 40	*Leptospermum polyanthum* *Bursaria spinosa* *Notelaea longifolia* *Myrsine variabilis* *Breynia oblongifolia* *Austrostipa ramosissima* *Cassinia aculeata* *Dodonaea viscosa* subsp *angustifolia* *Maytenus silvestris* *Persoonia linearis* *Exocarpus cupressiformis*	
Ground layer	To 1 m	30 - 70	*Themeda australis* *Echinopogon caespitosus* *Aristida vagans* *Eragrostis brownii* *Eindia trigonos* *Hibbertia diffusa* *Daviesia ulicifolia* *Leucopogon juniperinus* *Dianella revoluta* *Imperata cylindrica* *Dichondra repens* *Lomandra longifolia* *Pterostylis nutans*	
Vines / Climbers	Various		*Hardenbergia violacea* *Desmodium varians* *Eustrephus latifolius*	

* projective foliage canopy cover

Community 2: MARINE RIPARIAN FOREST – Mangroves and Littoral Rainforest (FM Act and EEC)

Stratum	Height	% cover*	Dominant species	Comments
Tree layer	6 - 16 m	50 - 80	*Avicennia marina* *Aegiceras corniculatum* *Casuarina glauca* *Alphitonia excelsa* *Cupaniopsis anacardioides* *Scolopia braunii* *Clerodendrum tomentosum* *Ficus coronata* *Glochidion ferdinandi*	Habitat: Tidal mudflats and adjacent banks with a saline influence along the shore and bank of the Manning River and the downstream section of the creek. Structure/Characteristics: Generally intact low forest to closed forest with shrub and ground layers partially intact. Distribution within Study Area: Occurs as a narrow band along the bank of the Manning River and the downstream end of the creek, below the weir. Condition & Presence of Weeds: Relatively natural with a moderate native species diversity, but subject to significant disturbances from grazing, trampling and edge effects, and consequent patchy weed invasions. Conservation Status: The habitat of the community together with the particular assemblage of species according to the Final Determination (NSW Scientific Committee 2004a) indicates that the landward parts of the community (excluding the intertidal mudflat areas where mangroves form pure stands) would qualify as the EEC 'Littoral Rainforest', intergrading with 'Subtropical Coastal Floodplain Forest' (NSW Scientific Committee 2004b), and a very small area of 'Swamp Oak Floodplain Forest' (NSW Scientific Committee 2004c). Mangroves are protected under the Fisheries Management Act
Shrub layer	1 - 2 m	10 - 40	*Phragmites australis* *Typha orientalis* *Crinum pedunculatum* *Maclura cochinchinensis* *Pittosporum revolutum* *P. undulatum* *Lantana camara* *Opuntia monacantha* *Myrsine variabilis*	
Ground layer	To 1 m	0 - 30	*Alternanthera denticulata* *Geranium homeanum* *Juncus* sp. *Eindia trigonos* *Tetragonia tetragonioides* *Dichondra repens* *Lomandra longifolia*	
Vines	Various		*Ipomoea cairica*	

* projective foliage canopy cover

Community 3: FRESHWATER REEDLAND – Native Reed / Bullrush (EEC)

Habitat: Low-lying and broadened creek floodplain subject to permanent inundation by fresh water.
Structure/Characteristics: Generally intact reedland dominated by Native Reed *Phragmites australis* with some Bullrush *Typha orientalis* and minor occurrences of other freshwater swamp species and weeds.
Distribution within Study Area: Occurs as a single patch in the upstream part of the creek in the central northern part of the site, above the weir.
Condition & Presence of Weeds: Relatively natural with very low species diversity, including a low abundance of weeds.
Conservation Status: The habitat of the community together with the dominant species present according to the Final Determination (NSW Scientific Committee 2004d) indicates that the community would qualify as a simplified form of the EEC 'Swamp Sclerophyll Forest on Coastal Floodplain' (SSFCF) as listed under the NSW TSC Act. The community within the subject site is a recognised variant of the EEC, a reedland form in which trees are absent (NSW Scientific Committee 2004d). The community could also be classified as the EEC 'Freshwater Wetlands on Coastal Floodplains' (FWCF) on the basis that the two dominant species (*Phragmites australis* and *Typha orientalis*) are amongst the list of characteristic species for the EEC. However, they are not listed amongst the major characterising species for FWCF (NSW Scientific Committee 2004e). Given the low species diversity and partly degraded nature of this patch, it is difficult to differentiate between the EECs in this case. The domination of the community by the reed *Phragmites australis* (which is also amongst the list of characteristic species for SSFCF) suggests it might be more appropriate to classify the community as the reedland variant of SSFCF. Both EECs have the same legal conservation status under the TSC Act.

Community 4: FRESHWATER RIPARIAN FOREST – Brush Kurrajong (EEC)

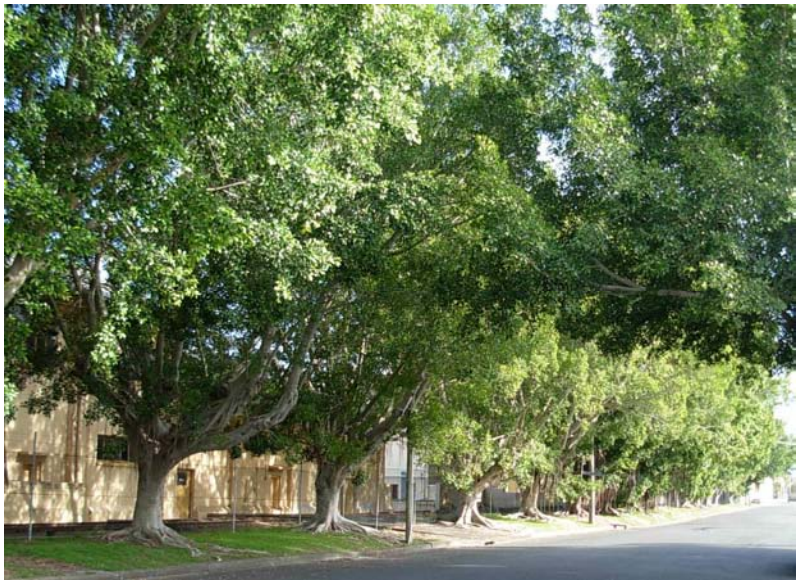
Stratum	Height	% cover*	Dominant species	Comments
Tree layer	18 - 25 m	40 - 70	*Commersonia fraseri* *Alphitonia excelsa* *Cupaniopsis anacardioides* *Glochidion ferdinandi* *Cinnamomum camphora*	Habitat: Narrow floodplain and bank along freshwater section of creek. Structure/Characteristics: Partially intact forest to closed forest with little or no shrub layer and a sparse, disturbed ground layer. Distribution within Study Area: Occurs as a single small patch along the creek immediately upstream from the weir. Condition & Presence of Weeds: Only the tree layer is intact. Impacted by grazing and trampling with consequent exotic weed and tree invasions, including Camphor Laurels. Most trees are native. Conservation Status: The habitat of the community together with the particular assemblage of species according to the Final Determination (NSW Scientific Committee 2004b) indicates that the community would qualify as a degraded, simplified form of the EEC 'Subtropical Coastal Floodplain Forest', intergrading with 'Littoral Rainforest' as listed under the NSW TSC Act. Both EECs have the same legal conservation status under the Act.
Ground layer	To 1 m	0 - 30	*Adiantum aethiopicum* *Geranium homeanum* *Commelina cyanea* *Dichondra repens* *Lomandra longifolia* *Entolasia marginata*	
Vines	Various		*Cissus antarctica*	

* projective foliage canopy cover

Community 5: WEEDY WASTELAND – Predominantly Weeds and Exotic Species

This community occupies two broad areas. One area consists of loosely associated patches of cleared, derelict land associated with the concrete plant and old dairy along the foreshore of the Manning River in the western half of the site. The other is a broad expanse of weeds and exotic trees along the far upstream section of the creek and its floodplain in the north-western corner of the site (pictured). The former area consists of mainly herbaceous weeds and is largely devoid of trees, while the creekline occurrence contains many exotic trees and vines. Both areas are almost exclusively dominated by weeds, and the community does not have any particular structure. The community has no conservation significance.	

Community 6: ARTIFICIALLY LANDSCAPED – Planted Trees & Shrubs

This artificial community occurs in two areas within the site. One patch of mixed planted trees and shrubs occurs in the north-eastern part of the site, adjacent to the car sales yard. The other area consists of a row of planted fig trees *Ficus microcarpa* along the edge of Pitt Street, adjacent to the abandoned dairy (pictured). The ground layer consists of mown grass. The community has no ecological conservation significance, and the trees along Pitt Street are not technically a community but simply a row of trees.	

Community 7: CLEARED PASTURE / MOWN GRASS – Predominantly Exotic Pasture Grasses and Weeds

This community accounts for the largest overall area within the site, mainly occupying the eastern half of the site. It consists of open grazing land made up of mostly introduced pasture grasses and pasture weeds, or areas of mown grass around commercial and industrial areas. The community generally occurs on the low-lying flood-prone parts of the site, and includes many marshy areas, some of which are low-lying natural depressions or minor drainage lines into the creek or river. Trees are almost entirely absent from the community with the exception of occasional paddock trees. Most of the community is currently grazed by horses, with some paddocks left ungrazed at any one time. The community has no conservation significance.	

In terms of comparisons with published regional vegetation mapping, the entire subject site is shown as 'cleared' according to the vegetation mapping prepared by Greater Taree City Council (McDonald & Floyd 2006). At the scale of this mapping, the natural vegetation remnants within the site were apparently too small to map.

Floral Diversity

Considering the predominantly cleared nature of the subject site, total species diversity was found to be high within the entire study area, with 167 flora species from 71 families being identified. However, this was largely due to the large proportion of exotic or planted species present. The species total included three ferns, 121 dicotyledons and 43 monocotyledons. Of the total species recorded, 93 species of introduced or artificially planted flora were identified, representing approximately 56% of the total species.

A list of all flora species recorded and identified from within the study area is included as **Appendix 2.**

Condition of the Vegetation and Presence of Weeds

The vegetation has been highly disturbed in most areas by past clearing, ongoing grazing, slashing, waste dumping from nearby industries and severe weed invasion above the river bank behind the industrial area and at the upstream end of the creek at the central northern end of the site. Clumps or strips of remnant native vegetation in moderate to good condition occur along the shore of the Manning River (mainly mangroves) and along the downstream end of the creek. Small remnants of Spotted Gum-Ironbark forest also occur above the river bank at the far eastern and western ends of the subject site. The remainder of the site accounting for the majority of its area consists of grazed pasture or cleared, weedy grassland with predominantly exotic pasture grasses and weeds.

Some parts of the natural vegetation along the river bank have been disturbed or removed. A short section of mangroves and associated vegetation along the river bank appears to have been removed

and/or poisoned east of the creek mouth. In addition, a short section the river bank has been disturbed at the far western end of the site where an informal 'rope swing' has been in use for a period of time. Since the river bank is steep at this location, the bank is suffering serious erosion as a consequence and many tree roots have become exposed (Plates 1 and 2).

Plate 1:
Gap in mangroves & riparian vegetation at eastern end

Plate 2:
River bank erosion due to rope swing at western end

Seven of the weed species recorded in the study area are declared to be noxious in the Greater Taree Control Area. These are:

- Blackberry *Rubus fruticosus* sp. aggr. – Class 4
- Bridal Creeper *Asparagus asparagoides* – Class 5
- Crofton Weed *Ageratina adenophora* – Class 4
- Drooping Pear *Opuntia monacantha* – Class 4
- Green Cestrum *Cestrum parqui* – Class 3
- Lantana *Lantana camara* – Classes 4 & 5
- Shamrock Oxalis *Oxalis articulata* – Class 5

Explanations of the relevant control categories area as follows:

Class 3: The plant must be fully and continuously suppressed and destroyed.
Class 4: The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Class 5: The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. See **Appendix 3** for further details.

Of the noxious species within the site, the major problem weeds according to Council are Blackberry, Green Cestrum and Crofton Weed (Greater Taree City Council 2007). None of these species occurred at particularly high abundance within the study area, and were mainly confined to the more degraded areas. Drooping Pear was moderately common along the river bank and Blackberry occurred sporadically, particularly near the creek.

Additional species recorded within the site not listed as noxious but considered to be environmental weeds by Council include Camphor Laurel *Cinnamomum camphora* and Privet (both small and large-leaved – *Ligustrum* spp.). Both species are highly invasive in native communities. Camphor Laurel in particular was common throughout the site.

Other recognised environmental weeds for which eradication or management would be desirable within the site include Moth Plant *Arauija sericifera*, Narrow Leaf Cotton Bush *Gomphocarpus fruticosus*, Cobblers Pegs *Bidens pilosa*, Fire Weed *Senecio madagascariensis*, Stinking Roger *Tagetes minuta*, Mile-a-minute and Morning Glory *Ipomoea* spp., Castor Oil Plant *Ricinus communis*, Golden Wreath Wattle *Acacia saligna*, Balloon Vine *Cardiospermum grandiflorum*, Wild Tobacco Tree *Solanum mauritianum*, Asparagus Fern *Asparagus aethiopicus*, Trad *Tradescantia fluminensis*, Mickey Mouse Plant *Ochna serrulata*, Whisky Grass *Andropogon virginicus*, Giant Reed *Arundo donax* and Rhodes Grass *Chloris gayana*.

Threatened or Significant Flora Species, Endangered Ecological Communities and Populations

One threatened flora species listed under the NSW TSC Act, *Eucalyptus nicholii* (Vulnerable), was recorded in the study area. A single tree of the species was noted behind (south of) the office for the concrete batching plant in the western part of the site, near the top of the river bank. This species is native to the ranges in New England area (Nundle to north of Tenterfield) but does not occur naturally in the Taree area. The species is frequently used in urban street and garden plantings and was obviously planted at this location some years in the past as part of the landscaping for the concrete plant.

However, according to advice from DECC, regardless of the origin of a threatened species within a site, a normal assessment of impact must be undertaken if the species may be affected by a proposed activity. On the other hand, at least one council has listed the species under its Tree Preservation Order as a species that can be removed without consent, on the basis of possible genetic contamination with other locally-occurring eucalypt species. It appears that Greater Taree does not have such a policy.

No flora species listed by the Commonwealth EPBC Act were found to occur in the study area. Nor were any species listed by ROTAP (Briggs and Leigh 1996) recorded, and none are expected to occur.

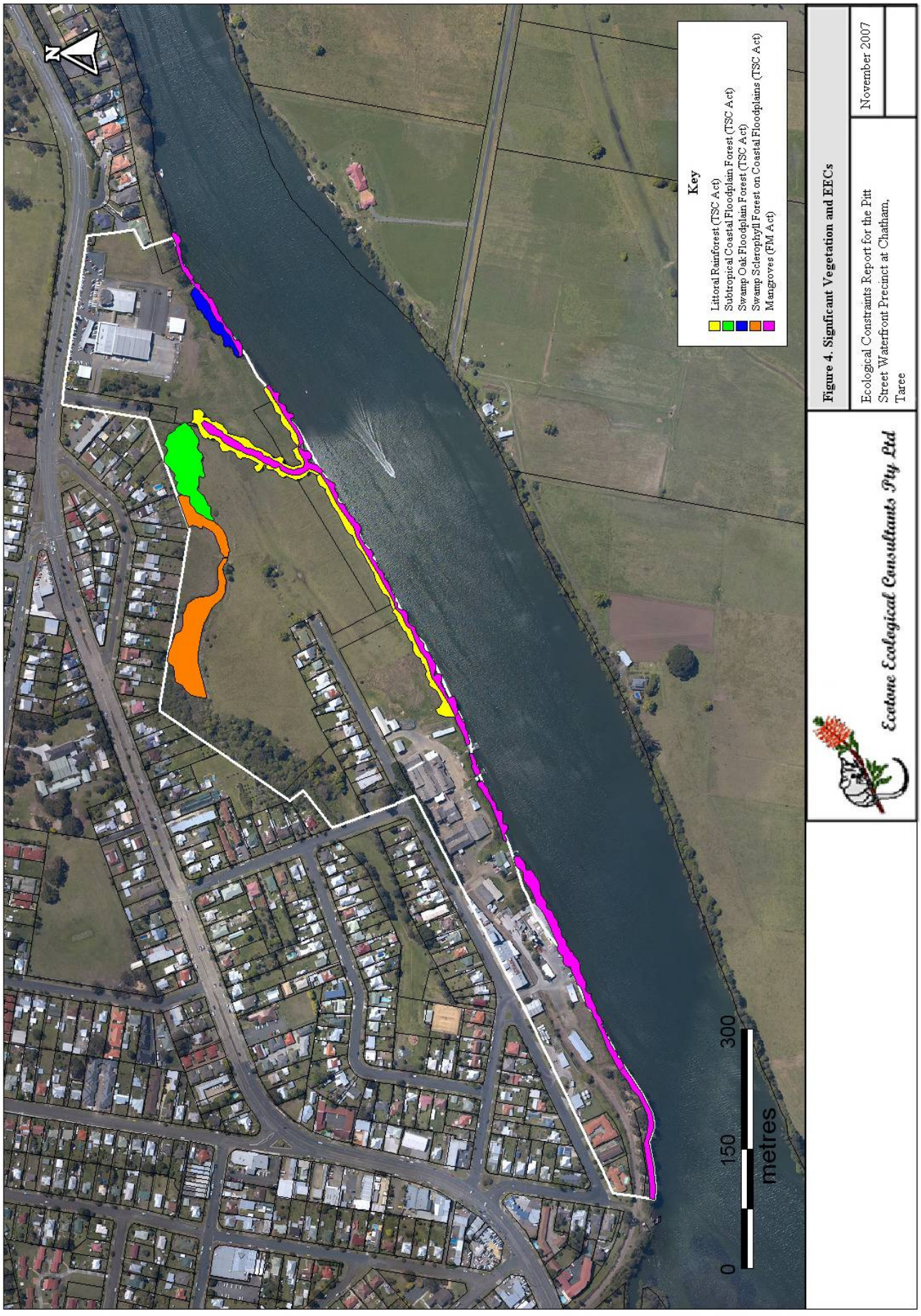
Four endangered ecological communities listed under the NSW TSC Act are considered to occur in the subject site, but in a much simplified or degraded form or as intergrade forms with other communities. The relevant EECs, their distributions within the subject site and their importance locally and regionally are discussed below:

- Littoral Rainforest: includes the landward part of Vegetation Community 2 including the section along the creek, below the weir. In this area it intergrades with the EEC Subtropical Floodplain Forest. The EEC excludes the intertidal mudflat areas of Community 2 where mangroves form pure stands. There are 16 documented areas of Littoral Rainforest in the Greater Taree LGA located at Crowdy Head, Harrington, Harrington Beach, Manning Point, Farquhar's Inlet, Old Bar, Red Head, Black Head and Wallabi Point amounting to a total area of 29.59 ha (Greater Taree City Council 2004). These sites are all either behind coastal dunes or on coastal headlands, much closer to the coast than the subject site. The stand in the study area is therefore not as subject to maritime influence as the documented sites. Its species composition indicates that it represents a marginal form of the EEC only. Considering this fact and its current condition, narrowness and size; the EEC within the site would not have a high local or regional importance. The narrow strip of mangroves on the river side of the community containing Littoral Rainforest is protected by the *Fisheries Management Act 1994*.

- Swamp Sclerophyll Forest on Coastal Floodplains: includes Vegetation Community 2 in the upstream part of the creek in the central northern part of the site above the weir. At this location it occurs as a variant reedland form in which trees are absent (NSW Scientific Committee 2004d). Regionally, major areas of the EEC occur around The Broadwater in Myall Lakes National Park, also in Hat Head National Park and more locally in Crowdy Bay National Park (DECC 2007). Numerous small remnants are likely to occur in low-lying swampy areas in the Manning catchment area. The occurrence within the subject site appears to represent the recognised reedland form of the EEC without trees, and would therefore have some local and regional significance as a distinct variant, although this would be reduced by its small size.
- Subtropical Coastal Floodplain Forest: includes Vegetation Community 4 along the creek immediately upstream from the weir where it intergrades with the EEC Littoral Rainforest. The dry rainforest vegetation class of this EEC is known to occur along the lower riparian corridors of many coastal rivers in northern NSW, including the Manning (DECC 2007). The occurrence within the subject site would represent a marginal contribution to the EEC locally, but would not form a major component of it.
- Swamp Oak Floodplain Forest: a very small patch of this EEC occurs in a limited area at the eastern end of Community 2 along the Manning River, where it intergrades with the EEC Littoral Rainforest. The EEC is widespread and numerous small remnants are likely to occur in low-lying swampy areas in the Manning catchment area. Owing to its very restricted extent and poor condition, the patch within the subject site is considered to have minimal local or regional significance.

The areas of vegetation that are either EECs or protected under the Fisheries Management Act (i.e. mangroves) are shown in **Figure 4**.

No endangered populations of flora are considered to occur in the subject site. The only endangered population considered to have any likelihood of occurring in the subject site is the population of *Eucalyptus seeana* in the Greater Taree LGA. *Eucalyptus seeana* can be superficially similar in appearance to the common Forest Red Gum *Eucalyptus tereticornis*. Two Forest Red Gums were recorded south of the loading area for the concrete plant. If there is a risk that they could be disturbed due to a specific development proposal, they should be checked carefully to confirm their identity prior to any impact assessment for the proposal.


N
Key
Littoral Rainforest (TSC Act)
Subtropical Coastal Floodplain Forest (TSC Act)
Swamp Oak Floodplain Forest (TSC Act)
Swamp Sclerophyll Forest on Coastal Floodplains (TSC Act)
Mangroves (FM Act)
0
150
300
metres
Figure 4. Significant Vegetation and EECs
Ecological Constraints Report for the Pitt Street Waterfront Precinct at Chatham, Taree
November 2007
Ecotone Ecological Consultants Pty Ltd

Overall Significance of the Vegetation

The site contains remnants of natural vegetation, mainly in the form of discontinuous patches or narrow bands or riparian vegetation along the river bank and creek. The bulk of the site is open and consists of cleared pasture. Large areas of the remnant vegetation are degraded and invaded by noxious and environmental weeds to varying degrees, from minor invasions in edge zones to almost complete replacement by exotic species.

However, some patches retain a substantial proportion of the original species composition of the natural community, and are at least partially intact. Some of the riparian communities appear to constitute marginal or degraded forms of endangered ecological communities as listed by the NSW TSC Act. Most of the communities would be transitional forms of the relevant EEC with other EECs or non-listed communities, and few areas of vegetation represent a 'pure' form of any EEC. This has been discussed in **Table 6** and in the previous section. The relevant EECs include 'Littoral Rainforest', 'Swamp Sclerophyll Forest on Coastal Floodplains', 'Subtropical Coastal Floodplain Forest' and 'Swamp Oak Floodplain Forest'.

The main ecological function of the remnant vegetation within the subject site is as part of a network of corridors that provides connectivity both for movement of fauna and for exchange of genetic material between native flora species locally. This would tend to reduce the risk of local flora populations becoming isolated.

Since the land in the Taree urban area has mostly been so highly cleared for public or private infrastructure and pasture, the vegetation may also represent one of the last refuges in the local area of many native flora species. This would be the case with the strips of remnant native vegetation along the creek and river bank.

3.2 Faunal Investigations

3.2.1 Methodology

Detailed Fauna field surveys have not been undertaken for the constraints stage of the proposal, partly as a result of the inappropriate timing of surveys for the target groups, bats and frogs, if conducted during the winter. Therefore, surveys conducted on the 1st August 2007 were limited to the following.

- Habitat assessment, including identifying habitat trees
- Bird survey
- Opportunistic observations

3.2.2 Results

A total of 46 fauna species were positively identified within the study area, including one mammal, two reptile and 43 bird species. Three birds were introduced species, (Spotted Turtle-dove, Rock Dove and Common Mynah), and the rest were native species.

Important habitat features for fauna within the study area were recorded during the surveys. The dense riparian habitat, although generally weed infested, provides potential habitat for arboreal mammals, such as the Common Ringtail Possum *Pseudocheirus peregrinus*, Common Brushtail Possum *Trichosurus vulpecula* and possibly the Sugar Glider *Petaurus breviceps*. Bandicoot diggings were observed on the boundary between the riparian habitat and cleared grazing land

where a dense ground cover occurs. Two species could occur in the study area, the Long-nosed Bandicoot *Perameles nasuta* or the Northern Brown Bandicoot *Isoodon macrourus*.

Given that the survey to date has been brief, birds are well represented, primarily as a result of the mix of terrestrial and aquatic habitats. The dense riparian strips provide ideal habitat for some of the smaller birds such as the Superb Fairy-wren, Yellow Thornbill, White-browed Scrub-wren, honeyeaters and Silvereye. Pelicans and Cormorants were observed fishing in the Manning River at the mouth of the un-named creek that runs through the subject site.

A list of all species recorded in the study area during this survey is presented in **Appendix 4.**

Significant Fauna Species

No threatened species were recorded, however, the Grey-headed Flying-fox *Pteropus poliocephalus* (listed as Vulnerable on the NSW TSC Act), is expected to seasonally feed in flowering trees, particularly Spotted Gums on site. Threatened insectivorous bats, particularly the Southern Myotis *Myotis macropus*, Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* and Little Bent-wing Bat *Miniopterus australis* could also potentially forage within the study area. A list of all threatened species considered to have potential to utilise the site is provided in Section 2.3.3. Surveys targeting bats and frogs will be conducted prior to the completion of the impact assessment stage of the project.

3.2.3 Aquatic Fauna

The results of the fish habitat assessment are as follows:

Geomorphology

a) Creek/drainage line draining to Manning River, partially tidal. Freshwater pools above pipe/bridge.

b) North Arm of the Manning River, approximately 200 m wide, forms the southern boundary.

Flow Regime

a) Creek intermittent, tidal for nearly 200 m.

b) Manning River – tidal with a low to medium flow velocity during dry periods and heavy flows after rain events.

Water Depth

a) Creek pools <1 metre

b) Manning River, maximum depth 7metres (average > 3-4 metres) and 0 to approximately 2 metres deep near the northern bank within the study area, (Hydrographic Surveys Pty Ltd).

Water Quality

No water testing was carried out, however, being tidal and influenced by freshwater flushes following major rain events it is expected that the salinity and pH levels will vary considerably within the Manning River. Nutrient and pollutant levels from stormwater runoff from the surrounding urban and industrial development and chemical and fertiliser use on agricultural land are also expected to vary with rainfall events. These water quality issues have been identified in the Greater Taree City Council Environmental Management Plan, 2006.

The water within the creek was noted to be highly discoloured and there was no water flow at the time of the site inspection. As a result of the headwaters of the creek emanating within the drainage of urban and industrial development, it is expected that testing would reveal water quality within the freshwater part of the creek to be generally low.

Land Use

Urban and industrial development surrounding flood prone agricultural land (river flats).

Riparian Vegetation

Appears to be in moderate condition – dominated by Grey Mangroves and River Mangroves with scattered rainforest species on the banks plus invasive weeds such as Lantana, Camphor Laurel and Large-leaved Privet in tidal areas. Generally heavily weed infested away from tidal influences with fewer native species present. Understorey weeds were prevalent and included Lantana, Crofton Weed, Cobblers Pegs, introduced grasses and Paddy's Lucerne.

Instream Vegetation

a) Creekline - appears to be in poor condition and dominated by introduced species, although there are some good patches of Native Reed *Phragmites australis* and Bullrush *Typha orientalis.*

b) Manning River and the tidal section of the creek have a narrow strip of Grey and River Mangroves along much of the river edge. Recent hydrological surveys indicate that seagrass occurs in shallow water near the mouth of Browns Creek and further to the west and as two small patches on the southern bank of the Manning River at the western end of the study area (Hydrographic Surveys Pty Ltd).

Presence of Wetlands

An area of swampy ground occurs in part of the cleared agricultural land to the east of the creek. Patches of native reed/bullrush swamp also occur within the drainage/creek line in the northern centre part of the site.

Substrate Type

Mud/sand base.

Fish Refuge Areas

None are obvious within the freshwater section of the creek line. The tidal section of the creek and mangroves along the Manning River banks are expected to act as fish refuge areas. The presence of pelicans and cormorants fishing at the mouth of the creek during this habitat assessment indicated that fish gather at this location.

Potential Spawning Areas

Overhanging riparian vegetation, including in stream mangroves, occur within the marine habitats of the study area. Freshwater fish, apart from the introduced Mosquito Fish, are unlikely to occur within the creek as a result of apparent poor water quality with water run-off originating in the surrounding urban and industrial development and the ephemeral nature of water flows. Further assessment of freshwater habitat may be required prior to the completion of the Impact Assessment report.

Natural and Artificial Barriers to Fish

An existing pipe culverts appears to prevent tidal influence occurring further upstream in the creek, however, some inundation by salt water may occur during king tides. There are no barriers in the Manning River.

Likely Presence of Migratory Fish Species

None are expected within the freshwater creek/drainage line. Species that migrate into river systems or to the ocean to spawn, such as eels, seabreams and mullets, are expected to occur within the Manning River.

Aquatic Fauna Present

Only one fish species was recorded in the creek line during the surveys, the introduced Mosquitofish *Gambusia holbrooki*. A full species list would only be obtained by conducting a detailed capture and release study.

.

4.0 DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES AND ASSESSMENT REQUIREMENTS IDENTIFIED WITHIN THE STUDY AREA

This section contains an assessment of the potential cumulative impacts of future development on biodiversity within the study area and consequent requirements for assessment under the relevant legislation and planning requirements. This includes a consideration of the capacity of the land within the subject site to support development with respect to biodiversity, including threatened species, populations and Endangered Ecological Communities.

4.1 Regional Context of the Site

The subject site occupies land adjacent to the Manning River at Chatham, approximately 2 km east of the Taree central business district. Apart from riparian habitat along a drainage line in the north-central area and along the banks of the Manning River, the subject site is devoid of natural vegetation. Current and past land uses are mainly industrial in the western and far eastern parts of the subject site with urban development along the northern side of Pitt Street. The low lying floodplain of the drainage line in the centre of the site has been used for agricultural purposes for a long period of time. A disused rail spur to the former dairy enters the industrial area at the western end, adjacent to the river bank and near the mouth of Browns Creek. Tentative links occur between the riparian habitat along the Manning River and the Browns Creek corridor, however, these links are severed where vegetation is absent and the riparian corridor is narrow, often consisting of a single row of trees. Therefore, in a regional context, the site is highly disturbed with limited ecological importance for terrestrial flora and fauna. However, the mangroves and marine habitat provide important areas for aquatic marine organisms, including fish breeding grounds, although similar habitats are common along other parts of the tidal limits of the Manning River and its tributaries.

4.2 Summary of Terrestrial Biodiversity Values

From desktop and field investigations of the habitats within the study area it is clear that natural vegetation is limited to riparian strips along a drainage line and the Manning River. All of the remnants are weed infested to various degrees.

Although 167 flora species from 71 families were recorded within the subject site, 93 (56%) of these are introduced weeds, planted native species or exotics. No naturally-occurring threatened flora species were detected. However, a single planted Narrow-leaved Black Peppermint *Eucalyptus nicholii* tree was recorded. If there is a risk that this could be disturbed as part of a future development, the species may need to be formally assessed under Part 5A of the EP&A Act. No additional threatened or significant flora species are expected to occur. Four EECs listed by the TSC Act are considered to be present, in a modified and degraded form.

Most of the riparian habitats appear to be degraded examples of four endangered ecological communities. These will be discussed in more detail in **Section 4.5.1**.

Full fauna surveys have not been carried out at this stage, however, bird diversity was found to be reasonable considering the disturbance on site, with 43 species recorded. The other faunal groups are expected to be poorly represented, although the 'vulnerable' Grey-headed Flying-foxes and insectivorous microbats, (including threatened species), are expected to occur. Some of the existing buildings may provide roost sites for some of the microbat species and the vegetated remnants provide potential foraging areas. These remnants may also provide habitat for arboreal mammals such as the Common Ringtail Possum and Common Brushtail Possum, however, apart from bandicoots, recorded by their characteristic diggings, native terrestrial mammals are expected to be

absent and replaced with the introduced Black Rat *Rattus rattus* and House Mouse *Mus musculus*. An exception may be the Swamp Rat *Rattus lutreolus* which could inhabit the freshwater reedlands and long grass within the study area. However, the available vegetation remnants are too small, isolated and disturbed for other common species, such as the Brown Antechinus *Antechinus stuartii* and the Bush Rat *Rattus fuscipes*, to occur. Reptile species diversity is expected to be low and amphibian (frog) diversity may be compromised by the water quality in the freshwater parts of the creek.

4.3 Corridors and Habitat Links

Corridors and habitat links are limited to the riparian habitats within the subject site. The main link consists of a narrow strip of riparian habitat, including mangroves, along the Manning River and this has limited links to the Browns Creek corridor at the western end of the subject site and connectivity with a similar riparian strip of vegetation to the east. Given the isolation and disturbed state of the remnant vegetation, this corridor link is best suited to more mobile species (eg. birds and bats).

A review of the DECC Key Habitats and Corridors in North East NSW indicates that the vegetation remnants in the study area are not part of an identified corridor. Scattered remnants of key habitat are shown approximately 1km to the north-east of the study area in association with the Dawson River. A subregional corridor is shown just to the north of Bushland Drive and Wingham Road, approximately 2km north of the study area. This links to a regional corridor, approximately 4km to the north. This corridor passes through Brimbin NR from the north and then heads east through Kundle Kundle. No direct links between the study area and the identified corridors and the key habitat occur.

4.4 Riparian Habitat and Buffer

The vegetated remnants on site are primarily riparian habitat situated along the banks of the Manning River and along the creek/drainage line within the subject site. Mangroves present within tidal marine environments provide important habitat for breeding fish, other aquatic organisms and migratory shorebirds, with the associated riparian habitat providing important shelter and foraging habitat for passerine birds.

Any riparian protection issues would need to be assessed in the first instance by the Department of Water and Energy pursuant to the *Rivers and Foreshores Improvement Act 1948* but possibly also by the Hunter - Central Rivers Catchment Management Authority pursuant to the *Native Vegetation Act 2003*. The *Fisheries Management Act 1994* would also be relevant in relation to impacts on aquatic habitats. For further details see sections 4.5.3, 4.5.4 and 4.5.5.

4.5 Commonwealth and NSW State Legislative Requirements

4.5.1 NSW Threatened Species Conservation Act 1995 (Section 5A of the EP&A Act 1979)

The *Threatened Species Conservation Act*, (TSC Act), was gazetted in late 1995 and aims to conserve threatened species, populations and ecological communities of animals and plants. Specific objectives of the *Act* are to: -

a) conserve biological diversity and promote ecologically sustainable development;

b) prevent the extinction and promote the recovery of threatened species, populations and ecological communities that are endangered;

c) protect critical habitat of those threatened species, populations and ecological communities;

d) eliminate or manage certain processes that threaten the survival or evolutionary development of those threatened species, populations and ecological communities;

e) ensure that the impact of threatening actions are properly assessed; and

f) encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

Section 5A of the *Environmental Planning & Assessment Act 1979*, (EP&A Act), aims to improve the standard of consideration and protection afforded to threatened species, populations and communities, and their habitats in the planning process. The outcome of any threatened species assessment should be that developments and activities are undertaken in an environmentally sensitive manner, and that appropriate measures are undertaken to minimise adverse effects on threatened species or their habitats. Under the *Threatened Species Conservation Amendment Act 2002*, Section 5A of the *EP&A Act* has been amended. This has also affected the *TSC Act 1995* and the *Fisheries Management Act 1994*. An essential outcome of the amendments is that as of late 2005, the previous "eight-part test" has been replaced with a set of revised factors now known as the "seven-part test".

Under the TSC Act, any future rezoning or planned development of land within the subject site would need to assess the potential impacts on any threatened species, populations and ecological communities known or likely to occur within the area. During the field survey work, four Endangered Ecological Communities have been identified (mostly as simplified or transitional forms), and threatened fauna species (mainly bats) are expected to occur within the subject site. The preparation of '7-part tests' for the above threatened species and Endangered Ecological Communities cannot be carried out at this stage as no firm development plans are currently available and additional fauna survey work needs to be carried out.

Based on current information, it appears that all of the masterplans under consideration intend to retain and regenerate the riparian habitat along the creek/drainage line however there will be some loss of riparian habitat along the Manning River in each of the masterplans to varying degrees. Although this may result in the removal or modification of parts of endangered ecological communities, it is considered unlikely that this would represent a significant loss. Assessment under the *Fisheries Management Act 1994* is likely to be more of an issue (see **Section 4.5.3**).

As most of the existing vegetation remnants are likely to be retained and probably enhanced in some areas, it is considered that a significant impact on any threatened fauna species that may be recorded during future surveys is unlikely to occur as a result of any proposal within the subject site. This assumption is based on the high level of disturbance within the study area, the small size and linear nature of the remnants and poor connectivity to other vegetation remnants outside of the study area.

Therefore, it is considered unlikely that the preparation of a Species Impact Statement for Endangered Ecological Communities and terrestrial fauna would be required, although this would need to be determined by the preparation of 7 - part tests in the impact assessment report.

Key threatening processes that may require consideration or assessment pursuant to the Act include:

- Alteration to the natural flow regimes of rivers and streams and their floodplains or wetlands
- Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments
- Clearing of native vegetation
- Invasion of native plant communities exotic perennial grasses
- Invasion, establishment and spread of Lantana
- Invasion and establishment of exotic vines and scramblers
- Loss of hollow bearing trees

4.5.2 Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act was gazetted in 2000 and replaced several earlier Commonwealth statutes. This Act focuses Commonwealth interests on matters of national environmental significance including integrated biodiversity conservation and the management of important protected areas. The Act also establishes a streamlined environmental assessment and approvals process.

The matters of national environmental significance (NES) as identified in the Act which require assessment and approval to be addressed by the Commonwealth include:

- World heritage properties
- National heritage places
- Ramsar wetlands
- Nationally threatened species and ecological communities (Part 13, Division 1, Subdivision A of the EPBC Act)
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)

The assessment and approval process applies to any action that has, will have or is likely to have a significant impact on a matter of NES. An 'action' is defined as a project, development, undertaking or an activity or series of activities. As of 18 January 2007, a bilateral agreement has been signed between the Commonwealth and the state of NSW which essentially accredits the NSW assessment process of environmental impact for the purposes of the EPBC Act, provided that the assessment has been done in accordance with the bilateral agreement. This has effectively removed the need for duplication of assessment effort by both the Commonwealth and state.

With regard to flora and fauna, the only matters of NES relevant to the study area are nationally threatened species and migratory species. The relevant criteria given in the administrative guidelines for the Act to determine whether the action will or is likely to have a significant impact on a nationally threatened species are as follows:

Critically endangered and endangered species

Criteria

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

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or

- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.

** Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.*

Vulnerable species

Criteria

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

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population[#], or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*, or
- interferes substantially with the recovery of the species.

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

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

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.*

Migratory Species

Criteria

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

- substantially modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles) destroy or isolate an area of important habitat* for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion[#] of the population[+] of a migratory species.

** An area of 'important habitat' for a migratory species is:*

- *habitat utilised by a migratory species occasionally or periodically within the region that supports an ecologically significant proportion of the population of the species; and/or*
- *habitat that is of critical importance to the species at particular life-cycle stages; and/or*
- *habitat utilised by a migratory species which is at the limit of the species range; and/or*
- *habitat within an area where the species is declining.*

[#] Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

[+] 'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

Threatened Flora or Ecological Communities

No threatened flora species or ecological communities listed by the Act are considered to have potential to occur within the study area.

Threatened and Migratory Fauna

With regards to threatened fauna, one threatened fauna species listed in the EPBC Act has most potential to occur within the study area (Grey-headed Flying-fox *Pteropus poliocephalus*). Potential habitat exists within the study area for four additional threatened species listed in the EPBC Act, the Swift Parrot *Lathamus discolor*, Australian Painted Snipe *Rostratula australis*, Regent Honeyeater *Xanthomyza phrygia* and the Green and Golden Bell Frog *Litoria aurea*.

Of these five species, four are highly mobile species with large foraging areas. The Grey-headed Flying-fox is likely to be an opportunistic visitor to the subject site, foraging within the area when food resources are available. In particular, the Spotted Gums are likely to provide an important food resource as they flower during winter when other food resources are scarce. The nearest permanent Grey-headed Flying-fox camp is at Wingham Brush, well within the foraging range of the species. The endangered Swift Parrot and Regent Honeyeater may forage within the study area on an occasional opportunistic basis, particularly during peak winter flowering periods of the Spotted Gums. As it appears that most of the Spotted Gums will be retained and given their large foraging ranges and/or nomadic tendencies it is unlikely that any development within the subject site would significantly impact upon any of these species.

Potential habitat for the Australian Painted Snipe occurs in the wetland area in the north centre section of the site, however, it is unlikely to occur given a lack of records, (the nearest being Hexham Swamp near Newcastle) and the disturbed, grazed nature of the habitat. The Green and Golden Bell Frog had previously been recorded within the study locality, however, the water quality in the freshwater part of the creek is dubious and therefore, it is considered unlikely to occur.

With regards to migratory species, one species listed in the EPBC Act, the Cattle Egret *Ardea ibis* was recorded within the subject site and four additional species, the Osprey *Pandion haliaetus,* Great Egret *Ardea alba*, White-throated Needletail *Hirundapus caudacutus* and the White-bellied Sea-Eagle *Haliaeetus leucogaster*, are known to occur in the locality and are likely to at least fly over the subject site. Listed waders, such as the Lesser Sand-plover *Charadrius mongolus*, Black-tailed Godwit *Limosa limosa*, Latham's Snipe *Gallinago hardwickii*, Eastern Curlew *Numenius*

madagascariensis and Pacific Golden Plover *Pluvialis fulva*, may forage along the edge of the Manning River. Additional migratory species listed in the EPBC protected matters report for the study locality (**Table 3**, **Section 2.1.3**) may occur or have suitable habitat available within the locality. These are the Rainbow Bee-eater *Merops ornatus*, Satin Flycatcher *Myiagra cyanoleuca*, Black-faced Monarch *Monarcha melanopsis*, Spectacled Monarch *Monarcha trivirgatus* and Rufous Fantail *Rhipidura rufifrons*, however, given the small area and disturbed nature of potential habitat, at best, they may only pass through the area on migration.

Although some foraging habitat for waders and passerine birds may be lost or modified along the banks of the Manning River, there is some potential for additional habitat to be created during regeneration and/or landscaping works and as habitats could be improved and increased in area, it is considered that a significant impact is unlikely to occur. Therefore it is considered unlikely that specific assessment under the provisions of the *EPBC Act* 1999 will be required for any proposed future development within the subject site.

4.5.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* was amended by the *Fisheries Management Amendment Act* 1997 to include marine habitat. Therefore, marine vegetation such as seagrasses and mangroves, gravel and snags are covered by the Act and are the responsibility NSW Department of Primary Industries – Fisheries. The areas where mangroves occur, along with significant vegetation covered by other legislation, are shown in **Figure 4**.

A Fish Habitat Protection Plan No. 1 – General has been developed (NSW Fisheries 1998). This plan applies to all waters to which the Fisheries Management Act applies and habitat features required for spawning, nursery, shelter and feeding activities of fish. Features known or likely to be present within or adjacent to the subject site include the quantity and quality of the water, mangroves, possibly seagrasses, mudflats, sand and gravel substrates, reed beds and other aquatic plants and snags, primarily fallen branches and rocks.

Activities applicable to the plan and relevant to the proposal include dredging reclamation, damaging marine/riparian vegetation and desnagging, (removal of logs and rocks within wharf/jetty developments).

At least one threatened marine species the Grey Nurse Shark *Carcharias taurus* has been recorded in the Taree area (Bionet search). The preferred habitat is rocky reefs however individuals may occasionally venture into the tidal reaches of the Manning River.

In the case of this proposal, water pollution, dredging and loss of riparian/marine vegetation are the most relevant potential impacts. Therefore, it is likely that a full assessment under the *Fisheries Management Act 1994* would be required for the riparian habitat along the bank of the Manning River. This could involve a survey for seagrass, fish and invertebrates, benthic and other fauna. Hydrological surveys conducted for this proposal by Hydrographic Surveys Pty Ltd found that seagrasses were confined to shallow water areas near the entrance to Browns Creek and further to the west as well as two small patches on the southern bank of the Manning River (North Arm) at the western end of the study area.

4.5.4 Rivers and Foreshores Improvement Act 1948

It is intended that this act will eventually be included under the *Water Management Act 2000*; however, it is still in force at this point in time. The *Water Management Act* covers all waters,

including coastal waters to the three mile nautical limit. The aim of the *Rivers and Foreshores Improvement* Act is to prevent degradation, mainly erosion, in and adjacent to rivers, lakes and estuaries, whereas the *Water Management Act* will provide for the protection, conservation and ecological sustainable development of waters (NSW Department of Land and Water Conservation, 2001.

With regards to this proposal the *Rivers and Foreshores Improvement Act 1948* may be relevant in that removal of riparian habitat, dredging and changes to the river bank are likely to occur. This would apply to any proposed activity within 40 m of the Manning River or creek bank. The NSW Department of Water and Energy would need to be contacted to undertake an assessment of riparian issues and conservation requirements in relation to a particular development proposal.

4.5.5 NSW Native Vegetation Act 2003 (NV Act)

The *Native Vegetation Act 2003* (NV Act) applies to the clearing of native vegetation from all land in NSW except within conservation reserves, state forests and urban areas. Urban areas include any areas zoned residential (but not rural residential), village, township, industrial or business.

Since part of the subject site is currently zoned Rural, any clearing of native vegetation may be relevant. However, as it is intended to change the zoning for the proposal and the surrounding land consists of urban and industrial development, in this case it is likely that the proposal would not be subject to the provisions of the NV Act but this would depend of the final zoning(s) adopted. The Hunter-Central Rivers Catchment Management Authority (CMA) should be contacted for a definitive ruling on obligations of the proponent under the Act, once a clear proposal is adopted.

If it is concluded that the NV Act does apply, the action required will be determined by the CMA. Depending on the level of natural vegetation removal proposed this may require the preparation of a Property Vegetation Plan (PVP) by the local CMA. The criteria for approval of the proposal by the local CMA would be whether it 'improves or maintains' the biodiversity values of the site. This would involve a systematic documentation of all biodiversity values including vegetation communities, vegetation condition (remnant or regrowth since 1990), habitat trees and actual or potential presence of threatened species and endangered communities. Areas of vegetation would need to be identified to be retained and managed to adequately offset natural remnant vegetation and / or any habitat trees lost. A plan for weed control and management of the areas of retained offset vegetation would need to form part of the PVP.

4.5.6 NSW National Parks and Wildlife Act 1974 (NP&W Act)

The NP&W Act includes provisions designed to protect and conserve native flora & fauna and Aboriginal archaeological relics.

Under the NP&W Act (Parts 7 & 8), it is an offence to pick or have in your possession a protected native plant or to harm any protected fauna. Protected native plants are those listed in Schedule 13 of the Act. Most fauna species found in NSW are considered protected fauna, with the exception of introduced animals such as dogs, cats, cows, horses, rabbits, etc. Under the Act it is also an offence to harm, pick or damage threatened species, endangered populations, endangered ecological communities or their habitat without specific approval pursuant to the TSC Act.

Under the NP&W Act (Part 6), it is an offence to knowingly damage or destroy Aboriginal archaeological relics without prior consent from the Department of Environment and Conservation. If an Aboriginal archaeological site is discovered, the Department of Conservation and Climate Change should be contacted.

In general, specific assessment under the NP&W Act is usually not required for development proposals as provisions under the TSC Act and EP&A Act are considered to be more appropriate for environmental impact assessment.

4.5.7 Rural Fires Act 1997

The main objectives of bushfire protection are the protection of human life and property. The key objectives to achieve this goal are as follows, (NSW Rural Fire Service and Department of Planning, 2001):

1. consider bushfire protection and management issues in land use planning and development decisions, to provide a safe environment for the community;
2. manage vegetation to reduce potential bushfire attack in the vicinity of habitable buildings;
3. design and siting of habitable buildings to improve the survivability of the buildings and the protection of life during the passage of a fire front;
4. provide safe access for emergency and other vehicles at all times;
5. ensure water is available to landholders and emergency services to enable the defence of habitable buildings against bushfire attack; and
6. establish a maintenance regime for fire protection for the life of the habitable buildings.

Bushfire protection will need to be considered, particularly where buildings are adjacent to vegetated remnants, however, given the limited vegetation on site bushfire protection requirements are likely to be minimal, even after the restoration of the drainage line. This assumption is largely due to the isolation of the study area from other bushland remnants thus reducing the potential for a wild fire.

4.5.8 SEPP 44 – Koala Habitat Protection

SEPP 44 was implemented on the 13th of February, 1995, with the reasoning that the current known distribution of the Koala in NSW is fragmented, with most colonies appearing to be small and isolated. Many of these populations are in locations that are under increased pressure from habitat loss or modification, predation and exposure to drought, disease and bushfire. The Koala is listed as 'Vulnerable' in Schedule 2 of the Threatened Species Conservation Act, 1995.

Prior to a Development Application for bushland areas being approved, the following considerations need to be assessed:

a) identification of "potential Koala Habitats" within the proposed development area; if the total tree cover contains 15% or more of the Koala food tree species listed in Schedule 2 of SEPP 44 then it is deemed to be "potential Koala habitat";
b) identification of "core Koala habitat" within the development area. "Core Koala habitat" is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population;
c) identification of "core Koala habitat" will require that a plan of management must accompany the DA application; and
d) if the rezoning of lands, other than to environmental protection, involves potential or core Koala habitat then the Director of planning may require a local environmental study be carried out.

As the Greater Taree LGA is listed in Schedule 1 of SEPP44, any planned rezoning or future development within the subject site would need to include an assessment of potential impacts on Koala habitat according to the criteria specified in SEPP 44.

In order to decide whether habitat within the subject site represents "potential" or "core" Koala habitat as defined under SEPP44, a visual assessment of the percentage of Koala food tree species present on the subject land was carried out. Koala food tree species were identified as those listed in Schedule 2 of SEPP 44.

Schedule 2 Feed Tree Species (SEPP 44):

Scientific Name	Common Name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus punctata	Grey Gum
Eucalyptus viminalis	Ribbon or Manna Gum
Eucalyptus camaldulensis	River Red Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus signata	Scribbly Gum
Eucalyptus albens	White Box
Eucalyptus populnea	Bimble Box or Poplar Box
Eucalyptus robusta	Swamp Mahogany

Only one preferred food species listed in SEPP 44 (Forest Red Gum *Eucalyptus tereticornis*) was found to occur within the subject site, with only two individual trees, probably planted, found at the rear of the concrete batching plant. It is, therefore, unlikely that the forest remnants on site would represent potential Koala habitat as defined in SEPP 44, particularly given the isolation and past disturbance on the subject site.

In addition, although occasional records occur along Browns Creek as far as the Showground (Lincoln Carter, pers. com.), most recent Koala records occur north of Bushland Drive and no records could be found within 2.5 km of the subject site on the DECC Wildlife Atlas. Also, in the Browns Creek Management Plan (Greater Taree City Council, 2006) the community group, Koalas in Care Inc., advised that Koalas should not be encouraged to venture south of Bushland Drive because of the high risk of vehicle strikes and dog attacks. As it is considered unlikely that any resident Koala population occurs within the subject site, the habitats available do not represent "core Koala habitat" as defined in SEPP 44.

4.5.9 SEPP 14 Coastal Wetlands

The aim of this policy is to ensure that coastal wetlands are preserved and protected in the environmental and economical interests of the State. The policy applies to all wetlands that have been identified and mapped under SEPP 14.

No designated/mapped wetlands under SEPP 14 occur on or near the subject site. No action under this policy is likely to be required.

4.5.10 SEPP 71 Coastal Development

The entire subject site falls within the provisions of SEPP 71 Coastal Development. An area encompassing the entire western end of the site plus a broad band of approximately 150 m width along the river to the eastern end, including the central creekline vegetation has been classified 'Sensitive Coastal Location' under the policy. The remainder of the subject land comes under the NSW Coastal Policy generally (**Figure 5**).

SEPP 71 provides that certain additional matters must be considered in the determination of development applications. Some of these matters include consideration of:

- public access to and along the coastal foreshore;
- impacts on the amenity of the coastal foreshore – e.g, overshadowing, loss of views;
- scenic qualities of the NSW coast;
- measures to conserve fauna (including fish) and marine vegetation;
- likely impacts of coastal processes and hazards on the development and vice versa; and
- conservation and preservation of items of heritage, archaeological or historic significance.

Certain categories of development within this zone are designated by SEPP 71 as significant and must be referred by the relevant council to the Director-General of the NSW Department of Planning. The NSW Planning Minister may then decide to call in the development or may refer it back to the council, specifying additional matters that must be taken into consideration in determining the development application.

Significant development includes development on land within, or partly within 'sensitive coastal locations'. Part of the land within the subject site is designated as a 'sensitive coastal location' as described above.

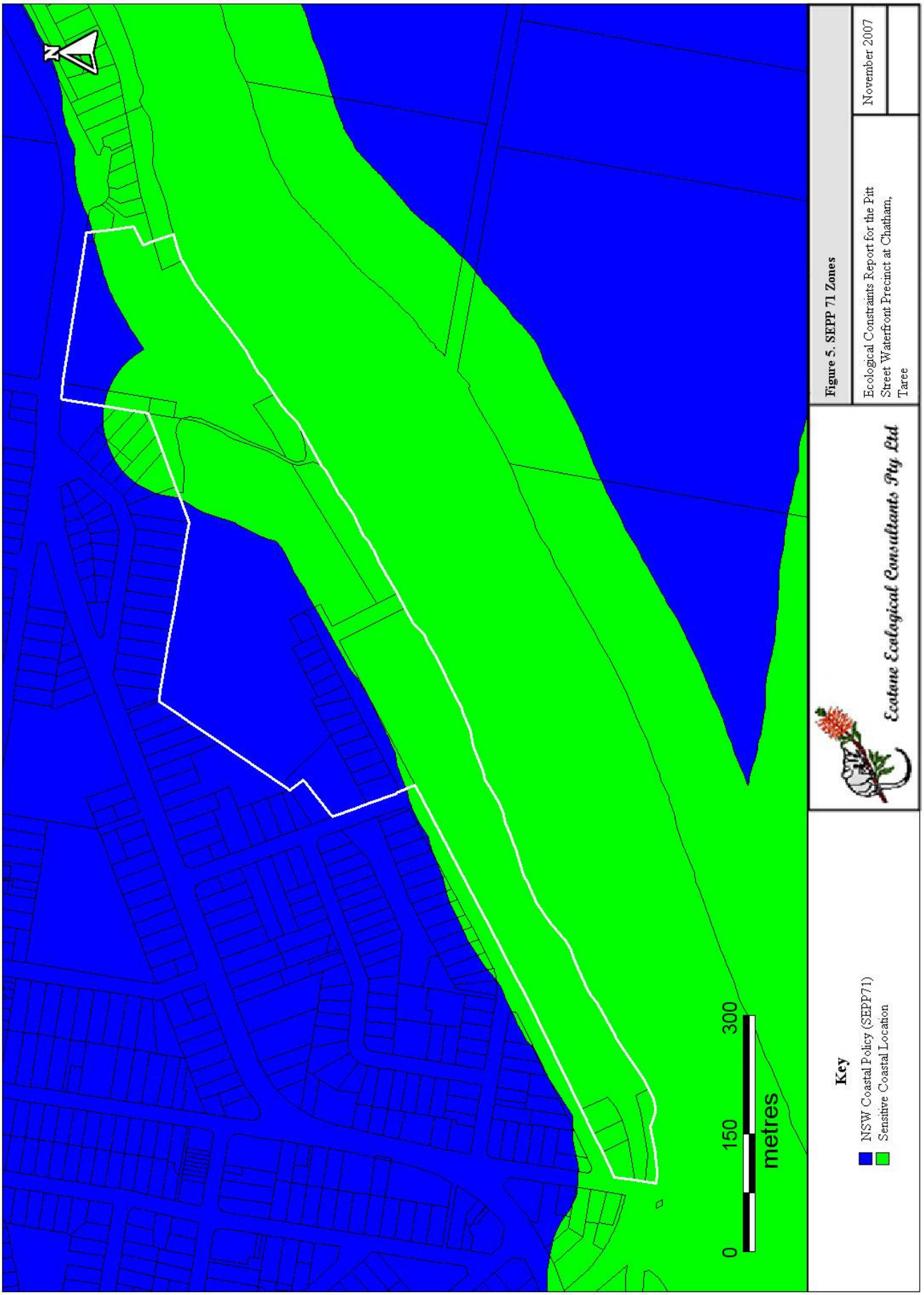
An example of developments within the coastal zone for which the NSW Planning Minister is likely to become the consent authority include:

- buildings greater than 13 metres in height (about four storeys);
- large tourist or **recreational facilities** for more than 100 people;
- extractive industries, **landfill**, mining, **marinas** and other industries; and
- some **residential subdivisions**.

Therefore, special consideration and possibly referral to the Department of Planning pursuant to SEPP 71 would be required in relation to proposals within the broad zone of land by the river and the central creekline areas designated a 'sensitive coastal location' under the policy.

4.5.11 SEPP 26 Littoral Rainforest

The mapping for SEPP 26 does not show any areas of Littoral Rainforest occurring within the study area although the community was considered to be present according to this study. The Final Determination for the EEC (NSW Scientific Committee 2004a), states that the mapping for SEPP 26 is not exhaustive and many stands of the EEC occur at locations not mapped by SEPP 26. Although SEPP 26 is still operative, particularly in regards to areas mapped as 'Littoral Rainforest' along the NSW Coast, the SEPP is for all practical purposes effectively covered by the listing of the EEC 'Littoral Rainforest', for which a full impact assessment for any proposal would need to be undertaken pursuant to the EP&A Act.


N
0
150
300
metres
Key
NSW Coastal Policy (SEPP71)
Sensitive Coastal Location
Ecotone Ecological Consultants Pty Ltd
Figure 5. SEPP 71 Zones
Ecological Constraints Report for the Pitt Street Waterfront Precinct at Chatham, Taree
November 2007

5.0 CONCLUSION AND RECOMMENDATIONS

An assessment of the potential constraints resulting from flora and fauna issues for the proposed rezoning and development of the Pitt Street Waterfront Precinct has been made based on a combination of literature review and field survey. The resulting information has been used to anticipate the likely requirements of Section 5A of the *Environmental Planning and Assessment Act 1979* and other relevant legislation for future rezoning and development of the site.

No naturally occurring threatened flora species were recorded within the subject site and none are expected to occur. A planted specimen of the threatened tree *Eucalyptus nicholii* was recorded on the site. Two trees identified as Forest Red Gums *Eucalyptus tereticornis* require further investigation prior to the impact assessment stage as this species is similar in form to *Eucalyptus seeana*, listed in the TSC Act as an endangered population within the locality. However, based on the position and alignment of these trees it is thought that they have also been planted for landscaping purposes. Some of the degraded remnants of vegetation at least marginally represent four endangered ecological communities, Littoral Rainforest, Swamp Sclerophyll Forest on Coastal Floodplain, Subtropical Coastal Floodplain Forest and Swamp Oak Floodplain Forest, as simplified or intergrade forms.

Although no threatened fauna species have been recorded so far, several species, including the Grey-headed Flying-fox, Eastern Bent-wing Bat, Little Bent-wing Bat, Southern Myotis, East Coast Freetail-bat, Osprey have most potential to at least forage or fly over the subject site. Potential habitat for the Green and Golden Bell Frog, Australasian Bittern and Black-necked Stork occurs, however, there is only a low probability of them occurring within the subject site. Microbats could potentially roost within the buildings currently on site.

When considering the relevant legislation, it is considered unlikely that the proposal would significantly impact on any local population of threatened terrestrial flora or fauna species, or endangered ecological communities. The assumption is based on the apparent proposal to retain and enhance much of the existing natural riparian vegetation and to replace weed infested areas with native vegetation. Additional landscaping work within the chosen development proposal is also likely to add to the available foraging habitats, particularly for birds and the Grey-headed Flying-fox, providing that nectar producing plant species are used. Therefore, it is considered unlikely that a Species Impact Statement under the TSC Act or referral to the federal Minister for Environment under the EPBC Act would be required for terrestrial flora and fauna. This conclusion will be tested by the application of the 7-part test of significance under Section 5A of the EP&A Act 1979 at the impact assessment stage of the proposal.

However, the potential removal of mangroves and riparian habitat, changes to the water depth through dredging and the construction of wharfs, jetties and boat moorings is likely to require a full assessment under the Fisheries Management Act and the results of this survey may trigger the need for the preparation of a Species Impact Statement.

All four masterplans submitted for consideration involve some disturbance to the bank of the Manning River to varying degrees. It is therefore suggested that the final plan selected is the one that least impacts on the river bank and existing native riparian/mangrove vegetation. Three of the masterplans have retained the existing creek/drainage line in its entirety with provision for landscaping and regeneration. The fourth plan prepared by LAB shows substantial modification to the tidal part of the creek, which in our view should be avoided.

To avoid further erosion to the river bank, any areas where natural vegetation by the river bank has been disturbed or removed or is heavily invaded by weeds (if development is not proposed for these areas) should be physically stabilised and rehabilitated with appropriate native species.

As a detailed fauna survey has not been carried out at this stage, the following methodologies are suggested based on the habitat assessment and potential impacts:

- Aquatic flora and fauna survey primarily to accurately map the extent of mangroves, seagrass (already carried out by Hydrographic Surveys Pty Ltd) and other fish habitat following guidelines provided in Lincoln Smith (1998);
- A bat survey, including spotlighting to target the Grey-headed Flying-fox and ultrasonic bat call analysis (Anabat) to target insectivorous microbat; and
- A frog search targeting the Green and Golden Bell Frog.

These surveys will be essential to the preparation of a detailed impact assessment when detailed plans for the subject site have been finalised.

6.0 REFERENCES

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. & Poulter, R., 2003. *The New Atlas of Australian Birds*, RAOU

Briggs, J. D. & Leigh, J. H., 1996. *Rare or Threatened Australian Plants*. CSIRO Publications.

Churchill 1998. *Australian Bats*. Reed New Holland, Sydney.

Cogger, H.G., 1995. *Reptiles and Amphibians of Australia.* Reed Books, Sydney.

DECC, 2007. *Threatened Species Profiles*. http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx

DECC Atlas of NSW Wildlife http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas

Greater Taree City Council 2004. *State of the Environment Report 2003 – 2004.*

Greater Taree City Council 2006. *Browns Creek Management Plan.*

Greater Taree City Council 2006. *Environmental Management Plan*, final version 1.11 March 2006.

Greater Taree City Council 2007. *Noxious and Environmental Weeds.* http://www.gtcc.nsw.gov.au/webcomm/Page/Page.asp?Page_Id=184&p=1

Harden, G.J. (ed) 1990. *Flora of New South Wales* Volume 1. Royal Botanic Gardens and New South Wales University, Sydney

Harden, G.J. (ed) 1992. *Flora of New South Wales* Volume 3. Royal Botanic Gardens and New South Wales University, Sydney

Harden, G.J. (ed) 1993. *Flora of New South Wales.* Volume 4. Royal Botanic Gardens and New South Wales University, Sydney.

Harden, G.J. (ed) 2002. *Flora of New South Wales.* Volume 2. Revised Edition. Royal Botanic Gardens and New South Wales University, Sydney.

Harden, G.J. & Murray, L.J. (eds) 2000. *Supplement to Flora of New South Wales.* Volume 1. Royal Botanic Gardens and New South Wales University, Sydney.

Higgins (ed) 1999. *Handbook of Australian New Zealand and Antarctic Birds.* Volume 4: Parrots to Dollarbird. Oxford University Press.

Higgins P., Peter J. and Steele W. 2001. Handbook of Australian New Zealand and Antarctic Birds. Volume 5: Tyrant-flycatchers to Chats. Oxford University Press.

Lincoln Smith. M., 1998. *Guidelines for Assessment of Aquatic Ecology in EIA*. Report prepared by The Ecology Lab P/L for DUAP

McDonald, P. & Floyd, R. 2006. *Vegetation Mapping of GTCC LGA*. 1:25 000 capture scale digital mapping with vegetation species compiled by Richard Floyd, GTCC Environmental Scientist from data collected by Paul McDonald, API Consultancy Services.

Morcombe M., 2000. *Field Guide to Australian Birds*. Steve Parish Publishing, Archerfield, QLD.

NSW Department of Lands and Water Conservation, 2001. *Water Management Act 2000. What it means for NSW.* NSW DLWC, Sydney.

NSW Fisheries, 1998. *Policy and Guidelines - Aquatic Habitat Management and Fish Conservation*. Eds. A.K. Smith and D.A. Pollard, NSW Fisheries, Sydney.

NSW Rural Fire Service and PlanningNSW, 2001. *Planning for Bushfire Protection*, prepared by Planning and Environmental Services, NSW Rural Fire Service in conjunction with PlanningNSW, December 2001.

NSW Scientific Committee 2004a. *Final Determination to list Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an Endangered Ecological Community.* NSW Department of Environment and Conservation.

NSW Scientific Committee 2004b. *Final Determination to list Subtropical Coastal Floodplain Forest in the NSW North Coast Bioregion as an Endangered Ecological Community.* NSW Department of Environment and Conservation.

NSW Scientific Committee 2004c. *Final Determination to list Swamp Oak Floodplain Forest in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an Endangered Ecological Community.* NSW Department of Environment and Conservation.

NSW Scientific Committee 2004d. *Final Determination to list Swamp Sclerophyll Forest on Coastal Floodplains in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an Endangered Ecological Community.* NSW Department of Environment and Conservation.

NSW Scientific Committee 2004e. *Final Determination to list Freshwater Wetlands on Coastal Floodplains in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an Endangered Ecological Community.* NSW Department of Environment and Conservation.

NSW Scientific Committee 2005. *Final Determination to list Lower Hunter Spotted Gum – Ironbark Forest of the Sydney Basin Bioregion as an Endangered Ecological Community.* NSW Department of Environment and Conservation.

Robinson, M. 1993. *A Field Guide to Frogs of Australia.* Australian Museum / Reed Publication, Sydney.

Simpson, K.and Day, N., 2003. *The Claremont Field Guide to the Birds of Australia.* Penguin Books, Australia Ltd.

Stanger, M.., Clayton, M., Schodde, R., Wombey, J., and Mason, I. 1997. *CSIRO List of Australian Vertebrates. A reference with conservation status*. CSIRO Publishing, Collingwood, Victoria.

Strahan, R. 1995, *The Mammals of Australia*. Reed Books and Australian Museum, Sydney.

7.0 APPENDICES

Appendix 1. Habitat Tree Inventory

Tree No.	Tree Species	dbh (cm)	Hollow Size						Easting (AGD66)	Northing (AGD66)	Notes
			<5 cm	5-10 cm	10-15 cm	15-20 cm	20-40 cm	40+ cm			
1	Spotted gum	90	1?						450510	6469814	
2	Spotted gum	60							450513	6469810	
3	Spotted gum	80	2sp				1tk		450551	6469820	
4	Spotted gum	55							450606	6469826	
5	Spotted gum	55							450609	6469824	two trunks
6	Spotted gum	60	1sp?						450624	6469821	
7	Spotted gum	40		1sp					450637	6469829	
8	Spotted gum	55							450664	6469844	
9	Spotted gum	55							450661	6469843	
10	Grey ironbark	60							450665	6469852	
11	Narrow-leaved peppermint	60							450750	6469890	
12	Forest red gum	50							450813	6469923	
13	Fig tree	>50	1tk						450913	6470062	
14	Fig tree	>50	1br						450944	6470078	
15	Fig tree	>50	1	1					450963	6470088	
16	Fig tree	>50							451017	6470136	
17	Fig tree	>50							451011	6470133	
18	Grey ironbark	70							451001	6470145	
19	Grey ironbark	75							450992	6470141	
20	Spotted gum	75							451699	6470423	
21	Swamp oak	51							451702	6470422	
22	Spotted gum	90		2				1	451685	6470418	
23	Spotted gum	70							451661	6470410	
24	Swamp oak	23	1tk						451628	6470383	

Appendix 2. Flora Species Recorded in the Study Area

The following is a list of all flora species recorded within the study area. Please note that this list may be not fully comprehensive, and should be regarded as an indication of the flora present. A period of some years is often needed to identify all species present in an area, particularly for cryptic or seasonally detectable species (such as orchids and small grass-like herbs).

Notes:

* indicates an exotic or introduced native species
R indicates locally indigenous species that are potentially suitable for revegetation or replanting works

Nomenclature follows Harden (1990, 1992, 1993, 2002), Harden & Murray (2000) and subsequent recent revisions.

CLASS FILICOPSIDA (Ferns)

ADIANTACEAE		
Adiantum aethiopicum	R	Common Maidenhair Fern
DENNSTAEDTIACEAE		
Hypolepis glandulifera		Downy Ground Fern
THELYPTERIDACEAE		
Christella dentata	R	Binung

CLASS MAGNOLIOPSIDA (Flowering Plants)

Subclass Magnoliidae (Dicotyledons)

ACANTHACEAE		
Avicennia marina subsp. *australasica*	R	Grey Mangrove
AIZOACEAE		
Tetragonia tetragonioides		New Zealand Spinach
AMARANTHACEAE		
Alternanthera denticulata		Lesser Joyweed
ANACARDIACEAE		
*Schinus ariera**		Pepper Tree
ARALIACEAE		
Schefflera actinophylla (planted)*		Umbrella Tree
ASCLEPIADACEAE		
*Araujia sericifera**		Moth Plant
*Gomphocarpus fruticosus**		Narrow Leaf Cotton Bush
ASTERACEAE		
*Ageratina adenophora** (Noxious Class 4)		Crofton Weed
*Bidens pilosa**		Cobblers Pegs
Cassinia aculeata	R	Dogwood/Dolly Bush
*Cirsium vulgare**		Spear Thistle / Black Thistle
Conyza sp.*		Fleabane
*Delairea odorata**		Cape Ivy
*Erechtites valerianifolia**		Brazilian Fireweed
*Galinsoga parviflora**		Potato Weed
*Gamochaeta spicata**		Cudweed
*Senecio madagascariensis**		Fire Weed
*Soliva sessilis **		Bindii/Jo-jo
*Sonchus oleraceus**		Common Sowthistle

*Tagetes minuta**		Stinking Roger
*Taraxacum officinale**		Dandelion
BIGNONIACEAE		
*Jacaranda mimosifolia**		Jacaranda
BRASSICACEAE		
*Hirschfeldia incana**		Hairy Brassica/Buchan Weed
CACTACEAE		
*Opuntia monacantha** (Noxious Class 4)		Drooping Pear/Smooth Tree Pear
CAMPANULACEAE		
Wahlenbergia littoricola	R	-
CARYOPHYLLACEAE		
*Cerastium glomeratum**		Mouse-eared Chickweed
*Stellaria media**		Common Chickweed
CASUARINACEAE		
Casuarina glauca	R	Swamp She-oak
CELASTRACEAE		
Maytenus silvestris	R	Narrow-leaved Orange Bark
CHENOPODIACEAE		
Einadia trigonos subsp. *trigonos*		Fishweed
CONVOLVULACEAE		
Dichondra repens	R	Kidney Weed
*Ipomoea cairica**		Mile-a-minute
*Ipomoea indica**		Morning Glory
Polymeria calycina		Swamp Bindweed
DILLENIACEAE		
Hibbertia diffusa	R	Guinea Flower
ERICACEAE - Subfamily Styphelioideae		
Leucopogon juniperinus	R	Prickly Beard Heath
EUPHORBIACEAE		
Breynia oblongifolia	R	Coffee Bush
Chamaesyce sp.*		A Caustic Weed
Glochidion ferdinandi var. *ferdinandi*	R	Cheese Tree
*Ricinus communis**		Castor Oil Plant
FABACEAE - Subfamily Caesalpinoideae		
*Senna pendula**		Cassia
FABACEAE - Subfamily Faboideae		
Daviesia ulicifolia subsp. *ulicifolia*	R	Gorse Bitter Pea
Desmodium varians	R	Slender Tick-trefoil
*Erythrina crista-galli**		Cockspur Coral Tree
Glycine tabacina sens. lat.	R	A Love Creeper
Hardenbergia violacea	R	False Sarsaparilla
Indigofera australis	R	Native Indigo
*Medicago polymorpha**		Burr Medic
Pultenaea villosa	R	A Bush Pea
*Trifolium repens**		White Clover
Vicia sativa subsp. *nigra**		Narrow-leaved Vetch
FABACEAE - Subfamily Mimosoideae		
Acacia baileyana (planted)*		Cootamundra Wattle

Acacia implexa	R	Hickory/Lightwood
Acacia longifolia subsp. *longifolia*	R	Sydney Golden Wattle
Acacia maidenii	R	Hickory/Maidens Wattle
Acacia melanoxylon	R	Blackwood
*Acacia saligna** (Native of W.A.)		Golden Wreath Wattle
FLACOURTIACEAE		
Scolopia braunii	R	Flintwood/Brown Birch
FUMARIACEAE		
Fumaria muralis subsp. *muralis**		Wall Fumitory
GERANIACEAE		
Geranium homeanum		Northern Cranesbill
LAMIACEAE		
*Stachys arvensis**		Stagger Weed
LAURACEAE		
*Cinnamomum camphora**		Camphor Laurel
LYTHRACEAE		
Lythrum hyssopifolia		Hessop Loosestrife
MALACEAE		
*Cotoneaster glaucophyllus**		Cotoneaster
*Eriobotrya japonica**		Loquat
MALVACEAE		
Hibiscus sp.*		Cultivated Hibiscus
*Lagunaria patersonii** (planted)		Norfolk Island Hibiscus
*Modiola caroliniana**		Redflower Mallow
*Pavonia hastata**		Pink Pavonia
*Sida rhombifolia**		Paddy's Lucerne
MORACEAE		
Ficus coronata	R	Creek Sandpaper Fig
Ficus microcarpa var. *hillii* (planted)*		A Fig
Maclura cochinchinensis		Cockspur Thorn
MYRSINACEAE		
Aegiceras corniculatum		River Mangrove
Myrsine variabilis	R	Muttonwood
MYRTACEAE		
Callistemon linearis	R	Narrow-leaved Bottlebrush
Callistemon viminalis (planted)	R	Weeping Bottlebrush
Corymbia maculata		Spotted Gum
Eucalyptus acmenoides		White Mahogany
Eucalyptus eugenioides?	R	Thin-leaved Stringybark
***Eucalyptus nicholii* (planted) TSC - V**		**Narrow-leaved Black Peppermint**
Eucalyptus paniculata subsp. *paniculata*	R	Grey Ironbark
Eucalyptus tereticornis	R	Forest Red Gum
Leptospermum polyanthum	R	Slender Tea-tree
Melaleuca armillaris subsp. *armillaris* (planted)		Giant Honeymyrtle
Melaleuca linariifolia (probably planted)	R	Snow-in-summer
Melaleuca quinquenervia		Broad-leaved Paperbark
NANDINACEAE		
*Nandina domestica**		Japanese Sacred Bamboo/ Nanten
OCHNACEAE		
*Ochna serrulata**		Mickey Mouse Plant

OLEACEAE		
*Ligustrum lucidum**		Large-leaved Privet
*Ligustrum sinense**		Small-leaved Privet
Notelaea longifolia forma *longifolia*	R	Mock Olive
OXALIDACEAE		
*Oxalis articulata** (Noxious Class 5)		Shamrock Oxalis
PAPAVERACEAE		
Papaver somniferum subsp. *setigerum**		Poppy
PITTOSPORACEAE		
Bursaria spinosa	R	Blackthorn
Pittosporum revolutum	R	Rough-fruit Pittosporum
Pittosporum undulatum		Sweet Pittosporum
PLANTAGINACEAE		
*Plantago lanceolata**		Common Plantain
POLYGONACEAE		
*Rumex crispus**		Curly Dock
PROTEACEAE		
*Grevillea robusta**		Silky Oak
Persoonia linearis	R	Narrow-leaved Geebung
RHAMNACEAE		
Alphitonia excelsa	R	Red Ash
ROSACEAE		
Rubus fruticosus species aggregate* (Noxious Class 4)		Blackberry
RUBIACEAE		
*Galium aparine**		Goosegrass/Cleavers
RUTACEAE		
*Citrus limonia**		Lemon Tree
SALICACEAE		
*Salix babylonica**		Weeping Willow
SANTALACEAE		
Exocarpus cupressiformis	R	Cherry Ballart
SAPINDACEAE		
*Cardiospermum grandiflorum**		Balloon Vine
Cupaniopsis anacardioides	R	Tuckeroo
Dodonaea viscosa subsp *angustifolia*	R	Sticky Hop Bush
SCROPHULARIACEAE		
*Veronica persica**		Creeping Speedwell
SOLANACEAE		
*Cestrum parqui** (Noxious Class 3)		Green Cestrum
*Solanum mauritianum**		Wild Tobacco Tree
*Solanum nigrum**		Blackberry Nightshade
STERCULIACEAE		
Commersonia fraseri	R	Brush Kurrajong
TROPAEOLACEAE		
*Tropaeolum majus**		Nasturtium
VERBENACEAE		

Clerodendrum tomentosum	R	Hairy Clerodendrum
*Lantana camara** (Noxious Classes 4 &5)		Lantana
*Verbena bonariensis**		Purpletop
Verbena rigida var. *rigida**		Veined Verbena
VITACEAE		
Cissus antarctica	R	Kangaroo Grape
Subclass Liliidae (Monocotyledons)		
AMARYLLIDACEAE		
Agapanthus sp.*		Lily of the Nile
Crinum pedunculatum	R	Swamp Lily/River Lily
*Leucojum aestivum**		Snowflake/Loddon Lily
ANTHERICACEAE		
Arthropodium milleflorum		Vanilla Lily
ARACEAE		
*Monstera deliciosa **		Fruit Salad Plant
ARECACEAE		
*Phoenix canariensis**		Palm
ASPARAGACEAE		
*Asparagus aethiopicus**		Asparagus Fern
*Asparagus asparagoides** (Noxious Class 5)		Bridal Creeper
CANNACEAE		
*Canna indica**	R	Canna/Indian Shot
COMMELINACEAE		
Commelina cyanea		Scurvy Weed
*Tradescantia fluminensis**		Trad/Wandering Jew
JUNCACEAE		
Juncus sp.*		A Rush
LOMANDRACEAE		
Lomandra longifolia	R	Spiny-headed Mat-rush
LUZURIAGACEAE		
Eustrephus latifolius	R	Wombat Berry
Geitonoplesium cymosum	R	Scrambling Lily
MUSACEAE		
Musa sp.*		Banana
ORCHIDACEAE		
Pterostylis nutans	R	Nodding Greenhood
PHORMIACEAE		
Dianella revoluta var. *revoluta*	R	Spreading Flax Lily
POACEAE		
*Andropogon virginicus**		Whisky Grass
Aristida vagans	R	A Three-awn Speargrass
*Arundo donax**		Giant Reed
Austrostipa ramosissima		Stout Bamboo Speargrass
*Avena fatua**		Wild Oats
*Briza maxima**		Quaking Grass
*Briza minor**		Shivery Grass
*Chloris gayana**		Rhodes Grass
*Cynodon dactylon**		Couch

Echinopogon caespitosus var. *caespitosus*	R	Bushy Hedgehog Grass
Entolasia marginata	R	Bordered Panic
Eragrostis brownii	R	Brown's Love Grass
*Eragrostis tenuifolia**		Elastic Grass
Imperata cylindrica var. *major*		Blady Grass
*Lolium rigidum**		Annual/Wimmera Rye Grass
*Melinis repens**		Red Natal Grass
*Paspalum dilatatum**		Paspalum
*Paspalum urvillei**		Tall Paspalum / Vasey Grass
*Pennisetum clandestinum**		Kikuyu
Phragmites australis	R	Native Reed/Thatch Reed
Poa labillardierei var. *labillardierei*		Tussock Grass
*Setaria gracilis**		Slender Pigeon Grass
*Stenotaphrum secundatum**		Buffalo Grass
Themeda australis	R	Kangaroo Grass
TYPHACEAE		
Typha orientalis	R	Bullrush/Cumbungi

Appendix 3. Actions required in relation to Notifiable Weeds pursuant to the Noxious Weeds Act 2003

Section 8 of the amended Noxious Weeds Act 1993 classifies noxious weeds into 5 weed control classes as follows:

(a) Class 1 - State Prohibited Weeds,
(b) Class 2 - Regionally Prohibited Weeds,
(c) Class 3 - Regionally Controlled Weeds,
(d) Class 4 - Locally Controlled Weeds,
(e) Class 5 - Restricted Plants.

The characteristics of each class are as follows:

(a) Class 1 noxious weeds are plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.
(b) Class 2 noxious weeds are plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.
(c) Class 3 noxious weeds are plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.
(d) Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.
(e) Class 5 noxious weeds are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

A noxious weed that is classified as a Class 1, 2 or 5 noxious weed is referred to in the Act as a "**notifiable weed**".

The relevant sections of the Act that define the actions required in relation to **notifiable weeds** are reproduced below:

Section 15: An occupier of land (other than a local control authority) on which there is a **notifiable weed** must notify the local control authority for the land of that fact within 3 days after becoming aware that the **notifiable weed** is on the land. ***Maximum penalty (for an occupier other than a public authority): 20 penalty units***

Section 16: For the purpose of proving in any prosecution under section 15 (1) that an occupier of land was aware that a **notifiable weed** was located on the land, if it is proved that the occupier or an employee of the occupier or other person using the land ought reasonably to have known that a **notifiable weed** was located on the land, that is evidence that the occupier was aware that it was on the land.

Section 28:
(1) A person (including a public authority) must not sell or purchase:
(a) any **notifiable weed** material or other noxious weed material prescribed by the regulations, or
(b) any animal or thing which has on it, or contains, **notifiable weed** material or other noxious weed material prescribed by the regulations, knowing it to be, or to have on it or to contain, any such weed material.
(2) An occupier of land (including a public authority) must not knowingly remove or cause to be removed from the land any animal or thing which has on it, or contains, **notifiable weed material** or other noxious weed material prescribed by the regulations. ***Maximum penalty: 50 penalty units.***
(3) Notifiable weed material:
(a) in subsection (1) extends to the weed material of a weed that is a **notifiable weed** in any part of the State, and
(b) in subsection (2) is limited to the weed material of a weed that is a **notifiable weed** in that part of the State that includes the land that is relevant for the purposes of that subsection.

Section 29: An occupier of land (including a public authority) must not use or permit the land to be used for the purpose of disposing of, transporting or selling soil, turf or fodder, if the occupier knows, or ought reasonably to know, that there is a weed on the land that is a **notifiable weed** in any part of the State. ***Maximum penalty: 50 penalty units*.**

Section 40: An inspector who has reasonable cause to suspect that **notifiable weed** material of a weed that is a notifiable weed in any part of the State is or may be present in an agricultural machine may require the person apparently in charge of the machine to treat the machine immediately, in the manner specified by the inspector, to remove any such weed material.

For further information about notifiable noxious weeds, contact: Weeds Hotline 1800 680 244 or email: weeds@dpi.nsw.gov.au (NSW Department of Primary Industries).

Appendix 4. Fauna recorded within the Study Area

Notes:
AMG reference for site
Map Grid…56…Easting…451200…Northing…6470100 (AGD 66)…Accuracy 100m

* indicates introduced species (not native to the area)
Bold indicates a threatened species
V - Vulnerable, E – Endangered, M- Migratory

Observation types:

O	observed	W	Heard	H	Hair, feathers or skin
F	tracks/scratchings	P	scat	E	Nest/roost
T	Trapped or netted	Y	Bone or teeth	Z	In raptor/owl pellet
K	Dead	X	In scat	R	Road kill
M	Miscellaneous	U	Ultrasonic call	d	Definite identification

Family / Scientific Name	Common Name	TSC Act	EPBC Act	Number of individuals	Observation type	NPWS code
Mammals						
Family: *PERAMELIDAE*						
Isoodon macrourus **or**	Northern Brown Bandicoot				F	1093
Perameles nasuta	Long-nosed Bandicoot					1097
Reptiles						
Family: *SCINCIDAE*						
Ctenotus robustus	Robust Ctenotus			1	O	2375
Lampropholis delicata	Grass Skink			10+	O	2450
Birds						
Family: *ANATIDAE*						
Chenonetta jubata	Australian Wood Duck					0202
Anas superciliosa	Pacific Black Duck					0208
Family: *PHALACROCORACIDAE*						
Phalacrocorax melanoleucos	Little Pied Cormorant			1	O	0100
Phalacrocorax varius	Pied Cormorant			1	O	0099
Phalacrocorax sulcirostris	Little Black Cormorant			1	O	0097
Phalacrocorax carbo	Great Cormorant			1	O	0096
Family: *PELECANIDAE*						
Pelecanus conspicillatus	Australian Pelican			2	O	0106
Family: *ARDEIDAE*						
Egretta novaehollandiae	White-faced Heron			1	O	0188
Ardea ibis	Cattle Egret			5+	O	0977
Family: *ACCIPITRIDAE*						
Accipiter novaehollandiae	Grey Goshawk (White phase)			1	O	0220
Family:*LARIDAE*						
Larus novaehollandiae	Silver Gull			2	O	0125
Family: *COLUMBIDAE*						
Columba leucomela	White-headed Pigeon			2	O	0028
Streptopelia chinensis *	Spotted Turtle-dove			5+	O	0989
Geopelia humeralis	Bar-shouldered Dove			1	W	0032
Columba livia *	Rock Dove			5+	O	0957

Appendix 3. continued

Family / *Scientific Name*	Common Name	TSC Act	EPBC Act	Number of individuals	Observation type	NPWS code
Birds - continued						
Family: *CACATUIDAE*						
Eolophus roseicapillus	Galah					0273
Family: *PSITTACIDAE*						
Trichoglossus haematodus	Rainbow Lorikeet					0254
Family: *ALCEDINIDAE*						
Dacelo novaeguineae	Laughing Kookaburra					0322
Family: *MALURIDAE*						
Malurus cyaneus	Superb Fairy-wren					0529
Family: *PARDALOTIDAE*						
Pardalotus punctatus	Spotted Pardalote					0565
Pardalotus striatus	Striated Pardalote					0976
Sericornis frontalis	White-browed Scrubwren					0488
Acanthiza nana	Yellow Thornbill					0471
Family: *MELIPHAGIDAE*						
Anthochaera carunculata	Red Wattlebird					0638
Anthochaera chrysoptera	Little Wattlebird					0637
Philemon corniculatus	Noisy Friarbird					0645
Manorina melanocephala	Noisy Miner					0634
Meliphaga lewinii	Lewins Honeyeater					0605
Lichmera indistincta	Brown Honeyeater					0597
Family: *PACHYCEPHALIDAE*						
Pachycephala pectoralis	Golden Whistler					0398
Family: *DICRURIDAE*						
Grallina cyanoleuca	Magpie-lark					0415
Rhipidura fuliginosa	Grey Fantail					0361
Rhipidura leucophrys	Willie Wagtail					0364
Dicrurus bracteatus	Spangled Drongo					0673
Family: *CAMPEPHAGIDAE*						
Coracina novaehollandiae	Black-faced Cuckoo-shrike					0424
Family: *ORIOLIDAE*						
Sphecotheres viridis	Figbird					0432
Family: *ARTAMIDAE*						
Cracticus nigrogularis	Pied Butcherbird					0700
Gymnorhina tibicen	Australian Magpie					0705
Family: *CORVIDAE*						
Corvus orru	Torresian Crow					0692
Family: *PASSERIDAE*						
Lonchura castaneothorax	Chestnut-breasted Mannikin					0657
Family: *HIRUNDINIDAE*						
Hirundo neoxena	Welcome Swallow					0357

Family: *ZOSTEROPIDAE* *Zosterops lateralis*	Silvereye					0574
Family: *STURNIDAE* *Acridotheres tristis* *	Common Myna					0998

Appendix 5. Project Personnel and Relevant Licenses

REPORT COMPONENT	STUDY TEAM MEMBERS	QUALIFICATIONS
Overall Project Management, Flora Field Surveys, Flora Descriptions, Report Writing	Stefan Rose	B.Sc (Biol. Sci), M.Env.Stud., MAIBiol, MECA
Fauna Field Assessment, Fauna Descriptions, Literature review Report Writing	Ray Williams	Biol. Tech. Cert., MECA
Figure preparation	Jenny Lewis	B.Sc (Res. & Env. Mgt.) TAFE Cert II (Conserv. & Land Mgt. Nat. Area Rest.)
Literature review	Amy Rowles	B. Sc. (Hons) Biology/Ecology
Fauna Field Assessment	Narawan Williams	TAFE Cert II (Conserv. & Land Mgt. Nat. Area Rest.)

Relevant licences held by Ecotone Ecological Consultants

TYPE	FOR	LICENCE NO	NAME	DATE VALID TO	ORGANISATION	LOCATION
Animal Research Authority	Vertebrate Fauna Surveys	AW94/082	Brian Wilson	15-Nov-08	Animal care and ethics committee of the Director-General of NSW Agriculture	NSW
Certificate of Approval	Vertebrate Fauna Surveys	DG's ACEC 94/082	Brian Wilson	15-Nov-07		
Licence to	Access NPWS Wildlife Atlas Data Base	CON93002	Brian Wilson	31-Jan-08	NSW Department of Environment and Climate Change	
Scientific Licence	Harm/ trap/ release: protected fauna; pick/ hold: native flora	S10555	Brian Wilson Stefan Rose Amy Rowles Jenny Lewis Narawan Williams Anne Williams	30-Jun-08		
	As above plus bat banding	S10556	Ray Williams	31-Aug-08		