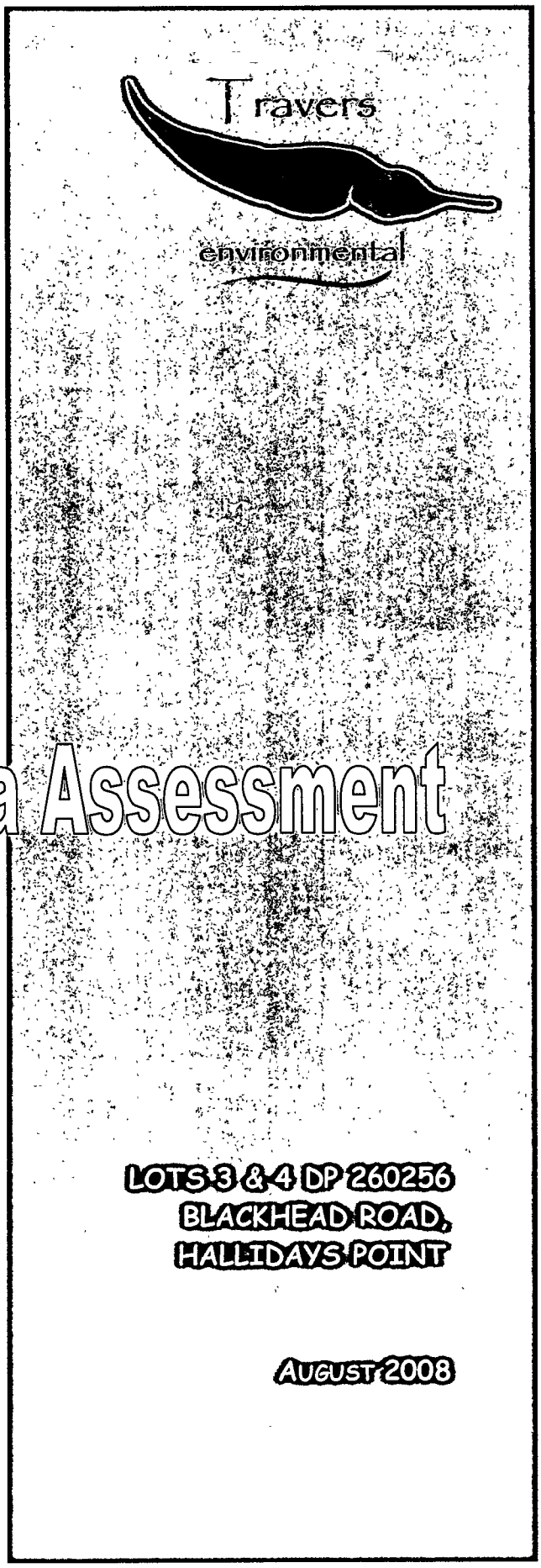

Flora & Fauna Assessment

LOTS 3 & 4 DP 260256
BLACKHEAD ROAD,
HALLIDAYS POINT

AUGUST 2008

FLORA & FAUNA ASSESSMENT

LOTS 3 & 4 DP 260256
BLACKHEAD ROAD,
HALLIDAYS POINT

AUGUST 2008

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EXECUTIVE SUMMARY

Travers environmental has been requested to carry out a Flora and Fauna Assessment of a proposed development located at Lots 3 & 4 DP 260256 Blackhead Road, Hallidays Point within the Greater Taree LGA.

The Greater Taree LEP 1995 identifies the zoning within the property as partly 1(a) Rural General, partly 1 (b1) Rural Valley Agriculture and partly 7(a) Environmental Protection Habitat.

The proposed tourist facility forms part of a 'staged' development application and will consist of 353 caravan park sites, 10 cabins, an equestrian centre, day spa, wellness centre, reception area, service station, convenience store, café, sports field and community centre. The proposed development stages are:

Stage 1: Concept approval
Stage 2: Main entrance, office, shop and fuel facilities, 93 tourist sites and horse stables
Stage 3: 132 sites, oval, community centre and horse jumping area and
Stage 4: All remaining sites, cabins and facilities.

- A tourist shop, office and service station will be provided at the northern entrance to the park with a community oval, community centre, parking and associated facilities provided within the central portion of the site.
- The proposed service station will be located approximately 80 metres from a narrow strip (<50 metres) of forested wetland vegetation in the south.
- The tourist sites (caravan, cabins and camping) will mainly be provided in the western portion with a small area provided at the eastern boundary. The equestrian centre will be located within the southern portion of the site.
- The proposed tourist park is located within the cleared / grassland areas of the site.
- Vegetated areas within the southern and central portions of the site are to be retained and as such asset protection zones will need to be applied to provide appropriate bushfire protection to the tourist facility.
- Roads and other access arrangements are provided to comply with Council and Rural Fire Service requirements.

A SEPP 14 Wetland 'Frogalla Swamp' is located to the south of the development. In addition, areas of *Swamp Sclerophyll Forest on Coastal Flood Plains* (Figure 1) have been identified within the riparian landscapes of the central portion of the site. This community is considered to be an endangered ecological community (EEC). This vegetation will be largely protected and managed by a proposed *ecological site management plan*.

Potential Ecological Impact

The potential ecological impact on this site relates to the impact not only from the construction of the development but also the long term environmental impacts that can result from any development undertaken within vegetated landscapes. The potential ecological impacts on this site relate to stormwater management, impact upon the SEPP 14 wetland, construction and implementation of asset protection zones, loss of vegetation and the potential impacts on the identified EEC.

Each of these issues has been taken into consideration during the design of this development to ensure that there are no short or long term ecological impacts to this site. No construction will be undertaken within the EEC and appropriate buffers have been provided to the SEPP 14 wetland.

Council Concerns

Greater Taree City Council have prepared a *Revised Statement of Facts and Contentions* dated 30 June 2008 which was filed in the Land and Environment Court on 01 July 2008. A response to items 5 and 11 are provided below:

5. *The proposal does not comply with the requirements of the Rural Fires Act 1997.*

The proposal complies with the requirements of the Section 100B of Rural Fires Act 1997 for development within bushfire prone lands. A bushfire protection assessment has been prepared by *Travers environmental* and has advised that matters respective of all proposed bushfire protection measures comply with PBP 2006.

11. *the development is likely to have an adverse environmental impact on the integrity and long-term viability of the SEPP 14 Coastal Wetland, endangered ecological communities and associated habitat for threatened species.*

(a) A species impact statement has not been submitted in support of the application.

A flora and fauna assessment has been prepared. This document forms the basis of assessment required by Section 5A of the *Environmental Planning and Assessment Act* (1979). This assessment determines if future development of the site is likely to have a significant effect on threatened species, populations and/or endangered ecological communities.

The flora and fauna assessment concluded that the proposed development is unlikely to cause a significant impact upon threatened species and populations. Therefore a Species Impact Statement is not required to be prepared for the proposed development.

(b) The application does not address the full range of direct, indirect and cumulative impacts of the intensive land being proposed in such close proximity to highly sensitive ecosystems.

Council has not directly detailed what they perceive to be the direct, indirect or cumulative impacts, however *Travers environmental* perceived impacts have been addressed below:

Development Design

The development application proposes to provide a development that has a low level of intensification such that its impact potential on riparian zones and or its impact upon the SEPP 14 wetland is low. For example:

The proposed tourist park will consist of 353 caravan park sites, 10 cabins, an equestrian centre, day spa, wellness centre, reception area, service station, convenience store, café, sports field and community centre. A tourist shop, office and service station will be provided at the northern entrance to the park with a community oval, community centre, parking and associated facilities provided within the central portion of the site.

The proposed service station will be located approximately 80 metres from a narrow strip (<50 metres) of forested wetland vegetation in the south. The tourist sites (caravan, cabins

and camping) will mainly be provided in the western portion with a small area provided at the eastern boundary. The equestrian centre will be located within the southern portion of the site. The proposed tourist park is located within the cleared / grassland areas of the site.

These facilities do not have an urban footprint and or provide activities that are 365 days per year, thus the level of intensification is low.

As most camping occurs to the north the plan then provides a lower density of use in the middle and southern landscapes. Protection of riparian zones is afforded through no development. Roads will cross these areas at four points but the impact is regarded as low given the proposed no development intention for these lands.

In addition the proposed 50 metre wide vegetated buffer to the SEPP 14 wetland will be further bolstered by the 60 metre wide asset protection zone. This area of 110 metres will separate the low key facilities proposed for the southern zone from the wetlands. Along with high permeability of the landscape through a lack of clearing and or intensified development their will be little in the way of run-off pollutants.

The development design is Parking for 112 vehicles (not 200 as expressed by Councils letter) is proposed within the asset protection zone surrounding the north eastern tip of the EEC buffer. These car parks are not located within any area of ecological significance. By the nature of its design, the car park will strengthen the APZ in this area.

Appropriate drainage design and stormwater management has been provided by *Lidbury, Summers & Whiteman* so that potential impacts upon the downstream waters, EEC areas and the SEPP 14 Wetland are avoided.

A service station is proposed on the northern side of the main access road into the proposed development. The service station is located outside of both the riparian buffer and the proposed asset protection zone. Nonetheless, appropriate spill control measures such as detention pits will be incorporated into the design of the petrol station to ensure that no overflow of petrol or other oils are able to enter the stormwater system and ultimately the EEC, riparian or SEPP 14 Wetland areas.

Stormwater Management

The Stormwater Management Strategy prepared by *Lidbury Summers & Whiteman* has addressed storm water quality measures for the intended land uses on the site. The strategy identifies the stormwater issues to be taken into account in the detailed planning, design and development of the site inclusive of the appropriate options and locations for the control of the quality and the quantity of stormwater leaving the site. Measures proposed to manage water quality include rain-gardens and bio-swales. In addition, the strategy identifies the land area required to implement the recommended options.

The strategy advises that there are no outstanding stormwater management issues. This has been validated against water quality targets (NSW EPA) for the reduction of nutrients and pollutants leaving the site and also for water quality via the appropriate pre development flows from the site during minor and major storm events. MUSIC modelling indicates that there will be no net increase in nutrients and that flows can be maintained to pre development conditions to avoid any direct impact upon the wetland.

Travers environmental believes that the works undertaken by *LS&W* through Music modelling will create a safe environment for the SEPP 14 wetland and other down stream environments such as Frogalla Swamp.

Construction and Implementation of bushfire asset protection zones

Bushfire asset protection zones will not be located within the endangered ecological communities. The development concept has located the development dominantly within the previously disturbed areas of the site.

The identified Swamp Sclerophyll Forest located in the north eastern portion of the site requires a minimum 20 metre buffer zone applied to the northern reaches. The buffer zone is to be managed as a natural area, i.e., weeding, revegetation and not managed as an asset protection zone.

Vegetation community 3 – Blackbutt / Bloodwood / Banksia Mixed Open Forest occurs adjacent to the wetland. The first 50m of this vegetation adjacent to the wetland will represent the wetland buffer and will be allowed to rehabilitate as mature forest. This means that the current under scrubbing and grazing will cease in that area.

A bushfire asset protection zone will extend from the edge of the above forest in a northerly direction. Due to the history of under scrubbing of vegetation in this area no clearing of trees or shrub vegetation will be required within the APZ.

(c) The development is proposed to be established within the riparian zone to two watercourses and wetland.

The proposal has undergone significant revision in terms of development within the riparian and EEC buffers. Various structures have been moved outside of this area as a result of this revision. Roads will cross the riparian zones at four places. These crossings will be constructed in accordance with the Policy and Guidelines for bridges, roads, causeways, culverts and similar structures (NSW Fisheries 1999).

(d) The development is proposed to be established within the buffer to the wetland.

The protection of the ecologically sensitive areas within the site will result in an improvement in the ecological attributes of the site and include a reduction in clearing of vegetation (via grazing), reduced erosion of creek banks, reduced incursion of exotic weed species and increase in habitat opportunities for native flora and fauna (via retention of the native understorey vegetation).

The existing fire trail / horse trail shown on the plan adjacent to the SEPP 14 zone is an existing feature of the site but should be moved from the buffer area into the asset protection zone.

Potential for better environmental outcomes

There is potential on this site to achieve a better environmental outcome than the current situation. The subject site is currently an unmanaged landscape with cattle being allowed to access and graze freely within the SEPP 14 wetland and EEC vegetation. Upon implementation of the recommendations from each of the reports prepared for this proposal, building envelopes, asset protection zones and retained vegetation areas have been designed for the proposal to ensure that the bulk of the development has been contained within the already cleared portions of the site.

The major drainage lines are to be protected within areas protected by buffers. These buffers are designed to increase the distance between development and the watercourse, EEC and SEPP 14 wetlands and reduce possible edge effects.

The retention and protection of these items will require the implementation of a *Ecological Site Management Plan* which will ensure the long term protection of the EEC's, Wetland and other retained vegetation within the subject site.

An assessment of the bushfire protection requirements needed for the development to guard against the potential impact of bushfires has been prepared (*Travers environmental*, August 2008). This assessment provides recommendations in respect of fuel management, construction standards / building protection, access, bushfire education and land ownership responsibility.

Legislative Assessment

In respect of matters required to be considered in the *Environmental Planning & Assessment Act* (1979) and relating to the species / provisions of the *Threatened Species Conservation Act* (1995), two (2) endangered ecological communities

- *Freshwater Wetlands on Coastal Floodplains,*
- *Swamp Sclerophyll Forest on Coastal Floodplains*

and four (4) threatened fauna species were recorded within the subject site. These species included

- Powerful Owl (*Ninox strenua*),
- Grey-headed Flying-fox (*Pteropus poliocephalus*),
- Eastern Bentwing-bat (*Miniopterus schreibersii oceansis*) and
- Little Bentwing-bat (*Miniopterus australis*).

The flora and fauna assessment concluded that the proposed development is unlikely to cause a significant impact upon threatened species and populations. Therefore a Species Impact Statement is not required to be prepared for the proposed development.

Conclusion

In respect of the issues raised within Councils Statement of Facts and Contentions dated 30 June 2008 and filed in the Land and Environment Court on the 01 July 2008, it is *Travers environmental* belief that each of these issues has also been dealt within the proposed development design and retention of sensitive vegetation which is protected by vegetated buffers.

The report recommends that a *ecological site management plan* is to be prepared as a condition of Council consent to specify ongoing vegetation and habitat management within the conserved remnants, buffer and asset protection zones.

John Travers
Director
Travers environmental

Licences –

National Parks and Wildlife Service

Individual staff members are licensed under Clause 20 of the *National Parks and Wildlife (Land Management) Regulation 1995* and Section 120 & 131 of the *National Parks and Wildlife Act, 1974* to conduct flora and fauna surveys within service and non-service areas. NPWS Scientific Licence Numbers: S10359 & S10618.

Department of Agriculture

The staff of *Conacher Travers* are licensed under an Animal Research Authority issued by the Department of Agriculture. This authority allows *Conacher Travers* staff to conduct various fauna surveys of native and introduced fauna for the purposes of environmental consulting throughout New South Wales.

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FLORA AND FAUNA ASSESSMENT

FLORA AND FAUNA ASSESSMENT OF LOTS 3 & 4 DP 260256 BLACKHEAD ROAD, HALLIDAYS POINT

SECTION 1.0 - INTRODUCTION

Travers environmental has been requested to carry out a Flora and Fauna Assessment of a proposed development located at Lots 3 & 4 DP 260256 Blackhead Road, Hallidays Point within the Greater Taree LGA. Figure 1 provides an aerial appraisal of vegetation and landuses within and adjacent to the subject site.

By way of history;

- *Conacher Travers* prepared a Flora and Fauna assessment in 2005.
- In August 2006 Greater Taree Council undertook its own mapping of the SEPP 14 wetland boundaries.
- In June 2007 *Conacher Travers* prepared an updated Flora and Fauna assessment based on generalised development planning concepts advised by the applicant and, as we understand, cognisant with the May 2007 *Conacher Travers* constraints plan. No final drawn concept plans were supplied to *Conacher Travers* at the time of the Flora and Fauna Report publication.
- In December 2007 General Terms of Approval were issued by Anthony Bryson (DWE) in relation to a similar DA. Whilst the current DA is different (aged care facilities removed), the waterway crossing locations and development areas have remained consistent and we assume compliance in terms of the 3a requirements of the Rivers and Foreshore Act.
- In January 2008 *Travers environmental* prepared an amended Section 5A (EPA Act) assessment In accordance with Taree Councils request i.e.

  > *"Provide an amended s5A assessment addressing the potential impacts on the Endangered Ecological Communities and the SEPP 14 wetland arising from equestrian uses within proposed buffer areas, the operation of the service station, provision of parking for 200 vehicles and from changes to the site's hydrological regimes".*

- This report (June 2008) consolidates the amended s5A assessment and provides a response to the *Revised Statement of Facts and Contentions* prepared by Mr Bruce Moore (Senior Development Planner – Greater Taree City Council) and dated 30 June 2008 and filed in the Land and Environment Court on the 01 July 2008. Further ecological consideration has also been made to the potential impacts of the proposed development.

1.1 Aims of the Assessment

The aims of the flora and fauna assessment are to:

- Carry out a botanical survey to describe the vegetation communities and their condition.
- Carry out a fauna survey for the detection and assessment of fauna and their habitats.
- Complete target surveys for threatened species, populations and ecological communities.
- Prepare a flora and fauna impact assessment in accordance with the requirements of the *Threatened Species Conservation (TSC) Act* (1995) and guidelines issued by the National Parks and Wildlife Service.
- To satisfy the requirements of Council in terms of the s5A assessment

1.2 Information Collation

To achieve the above aims, *Travers environmental* carried out field surveys on August 15th, 16th, 17th & 18th 2005 and April 19th & 20th 2007. These survey dates are all undertaken within the seasons of winter and autumn. Summer survey dates are not considered necessary due to the full retention of vegetation and provision of adequate buffers on this site resulting in a lack of any significant impact.

A review of the relevant information pertinent to the subject site was undertaken prior to the initiation of field surveys as background to the study. Information sources reviewed include the following:

- Bushfire Protection Assessment *Travers environmental* August 2008
- Aerial photographs (scale 1:25000) and Topographical maps (scale 1:25000)
- Atlas of NSW Wildlife (DECC 2007) for the relevant 1:100,000 scale map sheet
- The schedules of the *Threatened Species Conservation Act* (1995)
- The schedules of the *Fisheries Management Act* (1994)
- Lists of threatened species and communities in the *Environment Protection and Biodiversity Conservation Act* (1999)
- Rare or Threatened Australian Plants (ROTAP)
- Previous reports and surveys within the local area

1.3 Statutory Requirements

1.3.1 State

Threatened Species Conservation Act (1995)
The specific requirements of the *Threatened Species Conservation (TSC) Act* (1995) must be addressed in the assessment of flora and fauna matters. This requires the consideration of potential impacts on threatened species, populations and ecological communities.

The factors to be taken into account in deciding whether there is a significant effect are set out in Section 5A of the *Environmental Planning & Assessment (EP&A) Act* (1979) and are based on an 7 part test of significance.

Where a proposed activity is located in an area identified as critical habitat, or such that it is likely to significantly affect threatened species, populations, ecological communities, or their habitats, a Species Impact Statement (SIS) is required to be prepared.

Fisheries Management Act (1994)
The *Fisheries Management Act* (1994) provides a list of threatened aquatic species, which require consideration when addressing the potential impacts of a proposed development.

1.3.2 National

The *Environment Protection and Biodiversity Conservation (EPBC) Act* (1999) requires that Commonwealth approval be obtained for certain actions. The Act provides an assessment and approvals system for actions that have a significant impact on matters of national environmental significance (NES). These may include:

- Wetlands protected by international treaty (the Ramsar Convention)
- Nationally listed threatened species and ecological communities
- Nationally listed migratory species

Actions are projects, developments, undertakings, activities, and series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on a NES matter.

Where a proposed activity is located in an area identified to be of NES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, the matter needs to be referred to Department of the Environment & Heritage.

1.4 Development Proposal

The proposed tourist park will consist of 353 caravan park sites, 10 cabins, an equestrian centre, day spa, wellness centre, reception area, service station, convenience store, café, sports field and community centre.

The tourist facility forms part of a 'staged' development application. The proposed development stages are:

Stage 1: Concept approval
Stage 2: Main entrance, office, shop and fuel facilities, 93 tourist sites and horse stables
Stage 3: 132 sites, oval, community centre and horse jumping area and
Stage 4: All remaining sites, cabins and facilities.

A tourist shop, office and service station will be provided at the northern entrance to the park with a community oval, community centre, parking and associated facilities provided within the central portion of the site.

The proposed service station will be located approximately 80 metres from a narrow strip (<50 metres) of forested wetland vegetation in the south.

The tourist sites (caravan, cabins and camping) will mainly be provided in the western portion with a small area provided at the eastern boundary. The equestrian centre will be located within the southern portion of the site.

The proposed tourist park is located within the cleared / grassland areas of the site.

Vegetated areas within the southern and central portions of the site are to be retained and as such asset protection zones will need to be applied to provide appropriate bushfire

protection to the tourist facility.
Roads and other access arrangements are provided to comply with Council and Rural Fire Service requirements.

The Greater Taree LEP 1995 identifies the zoning within the property as partly 1(a) Rural General, partly 1 (b1) Rural Valley Agriculture and partly 7(a) Environmental Protection Habitat.

A SEPP 14 Wetland 'Frogalla Swamp' is located to the south of the development. In addition, areas of *Swamp Sclerophyll Forest on Coastal Flood Plains* (Figure 1) have been identified in the central portion of the site. This community is considered to be an *Endangered Ecological Community* (EEC) and has been provided with a 20 metre ecological buffer zone. This vegetation will be retained and asset protection zones have been provided outside of these zones.

1.5 Site Description

The planning and cadastral details of the subject site are provided in Table 1.1 while Table 1.2 summarises the geographical characteristics of the site. Table 1.3 provides a summary of the current site disturbance. Figure 1 provides an aerial appraisal of the subject site and surrounds.

Table 1.1 - Site Details

Location	Lots 3 & 4 DP 260256 Blackhead Road, Hallidays Point (subject site)
Description of Location	The subject site is situated on the southern side of Blackhead Road approximately 1.5 km west of its intersection with Diamond Beach Road.
Area	approximately 81 ha rural allotment
Topographic Map	Hallidays Point 1:25,000
Grid Reference	453500E and 6451500N
Local Government Area	Greater Taree City Council
Existing Land Use	Rural

Table 1.2 - Site Characteristics

Elevation	Approximately 2-18 m AHD
Topography	The subject site is situated on undulating land and extends onto Frogalla Swamp. Frogalla Swamp is at the head of Darawank Creek, which is a tributary of the Wallamba River. Gradients of the subject site away from Frogalla Swamp are variable, but generally 2-5%. The approximate elevation of the site is 10m metres Australian Height Datum (AHD).
Aspect	Various
Geology and Soils	The underlying geology of the subject site is characterised by sediments of the Devonian Period. Quaternary alluvium occurs in the south eastern section of the site, which is occupied by Frogalla Swamp. Narrow strips of Quaternary alluvium occur along ephemeral watercourses which cross the subject site. A Quaternary sand dune adjoins Frogalla Swamp.
Catchment	Frogalla Swamp
Drainage	Frogalla Swamp
Vegetation	Nine vegetation communities have been observed and discussed in greater detail in section 4.3.

The subject site has been affected by the following impacts:

Table 1.3 - Site Disturbance

Clearing	The large proportion of the subject site has been previously cleared.
Agriculture / Pastoral	The subject site appears to have a long history of grazing and at the time of the surveys in 2005 Lot 3 & 4 were being used for cattle grazing. More recently cattle grazing has been restricted to Lot 3.
Earthworks	Little if any earth works were noticed.
Introduced Weeds	The vegetation of the cleared sections is dominated by exotic species. The natural bushland contains relatively small incursions of a variety of weeds.
Evidence of Feral, Introduced or Domestic Fauna	Native fauna within the subject site is likely to have been impacted upon by the predation of European Red Fox (*Vulpes vulpes*), Cats (*Felis catus*) and Dogs (*Canis familiaris*).

SECTION 2.0 - SURVEY TECHNIQUES

2.1 Flora Survey Techniques

- ***Literature Review*** - A review of available literature for the area was undertaken to obtain reference material and background information for this survey. These documents are listed in the Bibliography section of this report.

- ***Database Searches*** - The Atlas of NSW Wildlife (DECC 2007) threatened flora records for the Bulahdelah, Camden Haven and Wingham 1:100,000 Scale Map Sheets were analysed to provide a predictive list of threatened flora species that occur locally and could possibly occur throughout the habitats identified within the subject site.

- ***Aerial Photograph Interpretation*** - Aerial photographs at 1:25,000 scale were utilised to identify the extent of vegetation with respect to the site and surrounding areas.

- ***Field Survey*** - A flora survey using a systematic stratified sampling regime within each of the identified vegetation communities, incorporating the placement of 20x20 metre quadrats, was undertaken on 16th & 17th August 2005. The flora survey targeted all vegetation communities present within the subject site. Random meanders (Cropper 1993) were undertaken throughout the site. The locations of flora survey quadrats are shown in Figure 1. Quadrat 1 was located within the sandy forest on Lot 4 whilst Quadrat 2 was located within the sandy forest on Lot 3. Quadrat 3 and Quadrat 4 were located within Lot 4 either side of the riparian zone – see Table A1.3 for results of vegetation within each quadrat.

- ***Accuracy of Identification*** - Specimens of plants not readily discernible in the field were collected for identification. Structural descriptions of the vegetation where relevant were made according to Specht et. al (1995).

2.2 Fauna Survey Techniques

- ***Literature Review*** - A review of available literature for the area was undertaken to obtain reference material and background information for this survey. These documents are listed in the bibliography of this report.

- ***Database Searches*** - The Atlas of NSW Wildlife (DECC 2007) threatened fauna records for the Bulahdelah, Camden Haven and Wingham 1:100,000 Scale Map Sheets were analysed to provide a predictive list of threatened fauna species that occur locally and could possibly occur throughout the habitats identified within the subject site.

- ***Field Survey*** - Survey dates, times, weather conditions and methods employed are shown in Appendix 2. Dates included August 15,16,17 & 18 2005 and April 19 & 20 2007. The location of fauna surveys is presented in Figure 1.

2.2.1 Diurnal Birds

Visual observation of birds was carried out during visits to the site. Flowering and fruiting trees were targeted during surveys. Opportunistic bird counts are also made while undertaking other survey work and during spotlight surveys of the site. Birds are observed and identified using binoculars. Calls are generally identified in the field by the observer. If an unknown call is heard it is recorded and identified using reference libraries.

2.2.2 Nocturnal Birds

The presence of Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*), Barking Owl (*Ninox connivens*) and Grass Owl (*Tyto capensis*) were targeted by broadcasting taped calls through a 15 watt Toa 'Faunatech' amplifier. Calls were played for 5-minute periods at 5-minute intervals. This was followed with quiet listening and spotlighting. Searches for evidence of owl roosts and potential owl roosting / breeding hollows were made during surveys of the subject site. Any whitewash, or regurgitated pellets found were noted.

2.2.3 Arboreal and Terrestrial Mammals

Elliott type A and B traps were used during August 2005 surveys for trapping arboreal and terrestrial mammals. Trapping consisted of 105 arboreal trap nights and 105 terrestrial trap nights.

Arboreal trap-lines using 10-25 metre trap separations were placed in the most suitable trees along approximately 80-100m transects. Elliott type A traps were placed onto platforms that were attached to the trunks of trees 2-3 m above the ground at an incline of 10 degrees to facilitate drainage during inclement weather. A mixture of honey and water was then sprayed onto the trunk 3-5 metres above the trap and around the platform as a lure.

Terrestrial trap-lines of type A and B Elliott traps using 10-25 metre trap separations were placed along the same line as the arboreal traps in the most suitable terrestrial habitats.

The traps were baited with a mixture of rolled oats, honey and peanut butter.

Seven trap-lines were set on the nights of August 15th, 16th and 17th 2005. The location of the trap-lines is shown in Figure 1. Each trap-line consisted of 5 type A arboreal traps, 3 type B terrestrial traps and 2 type A terrestrial traps.

Cage traps were positioned along each of the Elliott trap lines in suitable areas of dense shrub and ground cover. The standard cage traps used are 18cm x 18cm by 45cm long. Cage trapping consisted of a total of 21 trap nights. The cage traps were baited with a mix of honey, oats and peanut butter.

The presence of Yellow-bellied Glider (*Petaurus australis*) and Koala (*Phascolarctos cinereus*) was targeted by broadcasting taped calls through a 15 watt Toa 'Faunatech' amplifier. Calls were played for 5-minute periods during each nocturnal survey. This was followed with quiet listening and spotlighting.

Assessment was made of 'found' scats, markings, diggings, runways and scratches during visits to the site. Habitat was also assessed to determine the likelihood of threatened native species of fauna occurring within the subject site.

Spotlighting for nocturnal mammalian fauna was carried out using a hand held lamp of 750,000 candlelight power (100W halogen globe). This technique involved walking amongst the woodland areas of the subject site so that a maximum number of trees could be observed.

The subject area was assessed for the presence of Koalas using the following methods:

i. A search of the Atlas of NSW Wildlife (DECC 2007) database.

ii. The site was surveyed on foot, with Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for the presence of Koalas, characteristic scratch and claw marks on the trunk and scats around the base of each tree. The proportion of trees showing signs of Koala use was calculated by using the Spot Assessment Technique (Phillips and Callaghan, 1995). Additionally the location and density of droppings if found were documented.

iii. Koalas were also targeted during spotlight surveys.

iv. Identification and an assessment of the density of tree species listed as Koala feed trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site. An estimate of the percentage density of each tree species across the site was determined by averaging the percentage of stems counted.

A Koala Spot Survey was undertaken within areas of remnant forest or woodland according to the Spot Assessment Technique for determining the significance of habitat utilisation by Koalas (Phillips and Callaghan, 1995). This involved an assessment of Koala activity within a circle of minimum radius 10 metres from any one point around the basal circumference of a tree considered likely to have been utilised by a Koala. A minimum of 20 trees must be contained within the circle.

A tree is defined as a live wood stem of any plant species (except palms, cycads, tree ferns and grass trees) which has a diameter at breast height (DBH) of 100mm or more. A systematic faecal pellet search beneath each tree for a maximum of two person minutes was undertaken with any results recorded on a standard field pro-forma.

The trees utilised for the Spot Assessment Technique (SAT) were identified to species level and the density of Koala feed trees was calculated. The trees on the subject site were also searched for koalas and any sightings of koalas were noted.

2.2.4 Bats

Micro-chiropteran bats were surveyed by echolocation using an Anabat Mk 2 detector in both fixed and mobile positions throughout the subject site. The anabat was mobile during spotlighting survey and placed stationary for overnight survey. Mega-chiropteran bat species, such as Grey-headed Flying-fox (*Pteropus poliocephalus*), were surveyed by targeting flowering trees during spotlighting activities.

2.2.5 Amphibians

Amphibians were surveyed by visual observation, vocal call identification, or by using a tape recorder to record cryptic male calls in suitable places and then comparing these to known calls. Amphibians were also surveyed by habitat searches.

2.2.6 Reptiles

Spotlighting for nocturnal mammalian fauna was carried out using a hand held lamp of 750,000 candlelight power (100W halogen globe). This technique involved walking amongst the woodland areas of the subject site so that a maximum number of trees could be observed.

The subject area was assessed for the presence of Koalas using the following methods:

i. A search of the Atlas of NSW Wildlife (DECC 2007) database.

ii. The site was surveyed on foot, with Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for the presence of Koalas, characteristic scratch and claw marks on the trunk and scats around the base of each tree. The proportion of trees showing signs of Koala use was calculated by using the Spot Assessment Technique (Phillips and Callaghan, 1995). Additionally the location and density of droppings if found were documented.

iii. Koalas were also targeted during spotlight surveys.

iv. Identification and an assessment of the density of tree species listed as Koala feed trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site. An estimate of the percentage density of each tree species across the site was determined by averaging the percentage of stems counted.

A Koala Spot Survey was undertaken within areas of remnant forest or woodland according to the Spot Assessment Technique for determining the significance of habitat utilisation by Koalas (Phillips and Callaghan, 1995). This involved an assessment of Koala activity within a circle of minimum radius 10 metres from any one point around the basal circumference of a tree considered likely to have been utilised by a Koala. A minimum of 20 trees must be contained within the circle.

A tree is defined as a live wood stem of any plant species (except palms, cycads, tree ferns and grass trees) which has a diameter at breast height (DBH) of 100mm or more. A systematic faecal pellet search beneath each tree for a maximum of two person minutes was undertaken with any results recorded on a standard field pro-forma.

The trees utilised for the Spot Assessment Technique (SAT) were identified to species level and the density of Koala feed trees was calculated. The trees on the subject site were also searched for koalas and any sightings of koalas were noted.

2.2.4 Bats

Micro-chiropteran bats were surveyed by echolocation using an Anabat Mk 2 detector in both fixed and mobile positions throughout the subject site. The anabat was mobile during spotlighting survey and placed stationary for overnight survey. Mega-chiropteran bat species, such as Grey-headed Flying-fox (*Pteropus poliocephalus*), were surveyed by targeting flowering trees during spotlighting activities.

2.2.5 Amphibians

Amphibians were surveyed by visual observation, vocal call identification, or by using a tape recorder to record cryptic male calls in suitable places and then comparing these to known calls. Amphibians were also surveyed by habitat searches.

2.2.6 Reptiles

Searches for reptiles in likely localities such as under logs and in deep leaf litter were carried out during diurnal visits to the site. Spotlighting of terrestrial habitats suitable for reptiles occurred during nocturnal surveys.

2.2.7 Hollow-bearing Trees

Surveys for hollow-bearing trees were conducted using eight (8) sample quadrats (50 x 50 metre) placed throughout the subject site. These quadrats were used to estimate the density of hollow-bearing trees. Data collected is provided in Section 4.10.

SECTION 3.0 - SURVEY RESULTS

3.1 Flora Results

Observations

A total of 231 species of plants was observed within the subject site. Of these, 186 species were native plants and 45 species were exotic. The native species observed consisted of 16 trees, 44 shrubs, 23 vines and mistletoes, 92 herbs and 11 ferns.

The plants observed within the nine (9) vegetation communities of the subject site listed in Tables A1.1 and A1.2 of Appendix 1. No threatened flora or threatened population's were observed within the subject site. Two (2) endangered ecological communities (EEC's) were identified within the subject. The communities were;

(1) Phragmites Reedland (EEC)
(2) Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest (EEC)
(3) Blackbutt / Bloodwood / Banksia Open Forest (on sandy dune landscape)
(4) Swamp Oak / Paperbark Riparian Open Forest (EEC)
(5) Blackbutt / Red Gum / Bloodwood Mixed Open Forest
(6) Aquatic Herbfield
(7) Allocasuarina Open Scrub
(8) Spotted Gum / Ironbark Open Forest
(9) Grassland with Scattered Trees

Vegetation Condition

The overall vegetation condition of the site varied between Lot 3 and Lot 4. Both lots contained similar areas of mature and intact SEPP 14 wetland. Both lost also contained equal amounts of mixed open forest with under scrubbed understorey adjacent to the SEPP vegetation. However Lot 3 on the other hand contained little native vegetation other than a small area of riparian buffer in the northeast whilst Lot 4 contains most of the vegetation communities.

Approximately 70% of Lot 3 is cleared whilst some 25% of Lot 4 is cleared. Lot 3 is grazed whilst Lot 4 is now managed by mowing.

Dominant weeds in groundlayer are *Andropogon virginicus*, *Axonopus fissifolius*, *Bidens* sp., *Chloris gayana*, *Digitaria sp.*, *Eragrostis sp.*, *Hypochaeris radicata, Paspalum sp., Pennisetum clandestinum, Plantago lanceolata, Senecio madagascariensis*, *Setaria* sp., and *Sporobolus africanus*, representing a variable coverage of up to approximately 80%.

3.2 Fauna Results

During the course of surveys in 2005 and 2007 a total of one hundred and one (101) fauna species were recorded. This included 67 species of birds, 23 species of mammals, 3 species of reptile, 7 species of amphibian, and 1 species of fish. Species recorded throughout the duration of the fauna survey are listed in Table A1.6 of Appendix 1.

SECTION 4.0 - ECOLOGICAL ASSESSMENT

4.1 Previous Surveys Reviewed

Flora and Fauna Assessment of Lot 6 DP 588352 Blackhead Road, Hallidays Point (*Conacher Travers* June 2004).

A Flora and Fauna Assessment of a parcel of land on the northern side of Blackhead Road, 30 metres to the west of the study area. In summary no threatened flora species, fauna species or ecological communities were observed during that survey.

Assessment of Lot 2 DP 260256 Blackhead Road, Hallidays Point (*Conacher Travers* December 2003).

A survey of a parcel of land adjoining the western boundary of the subject site. No threatened flora species or ecological communities were observed during that survey. One threatened fauna species, Grey-headed Flying Fox, was observed flying over the site.

Flora and Fauna Flora and Fauna Assessment of Lot 3 DP 242332 Blackhead Road, Hallidays Point (*Conacher Travers* February 2003).

A Flora and Fauna survey and Assessment of a parcel of land to the north, directly opposite the current study area on the northern side of Blackhead Road. No threatened flora species, fauna species or ecological communities were observed during that survey.

Flora and Fauna Assessment of Fig Tree Hill Estate Redhead Road Redhead (*Conacher Travers* December 2002)

That survey was conducted in a similar environment, but with relatively large areas of native forest. No threatened flora species or ecological communities were observed. Two (2) threatened fauna species, Koala (*Phascolarctos cinereus*) and Grey-headed Flying Fox (*Pteropus poliocephalus*) were found to be utilising the site.

Greater Taree City Council Draft Comprehensive Koala Plan of Management Part 1: The CKPoM (Callaghan et al, 2002 - Australian Koala Foundation & Greater Taree City Council, September 2002)

Within the Greater Taree LGA the identification of Koala habitat has involved the preparation of a Koala Habitat Atlas (KHA) by the Australian Koala Foundation. The KHA maps the subject site as:

- *Secondary habitat class 'B'* – The majority of this mapped area has been partially cleared.
- *Primary and 2A Link over 2B* – The majority of this remains with some segments cleared.
- *Secondary habitat Class 'A'* – This has largely been cleared with only isolated trees remaining.
- *Primary & 2A link over Mainly Cleared Land* – Consists of cleared land with scattered trees.
- *100m Primary & 2A buffer over Secondary Habitat Class 'C'* – Consists of a small strip of remnant bushland adjoining Blackhead Road.
- *Other vegetation* – This area has either been cleared to grazing paddock or is SEPP 14 Wetland.

"The Koala atlas provides the basis for identifying the areas considered to warrant the highest level of habitat protection including all Primary Koala Habitat and Secondary A Koala Habitat. Secondary B Koala Habitat, Secondary C Koala Habitat and Tertiary Koala Habitat also require protection, although to a lesser degree."

Hallidays Point Habitat Study (Greater Taree City Council, December 1998)

In this survey and previous surveys, fourteen (14) threatened species have been recorded in the study area. These species include, Koala (*Phascolarctos cinereus*), Common Planigale (*Planigale maculata*), Squirrel Glider (*Petaurus norfolcensis*), Little Bentwing-bat (*Miniopterus australis*), Eastern Blossom Bat (*Syconycteris australis*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Osprey (*Pandion haliaceus*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Eastern Grass Owl (*Tyto capensis*), Glossy Black-cockatoo (*Calyptorhynchus lathami*), Australasian Bittern (*Botaurus poiciloptilus*), Pied Oystercatcher (*Haematopus longirostris*) and Sooty Oystercatcher (*Haematopus fuliginosa*).

4.2 Vegetation Communities

Vegetation Community 1 – Phragmites Reedland

This vegetation community closely resembles the Endangered Ecological Community, *Freshwater Wetlands on Coastal Floodplains.*

Occurrence - This vegetation community occurs in the south eastern section of the subject site and covers approximately 5.460ha of the subject site.

Structure - Dense herbfield to a height of approximately 2 metres, dominated by *Phragmites australis*, with scattered thickets of *Melaleuca ericifolia*, to approximately 2 metres.

Disturbances - Nil

Common Species

Groundcovers: *Phragmites australis* (Common Reed).

Shrubs: *Melaleuca ericifolia.*

Vegetation Community 2 – Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest

This vegetation community closely resembles the Endangered Ecological Community, *Swamp Sclerophyll Forest on Coastal Floodplains.*

Occurrence - This vegetation community occurs in the south eastern section of the subject site and covers approximately 7.956ha of the subject site.

Structure - This community is dominated in the north west by *Casuarina glauca* (Swamp Oak), which grades to an almost pure stand of *Melaleuca quinquenervia.* Throughout the north western half there are prominent stands of *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus grandis* (Flooded Gum). The canopy is generally 15-20 metres, with taller emergents and has a density of approximately 70%. It has a relatively sparse shrublayer and dense groundcover of sedges and ferns.

Disturbances - This vegetation community is relatively undisturbed.

Common Species

Trees: *Casuarina glauca* (Swamp Oak), *Melaleuca quinquenervia* (Broad-leaved Tea Tree), *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus grandis* (Flooded Gum),

Shrubs: *Melaleuca linariifolia* (Snow in Summer) and *Melaleuca quinquenervia* (Broad-leaved Tea Tree).

Groundcovers: *Blechnum indicum* (Swamp Water Fern), *Calochlaena dubia* (Common Ground Fern), *Centella asiatica* (Swamp Pennywort), *Enydra fluctuans, Gahnia sieberiana* (Red-fruited Saw-sedge), *Hypolepis muelleri* (Harsh Ground Fern), *Hydrocotyle peduncularis* (Pennywort), *Juncus continuus, Luzula densiflora, Phragmites australis* (Common Reed), *Ranunculus inundatus* (River Buttercup) and *Tricostularia pauciflora.*

Vegetation Community 3 – Blackbutt / Bloodwood / Banksia Open Forest:

Occurrence - This vegetation community occurs over the uncleared section of the dune and covers approximately 5.036ha of the subject site.

Structure - Open Forest with a canopy cover of approximately 40-50% and height of approximately 15-20 metres. The understorey consists of a sparse to moderate shrublayer to 6 metres high and a dense groundcover of herbs and ferns.

Disturbances - This vegetation community has been disturbed in Lot 3 & 4 by under scrubbing and the incursion of exotic species.

Common Species

Trees: *Eucalyptus pilularis* (Blackbutt), *Corymbia intermedia* (Pink Bloodwood), *Banksia serrata* (Old Man Banksia), *Angophora costata* (Sydney Red Gum) and *Eucalyptus microcorys* (Tallowwood).

Shrubs: *Acacia maidenii* (Maiden's Wattle), *Breynia oblongifolia* (Breynia), *Glochidion ferdinandi* (Cheese Tree) and *Persoonia linearis* (Narrow-leaved Geebung).

Groundcovers: *Calochlaena dubia* (Common Ground Fern), *Desmodium gunnii, Entolasia stricta* (Wiry Panic), *Glycine clandestina* (Twining Glycine), *Hardenbergia violacea* (False Sarsparilla), *Hibbertia scandens* (Climbing Guinea Flower), *Hydrocotyle laxiflora, Kennedia rubicunda* (Dusky Coral Pea), *Lomandra longifolia* (Spiky-headed Mat-rush), *Oplismenus aemulus, Pomax umbellata* (Pomax) and *Pteridium esculentum* (Bracken Fern).

Weeds: *Andropogon virginicus* (Whisky Grass), *Hypochaeris radicata* (Flatweed), *Lantana camara* (Lantana) and *Senecio madagascariensis* (Fireweed).

Vegetation Community 4 – Swamp Forest

This vegetation community closely resembles the Endangered Ecological Community, *Swamp Sclerophyll Forest on Coastal Floodplains.*

Occurrence - This vegetation community occurs along the ephemeral watercourses within the subject site and covers approximately 4.645ha of the subject site.

Structure - Open Forest with a canopy cover of approximately 60 % and height of approximately 15-20 metres. The understorey consists of a sparse shrublayer to 4 metres high and a dense groundcover of herbs and ferns. Because of the narrow nature of the vegetation community, a number of species characteristic of adjoining communities occur within this community.

Disturbances - This vegetation community has been disturbed by incursions of exotic species.

Common Species

Trees: *Casuarina glauca* (Swamp Oak) and *Melaleuca linariifolia* (Snow in Summer).

Shrubs: *Acacia maidenii* (Maiden's Wattle), *Dodonaea triquetra* (Hop Bush) and *Glochidion ferdinandi* (Cheese Tree).

Groundcovers: *Calochlaena dubia* (Common Ground Fern), *Carex appressa* (Tussock Sedge), *Centella asiatica* (Swamp Pennywort), *Cynodon dactylon* (Common Couch), *Entolasia marginata* (Bordered Panic), *Gahnia sieberiana* (Red-fruited Saw-sedge), *Hydrocotyle peduncularis* (Pennywort), *Hypolepis muelleri* (Harsh Ground Fern), *Lomandra longifolia* (Spiky-headed Mat-rush), *Parsonsia straminea* (Common Silkpod), *Persicaria strigosa*, *Pteridium esculentum* (Bracken Fern) and *Ranunculus inundatus* (River Buttercup).

Weeds: *Ageratina adenophora* (Crofton Weed), *Andropogon virginicus* (Whisky Grass), *Chloris gayana* (Rhodes Grass), *Hypochaeris radicata* (Flatweed), *Lantana camara* (Lantana), *Paspalum urvillei* (Vasey Grass), *Setaria sphacelata* (Setaria) and *Solanum mauritianum* (Tobacco Bush).

Vegetation Community 5 – Blackbutt / Red Gum / Bloodwood Open Forest:

Occurrence - This vegetation community occurs in the central section of Lot 4 and covers approximately 2.220ha of the subject site.

Structure - Open Forest with a canopy cover of approximately 50 % and height of approximately 15-20 metres. The understorey consists of a moderately sparse shrublayer to 6 metres high and a moderate to dense groundcover of herbs, ferns and grasses.

Disturbances - This vegetation community has been disturbed by the construction of vehicular trails and by the incursion of exotic species.

Common Species

Trees: *Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Sydney Red Gum), *Corymbia intermedia* (Pink Bloodwood), *Eucalyptus resinifera* (Red Mahogany) and *Eucalyptus microcorys* (Tallowwood).
Shrubs: *Acacia longifolia* (Sydney Golden Wattle), *Allocasuarina littoralis* (Black She-oak), *Dodonaea triquetra* (Hop Bush), *Glochidion ferdinandi* (Cheese Tree), *Hibbertia aspera*, juvenile *Melaleuca linariifolia* (Snow in Summer) and *Melaleuca nodosa*.

Groundcovers: *Aristida vagans* (Wire Grass), *Calochlaena dubia* (Common Ground Fern), *Cassytha pubescens* (Devil's Twine), *Dichondra repens* (Kidney Weed), *Digitaria ramularis, Echinopogon caespitosa* (Tufted Hedgehog Grass), *Entolasia stricta* (Wiry Panic), *Gonocarpus teucroides*, *Hardenbergia violacea* (False Sarsparilla), *Imperata*

cylindrica (Blady Grass), *Kennedia rubicunda* (Dusky Coral Pea), *Lomandra longifolia* (Spiky-headed Mat-rush) and *Pteridium esculentum* (Bracken Fern).
Weeds: *Andropogon virginicus* (Whisky Grass), *Hypochaeris radicata* (Flatweed), *Lantana camara* (Lantana) and *Setaria sphacelata* (Setaria).

Vegetation Community 6 – Aquatic Herbfield

Occurrence - This vegetation community occurs in the previously dammed sections of the ephemeral watercourses and covers approximately 1.451ha of the subject site.

Structure - Dense herbfield with scattered trees.

Disturbances - This community is the result of human activities.

Common Species

Groundcovers: *Blechnum indicum* (Swamp Water Fern), *Carex appressa* (Tussock Sedge), *Centella asiatica* (Swamp Pennywort), *Eleocharis sphacelata* (Tall Spike-rush), *Enydra fluctuans*, *Gahnia sieberiana* (Red-fruited Saw-sedge), *Persicaria strigosa*, *Persicaria lapathifolia*, *Philydrum lanuginosum* (Woolly Frogmouth), *Ranunculus inundatus* (River Buttercup), *Triglochin procerum* (Water Ribbons) and *Typha orientalis* (Cumbungi).
Weeds: *Nymphaea mexicana*.

Vegetation Community 7 – Allocasuarina Open Scrub

Occurrence - This vegetation community adjoins part of the northern boundary of the subject site and covers approximately 0.354ha of the subject site.

Structure - Open Scrub with a canopy cover of approximately 60 % and height of approximately 10-15 metres, with occasional emergent trees to approximately 20 metres. The understorey consists of a moderate to dense groundcover of herbs and grasses.

Disturbances - This vegetation community is a regrowth stage.

Common Species

Trees: *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus microcorys* (Tallowwood).

Shrubs: *Allocasuarina littoralis* (Black She-oak) and *Glochidion ferdinandi* (Cheese Tree).

Groundcovers: *Calochlaena dubia* (Common Ground Fern), *Dianella caerulea* (Flax Lily), *Echinopogon caespitosa* (Berry Saltbush), *Entolasia marginata* (Bordered Panic), *Entolasia stricta* (Wiry Panic), *Hydrocotyle peduncularis* (Pennywort), *Imperata cylindrica* (Blady Grass), *Lomandra longifolia* (Spiky-headed Mat-rush), *Pteridium esculentum* (Bracken Fern) *Themeda australis* (Kangaroo Grass) and *Xanthorrhoea macronema.*

Weeds: *Hypochaeris radicata* (Flatweed), *Lantana camara* (Lantana), *Senecio madagascariensis* (Fireweed) and *Setaria sphacelata* (Setaria).

Vegetation Community 8 – Spotted Gum / Ironbark Open Forest

Occurrence - This vegetation community adjoins the northern boundary of the subject site and covers approximately 0.529ha of the subject site.

Structure - Open Forest of juvenile trees, with a canopy cover of approximately 50 % and height of approximately 10 metres. The understorey consists of a sparse shrublayer to 4 metres high and a moderate to dense groundcover of herbs and grasses.
Disturbances - This vegetation community is a regrowth stage.

Common Species

Trees: *Corymbia maculata* (Spotted Gum), *Corymbia intermedia* (Pink Bloodwood), *Eucalyptus pilularis* (Blackbutt), *Eucalyptus siderophloia* (Northern Grey Ironbark) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Allocasuarina littoralis* (Black She-oak), *Glochidion ferdinandi* (Cheese Tree), *Hibbertia aspera*, *Leucopogon juniperinus* (Bearded Heath) and *Melaleuca nodosa.*

Groundcovers: *Aristida vagans* (Wire Grass), *Echinopogon caespitosa* (Tufted Hedgehog Grass), *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass), *Lomandra longifolia* (Spiky-headed Mat-rush) and *Themeda australis* (Kangaroo Grass).

Weeds: *Andropogon virginicus* (Whisky Grass), *Lantana camara* (Lantana) and *Senecio madagascariensis* (Fireweed).

Vegetation Community 9 – Grassland with Scattered Trees

Occurrence - This vegetation community occurs over the majority of the subject site and covers approximately 53.663ha of the subject site.

Structure - Dense groundcover of herbs, ferns and grasses with scattered trees and shrubs.

Disturbances - This vegetation community is the result of agricultural activities.

Common Species

Trees: *Corymbia intermedia* (Pink Bloodwood), *Eucalyptus pilularis* (Blackbutt), *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus siderophloia* (Northern Grey Ironbark).

Shrubs: *Acacia falcata* (Sickle Wattle), *Acacia longifolia* (Sydney Golden Wattle), *Allocasuarina littoralis* (Black She-oak), *Hibbertia aspera*, *Leucopogon juniperinus* (Bearded Heath), *Melaleuca linariifolia* (Snow in Summer) and *Melaleuca nodosa*.

Groundcovers: *Aristida vagans* (Wire Grass), *Cynodon dactylon* (Common Couch), *Echinopogon caespitosa* (Tufted Hedgehog Grass), *Entolasia stricta* (Wiry Panic), *Eragrostis brownii* (Brown's Lovegrass), *Imperata cylindrica* (Blady Grass), *Lomandra longifolia* (Spiky-headed Mat-rush), *Microlaena stipoides* (Weeping Grass), *Pteridium esculentum* (Bracken Fern) and *Themeda australis* (Kangaroo Grass).

Weeds: *Anagallis arvensis* (Pimpernel), *Andropogon virginicus* (Whisky Grass), *Axonopus fissifolius* (Narrow-leaf Carpet Grass), *Bidens pilosa* (Cobblers Pegs), *Chloris gayana* (Rhodes Grass), *Digitaria sanguinalis* (Summer Grass), *Paspalum dilatatum* (Paspalum), *Pennisetum clandestinum* (Kikuyu), *Plantago lanceolata* (Ribwort), *Senecio madagascariensis* (Fireweed), *Setaria sphacelata* (Setaria) and *Sporobolus africanus* (Parramatta Grass).

4.3 Vegetation Connectivity

The vegetation within the subject site is at the northern end of a vegetation corridor along Darawkh Creek, to the Wallamba River.

4.4 Flora Species

Methodology utilised throughout the duration of flora surveys is presented in Section 2.1. The plants observed are listed in Tables A1.1 and A1.2 of Appendix 1. The results of the floristic quadrats undertaken are provided in Table A1.3 of Appendix 1.

Tree density observations undertaken within vegetation communities 3 and 5 were undertaken to assess the species density of the trees on the site. The results of these observations are provided in Table A1.4 in Appendix 1.

No ROTAP species were observed during the survey.

4.5 Threatened Species

4.5.1 TSC Act (1995) – A search of the Atlas of NSW Wildlife (DECC 2007) database indicated that seven (7) species have been recorded within a 10 km radius of the study area. Those species are listed in Table A1.5 (Appendix 1).

Of those seven (7) threatened flora species, two have the potential to occur within the subject site. These species are *Lindernia alsinoides* and *Maundia triglochinoides*. Details on these species are provided below:

Lindernia alsinoides – A small, annual herb which occurs in heath and sclerophyll forest in swampy conditions. It was considered that potential habitat occurs along the edge of Frogalla Swamp, where it was targeted during surveys. No specimens were observed.

Maundia triglochinoides – An erect reed-like herb to 80cm which occurs in swamps or shallow fresh water on heavy clay north from Wyong. It was considered that potential habitat occurs in Vegetation Community 6, where it was targeted during the survey. No specimens were observed.

No threatened species were observed during the survey.

4.5.2 Environment Protection and Biodiversity Conservation Act (1999) - A review of the schedules of the *EPBC Act* (1999) indicated the potential for six (6) threatened flora species to occur within a 10km radius of the site. These include *Allocasuarina defungens, Allocasuarina simulans, Asperula asthenes, Cryptostylis hunteriana, Cynanchum elegans* and *Syzygium paniculatum.* None of those species were observed during the survey, or considered likely to occur. As such a referral to *Department of the Environment & Heritage* is not required.

Remnants of two endangered ecological communities, *Freshwater Wetlands on Coastal Floodplains* and *Swamp Sclerophyll Forest on Coastal Floodplains* were observed during the survey and are discussed in Section 4.7 below.

4.6 Endangered Ecological Communities

The following endangered ecological communities are known to occur within the general locality of the subject site: Coastal Saltmarsh, Freshwater Wetlands on Coastal Floodplains, River-Flat Eucalypt Forest on Coastal Floodplains, Subtropical Coastal Floodplain Forest, Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest on Coastal Floodplains.

However only two of these threatened ecological communities occur on the site, namely, *Swamp Sclerophyll Forest on Coastal Floodplains* and *Freshwater Wetlands on Coastal Floodplains.*

Vegetation Communities 1, 2 & 4 are considered representative of endangered ecological communities and are thus considered to be regionally significant. Vegetation Community 6 is commensurate with the endangered ecological community *Freshwater Wetlands on Coastal Floodplains*, but as it has been artificially created, there is some argument as to whether it should be classed as an endangered ecological community.

4.6.1 Freshwater wetlands on coastal floodplains (fwcf)

General Description
A variable complex of wetland communities on floodplains, which is distinct from the Endangered Ecological Community Sydney Freshwater Wetlands.

Habitat Requirements

- Geology / Soils: Alluvial soils which are subject to periodic or semi-permanent inundation by freshwater.
- Topography: Depressions, flats, drainage lines, lagoons and lakes of coastal floodplains.
- Characteristic Canopy Species: Sedgelands and reedlands, to herbfields, in which woody plants are generally scarce.

Conservation Status and Distribution
Occurs generally at elevations of less than 20 metres AHD, along the length of coastal NSW. Small areas are conserved in existing conservation reserves, including Ukerebagh, Tuckean, Tabbimobile Swamp, Hexham Swamp, Pambalong and Pitt Town Nature Reserves and Bungawalbin, Scheyville and Seven Mile Beach National Parks.

Key Threatening Processes
Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; and Anthropogenic climate changes.

Occurrence within the Site
Habitat requirements and species that characterise this community were located within vegetation community 1 within the subject site. As such, this ecological community is considered to occur on the subject site. Vegetation Community 6 was considered to be commensurate with this community, however, as it has been artificially created; there is some doubt as to whether it complies with the definition.

4.6.2 Swamp sclerophyll forest on coastal floodplains

General Description
The ecological community associated with humic clay loams and sandy loams on waterlogged or periodically inundated alluvial flats and drainage lines of coastal floodplains.

Habitat Requirements
- Geology / Soils: Waterlogged or periodically inundated humic clay loams and sandy loams.
- Topography: Alluvial flats and drainage lines of coastal floodplains.
- The most widespread canopy species of Swamp Sclerophyll Forest on Coastal Floodplains include: *Eucalyptus robusta, Melaleuca quinquenervia and eucalyptus botryoides.* Other prominent species are: *Callistemon salignus, Casuarina glauca, Eucalyptus resinifera subsp. hemilampra, Livistona australis,* and *Lophostemon suaveolens.*

Conservation Status and Distribution
Small areas of Swamp Sclerophyll Forest on Coastal Floodplains are contained within existing conservation reserves, including: Bungawalbin NR, Tuckean NR, Moonee Beach NR, Hat Head NP, Crowdy Bay NP, Wallingat NP, Garigal NP and Myall Lakes NP.

Key Threatening Processes
Clearing of native vegetation; alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; invasion of native plant communities by exotic perennial grasses; predation, habitat destruction, competition and disease transmission by feral pigs; anthropogenic climate change; high frequency fire and removal of dead wood and dead trees.

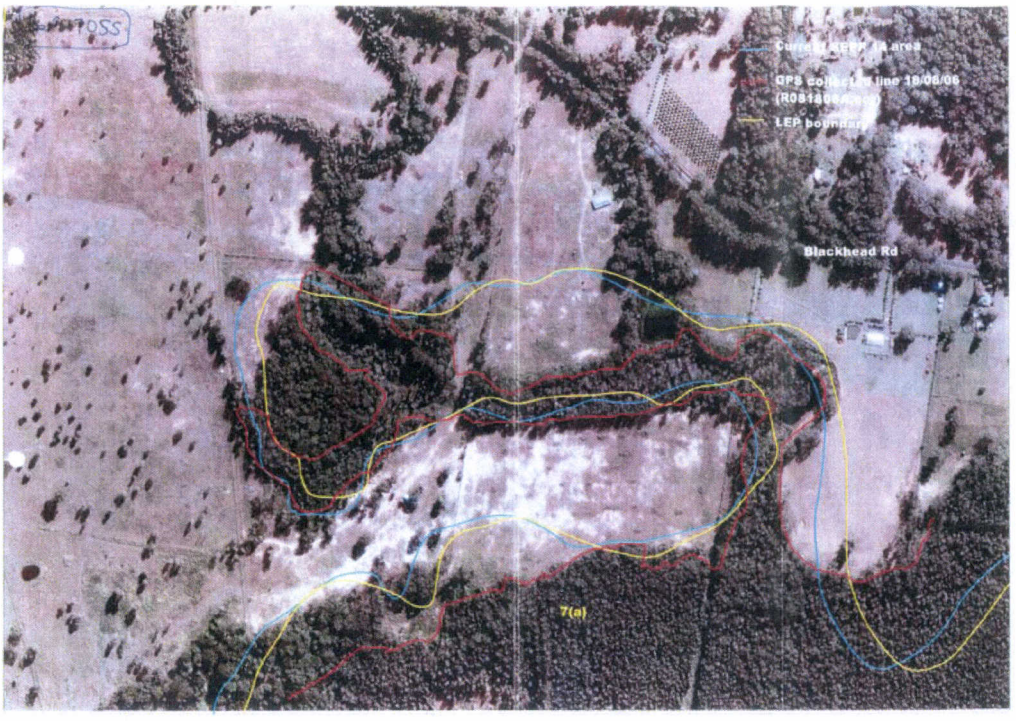
Occurrence within the Site
Habitat requirements and species that characterise this community were located within vegetation communities 2 and 4 within the subject site. As such, this ecological community is considered to occur on the subject site.

4.7 SEPP 14 Wetland Discussion

The south-eastern and eastern portions of the subject site associated with Frogalla Swamp have been mapped as SEPP 14 Wetland No 579. SEPP 14 wetlands are state significant wetlands identified for protection. The area mapped as the SEPP 14 Wetland No 579 within the subject site according to the Department of Infrastructure Planning and Natural Resources (DIPNR) is provided in Figure 2. It is considered that this mapping is inaccurate and does not reflect the true boundary of the wetland/s within the site based on drainage and vegetation characteristics.

As depicted in Figure 2, the current mapped boundary of the SEPP 14 wetland is inconsistent with the surveyed contours of the site or the groundtruthed vegetation communities undertaken by *Travers environmental*. Areas currently mapped as the SEPP 14 wetland include Vegetation Community 5, Blackbutt / Red Gum / Bloodwood Open Forest which is typically associated with well drained sandy soils. Based on the sites topography and detailed vegetation community mapping a groundtruthed wetland boundary has been mapped in Figure 2. This boundary is considered to be the boundary of the wetlands within the subject site based on vegetation communities present, topography and drainage characteristics.

In August of 2006 Greater Taree City Council undertook their own ground truthing of the SEPP 14 wetland boundary. A scanned image of their mapping is provided below. This Council mapping depicts the wetland boundary (in Red) as significantly further south than the opinion mapped provided by *Travers environmental* to which the development has been designed. Should council consider their boundary to be correct, then the additional protection provided to this wetland by the buffer and vegetation retention is significant.



Council SEPP 14 Wetland Mapping – August 2006

As can be seen on the photo above, Councils boundary is located to the south of the existing clearing. This clearing is being retained for the purposes of the proposal to provide access between development areas.

4.8 Fauna Species

During the course of surveys in 2005 and 2007 a total of one hundred and one (101) animal species were recorded. This included 67 species of birds, 23 species of mammals, 3 species of reptile, 7 species of amphibian and 1 species of fish. Species recorded throughout the duration of the fauna survey are listed in Table A1.6 of Appendix 1.

One (1) threatened bird species, Powerful Owl (*Ninox strenua*) was recorded during the field survey. The Powerful Owl was spotlighted responding to call playback on August 16th and 17th 2005. It appeared that this individual flew in from the south east of the subject site. No evidence of roosts, breeding or foraging on site was observed.

Thirteen (13) threatened bird species (as identified in Section 5) are considered to have potential to utilise the subject site.

Three (3) threatened mammal species, Eastern Bentwing-bat (*Miniopterus schreibersii oceansis*) Little Bentwing-bat (*Miniopterus australis*) and Grey-headed Flying-fox (*Pteropus poliocephalus*), were observed during surveys.

- The Eastern Bentwing-bat was recorded foraging within the subject site on April 19th 2007.
- The Little Bentwing-bat was recorded foraging within the subject site on August 15th 2005 and April 19th 2007.
- The Grey-headed Flying-fox was recorded foraging on flowering Eucalyptus trees on August 16th & 17th 2005 and April 19th 2007.

Thirteen (13) threatened mammal species (as identified in Section 5) are considered to have potential to utilise the subject site.

Three (3) reptile species, Delicate Skink (*Lampropholis delicata*), Eastern Blue-tongue Lizard (*Tiliqua scincoides*) and an Elapidae family snake species were recorded within the subject site. The Elapid snake was recorded from a slough (shed skin) and scale counts revealed it was not a member of the threatened *Hoplocephalus* genus. No threatened species of reptile are considered to have potential to utilise the subject site.

Seven (7) amphibian species Common Eastern Froglet (*Crinia signifera*), Dwarf Tree Frog (*Litoria fallax*), Whistling Tree Frog (*Litoria verreauxii*), Striped Marsh Frog (*Limnodynastes peroni*), Spotted Marsh Frog (*Limnodynastes tasmaniensis*), Wallum Rocket Frog (*Litoria freycineti*) and Brown Brood Frog (*Pseudophryne bibroni*) were heard calling within the dam, Frogalla Swamp and in low moist grassland areas. Two threatened species of amphibian are considered to have potential to utilise the subject site (Wallum Froglet, Green and Golden Bell Frog).

One (1) fish species Mosquito Fish (*Gambusia holbrooki*) was observed within the drainage line / within the centre of Lot 4. No threatened fish species are considered to have potential habitat within the subject site.

4.9 Habitat Types

A range of fauna habitats is present throughout the site and includes:

- Open Forest dominated by seasonally flowering *Eucalyptus spp* trees
- Sparse to dense shrub layer
- Moderate to dense ground cover
- Nectar producing plants, principally *Banksia, Melaleuca* and *Acacia*
- Sap flows
- Small (<10cm) to Large (>30cm) sized tree hollows
- Fallen timber and hollow logs
- Loose soil suitable for burrowing

- Scattered rocks and stones
- Artificial debris and material around disused lodging
- Sparse to moderate litter layer
- Aquatic Habitats characterised by farm dams, drainage lines and wetlands

4.10 Habitat within the vegetation communities

The nine (9) vegetation communities present within the subject site provide a diverse array of habitat. The habitat attributes of each vegetation community are described below.

Vegetation community 1 – Phragmites Reedland occurs in the south-eastern section of the subject site. This community is dominated by a dense herbfield to a height of 2 metres. This provides suitable habitat for birds, reptile and amphibian species. This community provides suitable foraging and nesting habitat for the Australasian Bittern, Black Bittern, and the Black-necked Stork. The community also provides suitable protective foraging and breeding habitat for the Wallum Froglet and Green and Golden Bell Frog.

Vegetation community 2 – Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest occurs in the south-eastern section of the subject site. This community is dominated with the Autumn to summer flowering *Melaleuca quinquenervia* (Broad-leaved Tea Tree), the May to July flowering *Eucalyptus robusta* (Swamp Mahogany), and the April to August flowering *Eucalyptus grandis* (Flooded Gum). This provides foraging habitat for birds, reptiles, bats and arboreal mammals. Also this winter foraging source provides potential foraging habitat for threatened migratory bird species, Swift Parrot and Regent Honeyeater. This community provides potential habitat for Koala as defined in SEPP 44. Hollow bearing trees were observed throughout this vegetation community in a density of approximately 8 - 12 per hectare. These contained small (<10cm) to medium (10 - 30cm) sized hollows. These provide potential roosting and nesting habitat for small birds, micro-chiropteran bats, small arboreal mammals and some arboreal reptile species. A sparse shrublayer provides habitat for birds, arboreal mammals and terrestrial mammal species. A dense groundcover of sedges and ferns provides protective and foraging habitat for small terrestrial mammals, reptiles and amphibians. This community also provides potential habitat for the threatened species Wallum Froglet and Koala.

Vegetation community 3 – Blackbutt / Bloodwood / Banksia Open Forest occurs adjacent to the wetland. This community is dominated by the September to March flowering *Eucalyptus pilularis* (Blackbutt), the January to April flowering *Corymbia intermedia* (Pink Bloodwood), the November to December flowering *Angophora costata* (Sydney Red Gum), the August to December flowering *Eucalyptus microcorys* (Tallowwood), and the January to June flowering *Banksia serrata* (Old Man Banksia). This provides foraging habitat for birds, bats and arboreal mammals. These foraging resources are also suitable for the threatened species Common Blossom Bat and Grey-headed Flying-fox. In some areas this community provides potential habitat for Koala. Hollow bearing trees were observed within this vegetation community in a density of approximately 8 - 12 per hectare. These contained small (<10cm) to medium (10 - 30cm) sized hollows. These provide potential roosting and nesting habitat for birds, micro-chiropteran bats, arboreal mammals and some arboreal reptile species. A sparse to moderate shrublayer provides protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. A dense groundcover of herbs and ferns provides habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation community 4 – Swamp Forest occurs along the ephemeral watercourses within the subject site. This community is dominated with *Casuarina glauca* (Swamp Oak), and *Melaleuca linarifolia* (Snow in Summer). These provide protective and foraging habitat for birds, bats and arboreal mammals. Scattered upper stratum trees within this community provides potential habitat for Koala as defined in SEPP 44. A sparse shrublayer to 4 metres provides suitable protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. The dense groundcover of herbs and ferns provides suitable habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation community 5 – Blackbutt / Red Gum / Bloodwood Open Forest occurs in the central section of Lot 4. This community is dominated by the September to March flowering *Eucalyptus pilularis* (Blackbutt), the January to April flowering *Corymbia intermedia* (Pink Bloodwood), the November to December flowering *Angophora costata* (Sydney Red Gum), the August to December flowering *Eucalyptus microcorys* (Tallowwood), and the October to February flowering *Eucalyptus resinifera* (Red Mahogany). This community provides foraging habitat for birds, bats and arboreal mammals. This community provides potential habitat for Koala as defined in SEPP 44. Hollow bearing trees were observed within this vegetation community notably trees surveyed numbers 98 and 102. These large trees have multiple hollows of small to large size. These provide potential roosting and nesting habitat for birds, micro-chiropteran bats, arboreal mammals and some arboreal reptile species. The large sized hollows also provide suitable nesting habitat for the Powerful Owl, Masked Owl, Sooty Owl and Glossy Black-Cockatoo. A generally sparse shrublayer provides limited protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. A moderate to dense groundcover of herbs, ferns, grasses as well as leaf litter provides suitable habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation community 6 – Aquatic Herbfield occurs in the previously dammed sections of the subject site. This community is dominated by a dense herbfield with scattered trees. This provides suitable habitat for birds and amphibian species. This community provides suitable foraging and nesting habitat for the Australasian Bittern, Black Bittern, and the Black-necked Stork. The community also provides suitable protective foraging and breeding habitat for the Green and Golden Bell Frog.

Vegetation community 7 – Allocasuarina Open Scrub adjoins part of the northern boundary of the subject site. This community is dominated by the September to March flowering *Eucalyptus pilularis* (Blackbutt), and the December flowering *Eucalyptus microcorys* (Tallowwood). This provides foraging habitat for birds, bats and arboreal mammals. Scattered upper stratum trees within this community provides potential habitat for Koala as defined in SEPP 44. The dense stand of *Allocasuarina littoralis* (Black She-oak) provides suitable foraging habitat for the Glossy Black-Cockatoo. A moderate to dense groundcover of herbs and grasses provides potential habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation community 8 – Spotted Gum / Ironbark Open Forest adjoins part of the northern boundary of the subject site. This community is dominated by the May to September flowering *Corymbia maculata* (Spotted Gum), the September to March flowering *Eucalyptus pilularis* (Blackbutt), the July to January flowering *Eucalyptus siderophloia* (Northern Grey Ironbark) and the June to November flowering *Eucalyptus tereticornis* (Forest Red Gum). This provides foraging habitat for birds, bats and arboreal mammals. This community provides potential habitat for Koala as defined in SEPP 44. Stands of *Allocasuarina littoralis* (Black She-oak) provides suitable foraging habitat for the Glossy Black-Cockatoo. A moderate to dense groundcover of herbs and grasses provides potential habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation community 9 – Grassland with Scattered Trees occurs over the majority of the subject site. Scattered trees and shrubs provide foraging habitat for birds, and bats. The dense groundcover of herbs, ferns and grasses and scattered rocks provides habitat for mammals, reptile and amphibian species.

4.11 Threatened Fauna

4.11.1 State Legislative Matters

TSC Act (1995) - A search of the Atlas of NSW Wildlife (NPWS, 2005) database for threatened species resulted in records of twenty-eight (28) threatened species within a 10 km radius of the subject site. Coastal and oceanic threatened species found within 10 km have not been included. Table A1.7 of Appendix 1 identifies whether the subject site provides potential habitat for these locally occurring threatened fauna species.

A habitat assessment of the vegetation communities present within the subject site, combined with knowledge of the location of local threatened species populations, was utilised to determine the potential habitat for the threatened species within the subject site. A detailed assessment in accordance with Section 5A of the *EP&A Act* (1979) for species identified to have potential habitat within the subject site is provided in Section 5 of this report.

Fisheries Management Act (1994) – It is considered that the subject site does not provide any potential habitat for threatened aquatic species listed under the *Fisheries Management Act* (1994).

SEPP 44 - Three (3) Koala food tree species (*Eucalyptus robusta* and *Eucalyptus microcorys,* and *Eucalyptus tereticornis*) listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection, were observed within the study area. These trees were in densities of >15% within Vegetation Communities: 2, 3, 4, 5, 7, and 8. This is greater than the 15% threshold as indicated by SEPP 44 for classification as Potential Koala Habitat. Therefore the subject site is considered to contain 'Potential Koala Habitat' as defined by SEPP 44.

No Koalas were observed during fauna surveys and there was no evidence of previous Koala habitation within the subject site. A search of the Atlas of NSW Wildlife (DECC, 2007) database found 44 records of Koala habitation within a 10 km radius from the study area. The most recent and closest record to the study area was approximately 1.4km to the north in 2003. *Conacher Travers* has recorded Koala approximately 2 km to the east and also approximately 3 km to the north-east. While potential foraging habitat is present within the subject site, it is not considered to be 'Core Koala Habitat' as defined by SEPP 44.

The Greater Taree City Council CKPoM (September 2002) lists the preferred feed tree species for Koala within the local area. This is separated into two categories:

Primary species recorded within the subject site include *Eucalyptus robusta* and *Eucalyptus microcorys,* and *Eucalyptus tereticornis.*

Secondary species recorded within the subject site include *Eucalyptus propuinqua*, *E paniculata*, and *E. siderophloia*.

As there is limited connectivity to the north of the subject site, development of the site is considered unlikely to affect movement of Koalas from habitat adjoining Frogalla Swamp to other areas to the north. While some foraging habitat is likely to be lost as a result of the proposal, riparian areas within the subject site, and foraging habitat adjoining Frogalla Swamp will remain.

4.11.2 National Legislative Matters

EPBC Act (1999) – A review of the schedules of the *EPBC Act* (1999) identified the presence of thirty-one (31) threatened species within a 10km radius of the subject site. These species that are not oceanic have been listed in Table A1.7 (Appendix 1). One nationally listed threatened species Grey-headed Flying-fox (*Pteropus poliocephalus*) was recorded foraging within the subject site. It is considered that a referral to the department of the Environment and Heritage should not be required.

SECTION 5.0 - 8 PART TEST OF SIGNIFICANCE (SECTION 5A EPA ACT 1979)

Council is required to consider the impact upon threatened species from any development or activity via the process of an 8 part test of significance. The significance of the assessment is then used to determine the need for a more detailed Species Impact Statement (SIS).

The following 8 part test of significance relies on the ecological assessment undertaken to date. It is considered that the subject site provides potential habitat for the following threatened species and will be assessed accordingly in the following eight-part test:

Threatened Flora

- *Lindernia alsinoides*
- *Maundia triglochinoides*

Threatened Fauna

- Wallum Froglet
- Green and Golden Bell Frog
- Square-tailed Kite
- Osprey
- Australasian Bittern
- Black Bittern
- Black-necked Stork
- Painted Snipe
- Glossy Black-Cockatoo
- Swift Parrot
- Regent Honeyeater
- Barking Owl
- Powerful Owl
- Grass Owl
- Masked Owl
- Common Planigale
- Brush-tailed Phascogale
- Spotted-tailed Quoll
- Long-nosed Potoroo
- Koala
- Squirrel Glider
- Yellow-bellied Glider
- Grey-headed Flying-fox
- Common Blossom-bat
- Little Bentwing-bat
- Eastern Bentwing-bat
- Eastern Freetail-bat
- Large-eared Pied Bat

Endangered Ecological Communities

- Freshwater Wetlands on Coastal Floodplains
- Swamp Sclerophyll Forest on Coastal Floodplains

The '8 part test of significance' is as follows.

(a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Detailed flora and fauna investigations of the subject site, together with habitat assessments (*Conacher Travers*, 2007), have resulted in the identification of potential habitat for a variety of threatened species. An assessment of these species is as follows:

Lindernia alsinoides

Lindernia alsinoides is a small annual herb that occurs in heath and sclerophyll forest in swampy conditions. Throughout the duration of the flora survey of the subject site it was identified that the subject site provides potential habitat for this species along the edge of Frogalla Swamp. Potential habitat may have occurred in parts of Vegetation Community 4, but those areas are severely impacted by exotic species. During the survey of the subject site, no specimens of *Lindernia alsinoides* were observed. Despite the presence of potential habitat for *Lindernia alsinoides* within the subject site, this species was not recorded during the flora survey.

Maundia triglochinoides

Maundia triglochinoides is an erect, reed-like herb to 8 metres high. It occurs in swamps and shallow fresh water on heavy clay, north from Wyong. Throughout the duration of the flora survey of the subject site it was identified that Vegetation Community 6 provides potential habitat for this species, although, the clay content of the soil may be too low. During the survey of the subject site, no specimens of *Maundia triglochinoides* were observed. Despite the presence of potential habitat for *Maundia triglochinoides* within the subject site, this species was not recorded during the flora survey.

Wallum Froglet

The Wallum Froglet is found in acidic paperbark swamps and wallum country with dense groundcover. This species breeds in temporary and permanent pools and ponds of high acidity. It is considered that the subject site provides potential habitat for this species within vegetation community 1 – Phragmites Reedland, 2 – Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest, and 4 – Swamp Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is likely that the development will occur outside of the areas of potential habitat for this species.

Green and Golden Bell Frog

The Green and Golden Bell Frog prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds where it is often located under debris including corrugated iron, timber and rock. It is considered that the subject site provides potential habitat for this species within vegetation community 1 - Phragmites Reedland and 6 – Aquatic herbfield. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is likely that the development will occur outside of the areas of potential habitat for this species.

Square-tailed Kite

The Square-tailed Kite moves low over the canopy of woodland, exploiting ecotones while hunting. It is known to favour *Angophora floribunda* and *Angophora subvelutina* woodland in association with box / ironbark eucalypt species along moist valleys on the coast of NSW. There is usually profuse blossom associated with this type of vegetation, which provides an abundance of nesting birds on which the kite typically preys. It is considered that the subject site provides potential foraging and nesting habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable foraging and nesting habitat will be retained as part of the development proposal.

Osprey

The Osprey utilises various environments including waterbodies such as coastal waters, inlets, lakes, estuaries for foraging and offshore islands with dead trees for perching and breeding. It is considered that the subject site provides potential foraging habitat for this species particularly within vegetation community 1 – Phragmites Reedland, and 2 - Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey. The areas of potential foraging and nesting habitat will be retained as part of the development proposal.

Australasian Bittern

The Australasian Bittern Inhabits shallow freshwater or brackish wetlands with tall dense beds of reeds, sedges or rush species and swamp edges. It is considered that the subject site provides potential foraging and nesting habitat for this species within vegetation community 1 - Phragmites Reedland, and 2– Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat will be retained as part of the development proposal.

Black Bittern

The Black Bittern inhabits freshwater and brackish wetlands, ponds and streams with tall dense reed beds (Lindsey 1992). It is considered that the subject site provides potential foraging and nesting habitat for this species within vegetation community 1 - Phragmites Reedland, 2 – Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest and 6 – Aquatic Herbfield. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat will be retained as part of the development proposal.

Black-necked Stork

The Black-necked Stork occurs in tropical to warm temperate terrestrial wetlands, estuarine and littoral habitats of eastern NSW. It is considered that the subject site provides potential foraging and nesting habitat for this species within vegetation community 1 - Phragmites Reedland, and 2 – Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest. Potential foraging habitat is also located within the farm dam. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat will be retained as part of the development proposal.

Painted Snipe

The Painted Snipe occurs in marsh with moderate cover and is most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. During the survey, potential foraging habitat was observed within vegetation community1 – Phragmites Reedland. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the development proposal.

Glossy Black-cockatoo

The Glossy Black-cockatoo inhabits *Allocasuarina* forest and woodland where it feeds almost exclusively on the fruit of *Allocasuarina* spp. It is considered that the subject site provides potential foraging habitat for this species primarily within Vegetation community 7 – Allocasuarina Open Scrub and 8 – Spotted Gum / Ironbark Open Forest. *Allocasuarina*

littoralis may also be found within the other open forest vegetation communities although in lower densities. Potential nesting habitat is located within large sized tree hollows of Vegetation Community 5 – Blackbutt / Red Gum / Bloodwood Open Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey.

Swift Parrot

The Swift Parrot inhabits eucalypt forests and woodlands foraging mainly on nectar from winter flowering eucalypts and also psyllids and lerp, and seeds and fruits (Higgins, 1999). This migratory species breeds in Tasmania and its offshore islands in summer and in late March, almost the entire population migrates to mainland Australia. It is considered that the subject site provides potential foraging habitat for this species predominantly within the winter flowering tree species, but also in all other trees throughout the subject site. Despite the presence of potential foraging habitat, this species was not recorded during the fauna survey. The majority of the higher quality foraging resources (*Eucalyptus robusta*) is likely to be retained as part of the proposal.

Regent Honeyeater

The Regent Honeyeater inhabits mostly dry eucalypt woodlands and forests dominated by box and ironbark eucalypts. In areas on western slopes of the Great Divide, this species is associated with moister more fertile soils, along creeks, broad river valleys and on lower slopes of foothills. This species is known to forage mainly among foliage or flowers in the upper canopy of trees, sometimes in the lower strata on trunks of trees, in shrubs, and occasionally on the ground. This species feeds on nectar, invertebrates (mostly insects) and their exudates, such as lerp and honeydew and occasionally on fruit. This species usually nests in canopy of forest or woodland. This species is often observed foraging on winter flowering eucalypts throughout western Sydney. This species was not recorded during the fauna survey it is considered that the subject site provides potential foraging habitat for the Regent Honeyeater particularly within the winter flowering tree species. The majority of the higher quality foraging resources (*Eucalyptus robusta*) is likely to be retained as part of the proposal..

Barking Owl

The Barking Owl utilises eucalypt forests, woodlands and adjacent cleared areas for foraging and large hollows for nesting and breeding (Schodde & Tidemann, 1986). This species usually roosts in large densely foliaged trees, either among foliage or on bare branch below foliage, sometime quite low (Higgins, 1999). It is considered that the subject site provides potential foraging and roosting habitat for this species. Potential nesting hollows are located within Vegetation Community 5 – Blackbutt / Red Gum / Bloodwood Open Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey. There are extensive areas of similar quality foraging habitat within the local area including Darawank Nature Reserve. Areas of potential foraging habitat will be retained as part of the proposal.

Powerful Owl

The Powerful Owl inhabits dense mountain gullies, coastal forests and woodlands, coastal scrubs, and pine plantations over a large range (approx. 400-1400 ha). The Powerful Owl occurs in a range of vegetation types from woodland and open forest to rainforest. In NSW this species most commonly occurs in tall, wet or dry sclerophyll forests. This species nests in large hollows within large old trees, usually in living *Eucalypts* (Higgins, 1999; *Conacher Travers,* 2007). This species mostly roosts in closed forest, including rainforest or wet sclerophyll forest within densely foliaged trees (Higgins, 1999). The Powerful Owl was

recorded on the nights of August 16th and 17th 2007 in response to call playback. It appeared as though the individual recorded flew in from the south-east on both nights. It is considered that the subject site provides suitable foraging and roosting habitat for this species. Potential nesting hollows are located within Vegetation Community 5 – Blackbutt / Red Gum / Bloodwood Open Forest. No evidence of roosts, breeding or foraging on site was observed. There are extensive areas of similar quality foraging habitat within the local area including Darawank Nature Reserve. Areas of potential foraging and roosting habitat will be retained as part of the proposal.

Grass Owl

The Grass Owl mainly inhabits open tussock grasslands. This species also occurs in agricultural land and marshy areas vegetated with tall dense tussocks of grass (Higgins, 1999). It is considered that the subject site provides sub-optimal nesting and foraging habitat for this species particularly within Vegetation community 9 – Grassland with Scattered Trees. Despite the presence of potential habitat, this species was not recorded during the fauna survey.

Masked Owl

The Masked Owl utilises eucalypt forests, woodlands and adjacent cleared areas for foraging and large hollows for roosting, nesting and breeding. It is considered that the subject site provides suitable foraging habitat for this species. Potential roost and nest hollows are located within Vegetation Community 5 – Blackbutt / Red Gum / Bloodwood Open Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey.

Common Planigale

The Common Planigale is a small carnivorous mammal that has been recorded in habitats ranging from rainforest to dry hardwood forest, grasslands, marshlands, rocky areas and on the fringes of urban areas (Braithwaite, 1988). The Common Planigales diet consists entirely of insects (Braithwaite, 1988). This nocturnal species has been recorded foraging across a wide range of substrates including loose bark, logs, leaf litter and open ground (Braithwaite, 1988). Breeding season of the Common Planigale varies across the country, with breeding occurring in NSW from late spring to summer. An average of 8 offspring are produced after a gestation period of 19 to 20 days (Braithwaite 1988). It is considered that the Open Forest vegetation communities provide potential habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Brush-tailed Phascogale

The Brush-tailed Phascogale is presently distributed in south-east Queensland and north-east New South Wales, and in a band extending from south-east New South Wales through to the west Victorian border where it is found in open forests with sparse ground cover. This species nests and shelters in tree hollows, using many different hollows over a short period of time. Suitable hollows for this species are 25-40mm wide. The Brush-tailed Phascogale mate between May and July). It is considered that the Open Forest vegetation communities provide potential habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Spotted-tailed Quoll

The Spotted-tailed Quoll inhabits a number of habitats including dry to moist open forests or closed forests containing rock caves, hollow logs or trees for shelter / breeding. It is considered that the subject site provides potential habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Long-nosed Potoroo

The Long-nosed Potoroo inhabits coastal heath and dry and wet sclerophyll forests. Its optimum habitat is wet sclerophyll forest and rainforest patches in moist sclerophyll forest, with a moist shrubby understorey, often associated with grassy areas. It is considered that the subject site provides potential habitat for this species particularly within vegetation community 2 – Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest, 3 – Blackbutt / Bloodwood / Banksia Open Forest, and 5 – Blackbutt / Red Gum / Bloodwood Open Forest. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Koala

The Koala inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees. It is considered that the subject site provides potential foraging habitat for this species within vegetation communities 2, 3, 4, 5, 7, and 8. Areas of vegetation community 9 may also provide scattered trees which could provide dispersal / movement habitat for the Koala. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Squirrel Glider

The Squirrel Glider inhabits mixed aged stands of eucalypt forest & woodlands including gum barked and high nectar producing species with hollow bearing trees. According to Quin (1995) the home-ranges of Squirrel Gliders have been estimated at between 0.65 and 8.55 ha, the movement of males being greater than that of females. Nightly movements are estimated at between 300 and 500 m. Quin (1995) found that the home-range of a family group is likely to vary according to habitat quality and availability of resources. The Squirrel Glider is a hollow-dependant species. It is considered that the subject site provides potential nesting and foraging habitat throughout vegetation communities 2, 3, 5 and 7. Potential foraging habitat is also located within vegetation community 4 and 8. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Yellow-bellied Glider *(Petaurus australis)*

The Yellow-bellied Glider is an arboreal tree-dwelling mammal. The Yellow-bellied Glider is restricted to tall mature eucalypt forests found within high rainfall regions of temperate through to sub-tropical eastern Australia (Russell 1988). The bulk of the diet of the Yellow-bellied Glider consists of plant and insect exudates including sap, nectar, honeydew and manna while arthropods and pollen are also eaten (Goldingay and Kavanagh 1991). Yellow-bellied Gliders occupy large exclusive home ranges between 30 and 65 hectares in size (Goldingay and Kavanagh 1991). It is considered that the subject site provides potential nesting and foraging habitat throughout vegetation communities 2, 3, 5 and 7. Potential foraging habitat is also located within vegetation community 4 and 8. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Areas of suitable habitat for this species will be retained as part of the proposal.

Grey-headed Flying-fox

The Grey-headed Flying-fox is a canopy feeding frugivore and nectarivore species inhabiting rainforests, open forests, woodlands, *Melaleuca* swamps and *Banksia* woodlands. This species provides a means of seed dispersal and pollination for many native plants. Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, *Melaleuca* stands, mangroves, riparian woodland or modified vegetation in urban areas. The Grey-headed Flying-fox was recorded foraging within flowering Eucalyptus trees on the nights of August 16th and 17th 2007. No roosting camps were observed within or in close proximity to the subject site. It is likely that the site forms only a small portion of the total foraging resources utilised by this species throughout the local area. Extensive areas of similar quality foraging habitat are located throughout the local area including Darawank Nature Reserve. The proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Common Blossom-bat

The Common Blossom-bat is principally a rainforest dweller in Queensland and northern NSW. In its southern limit it favours coastal rainforest and heathland, particularly areas with *Banksia integrifolia*. In NSW, coastal rainforest is an important habitat where it roosts in the sub canopy layer. Potential roosting habitat for this species is located primarily within Vegetation community 2 - Swamp Oak / Paperbark / Swamp Mahogany / Flooded Gum Open Forest, and 5 – Blackbutt / Red Gum / Bloodwood Open Forest. The most suitable foraging habitat for this species is primarily *Banksia serrata* (Old Man Banksia) located within vegetation community 3 – Blackbutt / Bloodwood / Banksia Open Forest, and 9 – Grassland with Scattered Trees. Better quality foraging habitat is located along the coastline to the south-east of the subject site and includes areas of Darawank Nature Reserve. Despite the presence of potential habitat, this species was not recorded during the fauna survey.

Little Bentwing-bat

The Little Bentwing-bat forages below the canopy within open forests and woodlands, feeding on small insects. This species roost in caves, tunnels, tree hollows and occasionally old buildings. This species was recorded in the northern section of the subject site on August 15th 2007. It is considered that the subject site provides suitable roosting and foraging habitat for this species. No breeding habitat is present within the subject site. Similar quality foraging and roosting habitat for this species is located throughout the local area. In addition areas of suitable habitat for this species will be retained within the subject site as part of the proposal. The proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Eastern Bentwing-bat

The Eastern Bentwing-bat forages above and below the canopy within open forests and woodlands, feeding on small insects (Dwyer 1995a). The Eastern Bentwing-bat is known to roost in a range of habitats including stormwater channels, under bridges, occasionally in buildings, old mines and, in particular, caves (Dwyer 1995a). This species was recorded foraging along the edge of vegetation community 4 within the central power-line easement of the subject site on April 19th 2007. It is considered that the subject site provides suitable foraging habitat for this species. No breeding habitat is present within the subject site. Similar quality foraging habitat for this species is located throughout the local area. In addition areas of suitable habitat for this species will be retained within the subject site as

part of the proposal. The proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Eastern Freetail-bat

The Eastern Freetail-bat inhabits open forests and woodlands foraging above the canopy and along the edge of forests. This species is known to roost in tree hollows, under bark and buildings. It is considered that the subject site provides potential roosting and foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Similar quality habitat for this species is located throughout the local area. In addition habitat suitable for this species will be retained within the subject site as part of the proposal.

Large-eared Pied Bat

The Large-eared Pied Bat has a restricted distribution from south central Queensland to central and northern NSW and is localised and uncommon throughout its range occurring in Rainforest, wet sclerophyll forest to dry sclerophyll forest and woodland habitats. It is considered that the subject site provides potential roosting and foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. Similar quality foraging and roosting habitat for this species is located throughout the local area. In addition areas of suitable habitat for this species will be retained within the subject site as part of the proposal.

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

Eucalyptus seeana has been listed as an endangered population in the Greater Taree LGA. This species was targeted during the survey, the result being that no specimens were observed.

Emu has been identified as an endangered population within the North-Coast Bioregion. The lack of local records of this species and absence during surveys indicates that the endangered population of this species is unlikely to be disrupted such that the viability of the population is likely to be significantly compromised.

c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The two (2) endangered ecological community *Freshwater Wetlands on Coastal Floodplains (FWCF), Swamp Sclerophyll Forest on Coastal Floodplains (SSFCF)* will be retained wholly within the subject site. Buffer zones have been provided around these communities. It is therefore considered that the proposed development is not likely to have an adverse effect upon the two (2) endangered ecological communities FWCF and SSFCF such that its local occurrence is likely to be placed at risk of extinction.

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

The *Freshwater Wetlands on Coastal Floodplains* community occupies approximately 5.46ha or 7% and the *Swamp Sclerophyll Forest on Coastal Floodplains* community occupies approximately 12.6ha or 16.5% within the subject site. The proposed development is located outside of these landscapes.

Due to the retention of the (FWCF) and (SSFCF) communities within the subject site and the retention of buffers zones it is considered that the proposed action is not likely to substantially and adversely modify the composition such that their local occurrence is likely to be placed at risk of extinction.

d) In relation to the habitat of threatened species, populations or ecological community:

i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

It is considered that the habitat attributes of the subject site provide known or potential habitat for threatened flora species *Lindernia alsinoides* and *Maundia triglochinoides, Freshwater Wetlands on Coastal Floodplains, Swamp Sclerophyll Forest on Coastal Floodplains,* Wallum Froglet, Green and Golden Bell Frog, Square-tailed Kite, Osprey, Australasian Bittern, Black Bittern, Black-necked Stork, Painted Snipe, Glossy Black-Cockatoo, Swift Parrot, Regent Honeyeater, Barking Owl, Powerful Owl, Grass Owl, Masked Owl, Common Planigale, Brush-tailed Phascogale, Spotted-tailed Quoll, Long-nosed Potoroo, Koala, Yellow-bellied Glider, Squirrel Glider, Grey-headed Flying-fox, Common Blossom-bat, Little Bentwing-bat, Eastern Bentwing-bat, Eastern Freetail-bat, and Large-eared Pied Bat within the local area or region.

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

The subject site contains disturbed native vegetation within Lot 3 (west portion) and native vegetation within Lot 4 (eastern portion) of the site. The vegetation within Lot 4 has the greatest connectivity to the surrounding lands. The site is bound to the west by rural residential lands. Lands to the east and south are undeveloped and contain remnant bushland which is connected to the native vegetation to be retained within the subject site.

The southern portion of the site consists of natural wetland and swamp forest. This habitat forms part of the east – west band of vegetation surrounding Frogalla Swamp. This existing vegetation is likely to form a movement corridor for fauna. This vegetation will be retained as part of the development proposal. There is no proposal to remove vegetation as part of the development or within bushfire asset protection zones associated with the development.

Within the central section of Lot 4 is other remnant vegetation that extends from the tributary of Frogalla Swamp on the west of the subject site and meanders northwards towards Tallwood's Estate. Much of this vegetation adjoins the existing drainage lines. Due to the lack of remnant vegetation to the north of the subject site this vegetation is not considered to form any significant movement corridor.

It is considered that known habitat for a threatened species, population or ecological community within the local area and region is unlikely to become isolated or fragmented as a result of the proposal.

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

There is no EEC habitat to be removed. All EEC habitat is to be protected within the Wetland and EEC buffers.

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

The site has not been identified as critical habitat within the provisions of the *Threatened Species Conservation Act* (1995). Therefore, this matter does not require further consideration at this time.

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

There are no current Recovery Plans for either of the threatened flora species *Lindernia alsinoides* or *Maundia triglochinoides* that have potential habitat within the site.

Draft recovery plans have been prepared for the following threatened species with potential habitat within the subject site:

- Barking Owl *(Ninox connivens)* (DECC 2003)
- Green and Golden Bell Frog (DECC 2005)

Approved recovery plans have been prepared for the following threatened species with potential habitat within the subject site:

- Large Forest Owls (Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) (DECC 2006)
- Yellow-bellied Glider (*Petaurus australis*), (DECC 2003)

It is considered that the proposed development is generally consistent with the objectives or actions of the above mentioned draft and approved recovery plans. It is considered that the minute amount of vegetation removed as part of the proposal should not be considered as an opposing objective to any of the aforementioned recovery plans.

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

A key threatening process is defined in the TSC Act (1995) as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

The current list of key threatening processes under TSC Act, and whether the proposed activity is recognised as a threatening process is shown below.

Listed Key Threatening Process (as described in the final determination of the Scientific Committee to list the threatening process)	**Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?**		
	Likely	**Possible**	**Unlikely**
Alteration of habitat following subsidence due to long wall			✓

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

The "Clearing of native vegetation" is a Key Threatening Process. Removal of native vegetation will occur in association with future development and is therefore classified as a threatening process. The removal of native vegetation on the subject site is not likely to significantly affect the biodiversity of the local area due to the extent of better quality natural vegetation within the local area and the small area of vegetation to be removed.

The "Removal of Dead Wood and Dead Trees" is a Key Threatening Process and as such the proposal is of a class of development recognised as a threatening process.

The "Invasion of native plant communities by exotic perennial grasses" is a Key Threatening Process. The proposal is of a class of development recognised as a threatening process due to possible incursions of grasses such as *Pennisetum clandestinum* (Kikuyu).

It is expected that the proposed development will provide an opportunity to manage the area with regard to weed invasion. A *ecological management plan* will be required to be implemented as a condition of development consent.

SECTION 6.0 – CONCLUSIONS AND RECOMMENDATIONS

Travers environmental has been requested to carry out a Flora and Fauna Assessment of a proposed development located at Lots 3 & 4 DP 260256 Blackhead Road, Hallidays Point within the Greater Taree LGA.

The Greater Taree LEP 1995 identifies the zoning within the property as partly 1(a) Rural General, partly 1 (b1) Rural Valley Agriculture and partly 7(a) Environmental Protection Habitat.

The proposed tourist facility forms part of a 'staged' development application and will consist of 353 caravan park sites, 10 cabins, an equestrian centre, day spa, wellness centre, reception area, service station, convenience store, café, sports field and community centre. The proposed development stages are:

Stage 1: Concept approval
Stage 2: Main entrance, office, shop and fuel facilities, 93 tourist sites and horse stables
Stage 3: 132 sites, oval, community centre and horse jumping area and
Stage 4: All remaining sites, cabins and facilities.

- A tourist shop, office and service station will be provided at the northern entrance to the park with a community oval, community centre, parking and associated facilities provided within the central portion of the site.
- The proposed service station will be located approximately 80 metres from a narrow strip (<50 metres) of forested wetland vegetation in the south.
- The tourist sites (caravan, cabins and camping) will mainly be provided in the western portion with a small area provided at the eastern boundary. The equestrian centre will be located within the southern portion of the site.
- The proposed tourist park is located within the cleared / grassland areas of the site.
- Vegetated areas within the southern and central portions of the site are to be retained and as such asset protection zones will need to be applied to provide appropriate bushfire protection to the tourist facility.
- Roads and other access arrangements are provided to comply with Council and Rural Fire Service requirements.

A SEPP 14 Wetland 'Frogalla Swamp' is located to the south of the development. In addition, areas of *Swamp Sclerophyll Forest on Coastal Flood Plains* (Figure 1) have been identified within the riparian landscapes of the central portion of the site. This community is considered to be an endangered ecological community (EEC). This vegetation will be largely protected and managed by a proposed *ecological site management plan.*

Potential Ecological Impact

The potential ecological impact on this site relates to the impact not only from the construction of the development but also the long term environmental impacts that can result from any development undertaken within vegetated landscapes. The potential ecological impacts on this site relate to stormwater management, impact upon the SEPP 14 wetland, construction and implementation of asset protection zones, loss of vegetation and the potential impacts on the identified EEC.

Each of these issues has been taken into consideration during the design of this development to ensure that there are no short or long term ecological impacts to this site. No construction will be undertaken within the EEC and appropriate buffers have been provided to the SEPP 14 wetland.

Council Concerns

Greater Taree City Council have prepared a *Revised Statement of Facts and Contentions* dated 30 June 2008 which was filed in the Land and Environment Court on 01 July 2008. A response to items 5 and 11 are provided below:

5. *The proposal does not comply with the requirements of the Rural Fires Act 1997.*

The proposal complies with the requirements of the Section 100B of Rural Fires Act 1997 for development within bushfire prone lands. A bushfire protection assessment has been prepared by *Travers environmental* and has advised that matters respective of all proposed bushfire protection measures comply with PBP 2006.

11. *the development is likely to have an adverse environmental impact on the integrity and long-term viability of the SEPP 14 Coastal Wetland, endangered ecological communities and associated habitat for threatened species.*

(e) A species impact statement has not been submitted in support of the application.

A flora and fauna assessment has been prepared. This document forms the basis of assessment required by Section 5A of the *Environmental Planning and Assessment Act* (1979). This assessment determines if future development of the site is likely to have a significant effect on threatened species, populations and/or endangered ecological communities.

The flora and fauna assessment concluded that the proposed development is unlikely to cause a significant impact upon threatened species and populations. Therefore a Species Impact Statement is not required to be prepared for the proposed development.

(f) The application does not address the full range of direct, indirect and cumulative impacts of the intensive land being proposed in such close proximity to highly sensitive ecosystems.

Council has not directly detailed what they perceive to be the direct, indirect or cumulative impacts, however *Travers environmental* perceived impacts have been addressed below:

Development Design

The development application proposes to provide a development that has a low level of intensification such that its impact potential on riparian zones and or its impact upon the SEPP 14 wetland is low. For example:

The proposed tourist park will consist of 353 caravan park sites, 10 cabins, an equestrian centre, day spa, wellness centre, reception area, service station, convenience store, café, sports field and community centre. A tourist shop, office and service station will be provided at the northern entrance to the park with a community oval, community centre, parking and associated facilities provided within the central portion of the site.

The proposed service station will be located approximately 80 metres from a narrow strip (<50 metres) of forested wetland vegetation in the south. The tourist sites (caravan, cabins

and camping) will mainly be provided in the western portion with a small area provided at the eastern boundary. The equestrian centre will be located within the southern portion of the site. The proposed tourist park is located within the cleared / grassland areas of the site.

These facilities do not have an urban footprint and or provide activities that are 365 days per year, thus the level of intensification is low.

As most camping occurs to the north the plan then provides a lower density of use in the middle and southern landscapes. Protection of riparian zones is afforded through no development. Roads will cross these areas at four points but the impact is regarded as low given the proposed no development intention for these lands.

In addition the proposed 50 metre wide vegetated buffer to the SEPP 14 wetland will be further bolstered by the 60 metre wide asset protection zone. This area of 110 metres will separate the low key facilities proposed for the southern zone from the wetlands. Along with high permeability of the landscape through a lack of clearing and or intensified development their will be little in the way of run-off pollutants.

The development design is Parking for 112 vehicles (not 200 as expressed by Councils letter) is proposed within the asset protection zone surrounding the north eastern tip of the EEC buffer. These car parks are not located within any area of ecological significance. By the nature of its design, the car park will strengthen the APZ in this area.

Appropriate drainage design and stormwater management has been provided by *Lidbury, Summers & Whiteman* so that potential impacts upon the downstream waters, EEC areas and the SEPP 14 Wetland are avoided.

A service station is proposed on the northern side of the main access road into the proposed development. The service station is located outside of both the riparian buffer and the proposed asset protection zone. Nonetheless, appropriate spill control measures such as detention pits will be incorporated into the design of the petrol station to ensure that no overflow of petrol or other oils are able to enter the stormwater system and ultimately the EEC, riparian or SEPP 14 Wetland areas.

Stormwater Management

The Stormwater Management Strategy prepared by *Lidbury Summers & Whiteman* has addressed storm water quality measures for the intended land uses on the site. The strategy identifies the stormwater issues to be taken into account in the detailed planning, design and development of the site inclusive of the appropriate options and locations for the control of the quality and the quantity of stormwater leaving the site. Measures proposed to manage water quality include rain-gardens and bio-swales. In addition, the strategy identifies the land area required to implement the recommended options.

The strategy advises that there are no outstanding stormwater management issues. This has been validated against water quality targets (NSW EPA) for the reduction of nutrients and pollutants leaving the site and also for water quality via the appropriate pre development flows from the site during minor and major storm events. MUSIC modelling indicates that there will be no net increase in nutrients and that flows can be maintained to pre development conditions to avoid any direct impact upon the wetland.

Travers environmental believes that the works undertaken by *LS&W* through Music modelling will create a safe environment for the SEPP 14 wetland and other down stream environments such as Frogalla Swamp.

Construction and Implementation of bushfire asset protection zones

Bushfire asset protection zones will not be located within the endangered ecological communities. The development concept has located the development dominantly within the previously disturbed areas of the site.

The identified Swamp Sclerophyll Forest located in the north eastern portion of the site requires a minimum 20 metre buffer zone applied to the northern reaches. The buffer zone is to be managed as a natural area, i.e., weeding, revegetation and not managed as an asset protection zone.

Vegetation community 3 – Blackbutt / Bloodwood / Banksia Mixed Open Forest occurs adjacent to the wetland. The first 50m of this vegetation adjacent to the wetland will represent the wetland buffer and will be allowed to rehabilitate as mature forest. This means that the current under scrubbing and grazing will cease in that area.

A bushfire asset protection zone will extend from the edge of the above forest in a northerly direction. Due to the history of under scrubbing of vegetation in this area no clearing of trees or shrub vegetation will be required within the APZ.

(g) The development is proposed to be established within the riparian zone to two watercourses and wetland.

The proposal has undergone significant revision in terms of development within the riparian and EEC buffers. Various structures have been moved outside of this area as a result of this revision. Roads will cross the riparian zones at four places. These crossings will be constructed in accordance with the Policy and Guidelines for bridges, roads, causeways, culverts and similar structures (NSW Fisheries 1999).

(h) The development is proposed to be established within the buffer to the wetland.

The protection of the ecologically sensitive areas within the site will result in an improvement in the ecological attributes of the site and include a reduction in clearing of vegetation (via grazing), reduced erosion of creek banks, reduced incursion of exotic weed species and increase in habitat opportunities for native flora and fauna (via retention of the native understorey vegetation).

The existing fire trail / horse trail shown on the plan adjacent to the SEPP 14 zone is an existing feature of the site but should be moved from the buffer area into the asset protection zone.

Potential for better environmental outcomes

There is potential on this site to achieve a better environmental outcome than the current situation. The subject site is currently an unmanaged landscape with cattle being allowed to access and graze freely within the SEPP 14 wetland and EEC vegetation. Upon implementation of the recommendations from each of the reports prepared for this proposal, building envelopes, asset protection zones and retained vegetation areas have been designed for the proposal to ensure that the bulk of the development has been contained within the already cleared portions of the site.

The major drainage lines are to be protected within areas protected by buffers. These buffers are designed to increase the distance between development and the watercourse, EEC and SEPP 14 wetlands and reduce possible edge effects.

The retention and protection of these items will require the implementation of a *Ecological Site Management Plan* which will ensure the long term protection of the EEC's, Wetland and other retained vegetation within the subject site.

An assessment of the bushfire protection requirements needed for the development to guard against the potential impact of bushfires has been prepared (*Travers environmental*, August 2008). This assessment provides recommendations in respect of fuel management, construction standards / building protection, access, bushfire education and land ownership responsibility.

Legislative Assessment

In respect of matters required to be considered in the *Environmental Planning & Assessment Act* (1979) and relating to the species / provisions of the *Threatened Species Conservation Act* (1995), two (2) endangered ecological communities

- *Freshwater Wetlands on Coastal Floodplains,*
- *Swamp Sclerophyll Forest on Coastal Floodplains*

and four (4) threatened fauna species were recorded within the subject site. These species included

- Powerful Owl (*Ninox strenua*),
- Grey-headed Flying-fox (*Pteropus poliocephalus*),
- Eastern Bentwing-bat (*Miniopterus schreibersii oceansis*) and
- Little Bentwing-bat (*Miniopterus australis*).

The flora and fauna assessment concluded that the proposed development is unlikely to cause a significant impact upon threatened species and populations. Therefore a Species Impact Statement is not required to be prepared for the proposed development.

Conclusion

In respect of the issues raised within Councils Statement of Facts and Contentions dated 30 June 2008 and filed in the Land and Environment Court on the 01 July 2008, it is *Travers environmental* belief that each of these issues has also been dealt within the proposed development design and retention of sensitive vegetation which is protected by vegetated buffers.

Recommendations

A *ecological site management plan* should be prepared as a condition of Council consent to specify ongoing vegetation and habitat management within the conserved remnants, buffer and asset protection zones.

Bibliography

Auld, B.A. & Medd, R.W. (1996) *Weeds* Inkata Press

Barker, J., Grigg, G.C. & Tyler, M.J. (1995) *A Field Guide to Australian Frogs* Surrey Beatty & Sons

Bishop, T. (1996) *Field Guide to the Orchids of New South Wales and Victoria* UNSW Press

Blakers, M., Davies, S., and Reilly, P.N (1984) The Atlas of Australian Birds RAOU Melbourne University Press.

Baithwaite, R. W. (1988).Common Planigale (Planigale maculata). In *The Australian Museum Complete Book of Australian Mammals.* R. Strahan (Ed.). Angus and Robertson Publishers, Sydney.

Briggs, J.D. & Leigh, J.H. (1995) *Rare or Threatened Australian Plants* CSIRO

Burbidge, N. (1977) *Australian Grasses* Angus & Robertson,.

Churchill, S (1998) *Australian Bats* New Holland

Clancy, G. P. (1991) *The biology and management of the Osprey Pandion haliaetus cristatus in NSW,* National Parks and Wildlife Service.

Cogger, H.G. (2000) *Reptiles and Amphibians of Australia sixth edition,* Reed Books Australia.

Conacher Travers (2005), Personal observations of Powerful Owl nesting sites between 2000 and 2005.

Cronin, L (1996) *Key Guide to Australian Mammals* Reed

Cronin, L (1989) *Key Guide to Australian Palms Ferns and Allies* Reed

DEC, (2004) *Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft),* New South Wales Department of Environment and Conservation, Hurstville, NSW.

Eldridge, M.D.B and R.L. Close (1995) in *The Mammals of Australia*, The Australian Museum, Sydney.

Ehmann, H (1997) *Threatened Frogs of New South Wales* FATS Group

EPBC (1999) Environmental Protection and Biodiversity Conservation Act 1999 - Interactive Map Database Search - http://epbcweb.ea.gov.au/image/otherbatch.html

Floyd, A.G. *Rainforest Trees of Mainland South-eastern Australia* Inkata 1989

Gillespie, G.R. 1990. *Distribution, habitat and conservation status of the Giant Burrowing*

Harden, G. (1993) *Flora of New South Wales* University NSW Press

Higgins P.J.(Ed.) 1999. *Handbook of Australian, New Zealand and Antartic Birds. Volume 4: Parrots to Dollarbird.* Oxford University Press, Melbourne

Higgins, P.J., J.M. Peter & W.K. Steel. (Eds) 2001. *Handbook of Australian New Zealand and Antartic Birds. Volume 5: Tyrant-flycatchers to Chats.* Oxford University Press, Melbourne.

Higgins,P.J., & J.M.Peter. (Eds) 2002. *Handbook of Australian New Zealand and Antartic Birds. Volume 6: Pardalotes to shrike-thrushes.* Oxford University Press, Melbourne.

Higgins, P.J., & S.J.J.F. Davies. (Eds) 1996. *Handbook of Australian New Zealand & Antartic Birds. Volume 3: Snipe to Pigeons.* Oxford University Press, Melbourne.

Hoser, R.(1989) *Australian Reptiles and Frogs*, Pierson & Co.

Jones, D.L. & Clemesha, S.C. (1977) *Australian Ferns and Fern Allies* Reed

Kingsford, R. (1991) *Australian Waterbirds: A field guide* Kangaroo Press

Ku-ring-gai Municipal Council (1995) *Ku-ring-gai Municipal Council Bushland Weed Assessment Guidelines*

Lamp, C. & Collett, F. (1996) *A Field Guide to Weeds in Australia* Inkata Press

Lee, A.K. 1967. *Taxonomy, ecology and evolution of the genus Heleioporus (Gray) (Anura: Leptodactylidae).* Australian Journal of Zoology 15: 367-439.

Lindsey, T.R. (1992) *Encyclopedia of Australian Animals – Birds.* Angus and Robertson Publishers, Sydney.

Lunney, D., Urquart, C.A. & Reed, P. (1988) *Koala Summit* NPWS

Marchant, S., & P.J. Higgins (Eds) 1990. *Handbook of Australian, New Zealand and Antartic Birds.* Volume 1 Ratite's to Ducks Part A Ratite's to Petrels Oxford University Press, Melbourne.

Marchant, S., & P.J. Higgins (Eds) 1993. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2: Raptors to Lapwings.* Oxford University Press, Melbourne.

Martin, A.A. 1967. *Australian Anuran Life Histories: Some evolutionary and ecological aspects.* Chapter 7, pp. 175-191. In: Weatherley, A.H. (Editor) *Australian Inland Waters and their Fauna.* 11 Studies. ANU Press, Canberra.

Martin, T. G and S. McIntyre 2007. *Impacts of Livestock Grazing and tree Clearing on birds of woodland and Riparian Habitats.* Conservation Biology Vol. 21, No.2, 504 – 514.

Mitchell, M. (1996) *Native Grasses* Agmedia.

Morrison, R.G.B. (1981) *A Field Guide to the Tracks & Traces of Australian Animals* Rigby

National Parks and Wildlife Service, NSW (1999), *Threatened Species Information – Brush-tailed Phascogale (Phascogale tapoatafa).*

National Parks and Wildlife Service, NSW (2001), *Threatened Species Information – Grey-headed Flying-fox (Pteropus poliocephalus).*

Nicholson, N. & H. (1994) *Australian Rainforest Plants* Terrania Rainforest Publishing

NPWS (2005) *Atlas of NSW Wildlife* for the relevant 1:100,000 scale map sheet

Oliver, D.L. (1998) *Roosting of non-breeding Regent Honeyeaters Xanthomyza phrygia*, EMU-Journal of the Royal Australasian Ornithologists Union, Volume 98 Part 1

Pizzey, G. & Knight, F. (1997) *A Field Guide to the Birds of Australia* Angus & Robertson

Quin D.G. 1995. Population Ecology of the Squirrel Glider (*Petaurus norfolcensis*) and the Sugar Glider (*P. breviceps*) (Marsupialia:Petauridae) at Limeburners Creek, on the Central North Coast of New South Wales. *Wildlife Research* 22: 471-505.

Reader's Digest (2002) *Complete Book of Australian Birds*

Recher, H.F., Date, E.M. & Ford, H.A. (1995) *The biology and management of rainforest pigeons in NSW,* NSW National Parks and Wildlife Service

Robinson, M. (1996) *A Field Guide to Frogs of Australia* Reed

Russell, R. (1984) Social behaviour of the Yellow-bellied Glider, *Petaurus australis,* in North Queensland. In *Possums and Gliders.* A.P. Smith and I.D. Hume (Eds). Surrey Beatty and Sons, Chipping Norton, Sydney, pp. 343-353.

Sainty, G. (1995) *Burnum Wildthings* Sainty & Associates

Sainty, G.R. & Jacobs, S.W.(1981) *Waterplants of New South Wales* Water Resources Commission of NSW

Schodde, R and Tidemann, S (Eds) (1986) Readers Digest *Complete Book of Australian Birds* Second Edition. Readers Digest Services Pty Ltd, Sydney.

Shephard, M (1994) *Aviculture in Australian: Keeping and breed Aviary birds.* Reed Books, Chatswood.

Simpson & Day (1996*) Field Guide to the Birds of Australia* Viking

Smith, P. (1991) *The biology and management of Waders (Suborder Charadrii) in NSW,* NSW National Parks & Wildlife Service

Specht, R.L., Specht, A., Whelan, M.B. & Hegarty, E.E. (1995) *Conservation Atlas of Plant Communities in Australia* Southern Cross University Press, Lismore

State Forests (1997) *Threatened Species Protocol Prelogging and Preroading Survey Design.*

Strahan, R. (1998) *The Mammals of Australia* The Australian Museum

Swan, G. (1990) *A field Guide to Snakes and Lizards of New South Wales* Three Sisters

Triggs, B. (1996) *Tracks, Scats & Other Traces: A Field Guide to Australian Mammals,* Oxford University Press, Melbourne.

Trounson, D & Trounson, M., (1998) Australian Birds Simply Classified. Murray David Publishing Pty Ltd.

Trounson, Donald & Molly, (1998) *Australian Birds Simply Classified*, Murray David Publishing Pty Ltd, NSW.

Wetland Cave Australia (2004) Dargiuakh Creek & Frogalla Swamp Wetland Management Plan; Report to Great Lakes Council.

Wheeler, D.J.B., Jacobs, S.W.L. & Norton, B.E. (1994) *Grasses of New South Wales* University of New England.

Wilson, K.W., Knowles, D.G. (1988) *Australia's Reptiles - A Photographic Reference to the Terrestrial Reptiles of Australia*. Cornstalk Publishing

APPENDIX 1

FLORA AND FAUNA SPECIES LISTS

Table A1.1 – Native Flora Observations for the subject site

Scientific Name	Common Name	Family	Community*
Trees			
Allocasuarina torulosa	Forest Oak	Casuarinaceae	3
Angophora costata	Sydney Red Gum	Myrtaceae	3 4 5c 9
Casuarina glauca	Swamp Oak	Casuarinaceae	2c 4c 5 6 9
Corymbia intermedia	Pink Bloodwood	Myrtaceae	3 4 5 8 9
Corymbia maculata	Spotted Gum	Myrtaceae	7 8c 9
Endiandra □anicul	Hard Corkwood	Lauraceae	3
Eucalyptus grandis	Flooded Gum	Myrtaceae	2c 3 9
Eucalyptus microcorys	Tallowwood	Myrtaceae	3 4 5 7 9c
Eucalyptus □aniculate	Grey Ironbark	Myrtaceae	5
Eucalyptus pilularis	Blackbutt	Myrtaceae	3 4 5c 7 8 9c
Eucalyptus propinqua	Small-fruited Grey Gum	Myrtaceae	5 8 9
Eucalyptus resinifera	Red Mahogany	Myrtaceae	4 5c 8 9
Eucalyptus robusta	Swamp Mahogany	Myrtaceae	2c 3 4 5 6 9
Eucalyptus siderophloia	Northern Grey Ironbark	Myrtaceae	5 8 9c
Eucalyptus tereticornis	Forest Red Gum	Myrtaceae	2 4 8 9
Livistona australis	Cabbage Tree Palm	Arecaceae	3 4
Shrubs			
Acacia binervata	-	Mimosoideae	4
Acacia falcata	Sickle Wattle	Mimosoideae	9
Acacia longifolia	Sydney Golden Wattle	Mimosoideae	5 7 9
Acacia maidenii	Maiden's Wattle	Mimosoideae	3 4 5
Acacia myrtifolia	Red-stem Wattle	Mimosoideae	9
Acacia ulicifolia	Prickly Moses	Mimosoideae	5 7
Allocasuarina littoralis	Black She-oak	Casuarinaceae	4 5c 7c 8c 9
Banksia serrata	Old Man Banksia	Proteaceae	3c 9
Banksia spinulosa	Hairpin Banksia	Proteaceae	9
Bossiaea rhombifolia	-	Faboideae	9
Breynia oblongifolia	Coffee Bush	Euphorbiaceae	3 5 7 8
Callistemon rigidus	Bottlebrush	Myrtaceae	9
Callistemon salignus	Willow Bottlebrush	Myrtaceae	4 5 9
Daviesia ulicifolia	Gorse Bitter-pea	Faboideae	5 9
Dodonaea triquetra	Hop Bush	Sapindaceae	4 5 9
Duboisia myoporoides	Corkwood	Solanaceae	5
Exocarpos cupressiformis	Native Cherry	Santalaceae	7 9
Glochidion ferdinandi	Cheese Tree	Euphorbiaceae	3 4 5 7 8
Hibbertia aspera	Rough Guinea Flower	Dilleniaceae	5 7 8 9
Hibbertia linearis	-	Dilleniaceae	3 9
Leptospermum polygalifolium	Yellow Tea Tree	Myrtaceae	4 5 9
Leucopogon ericoides		Epacridaceae	3
Leucopogon juniperinus	Bearded Heath	Epacridaceae	3 5 7 8c 9
Leucopogon lanceolatus	Lance-leaf Beard-heath	Epacridaceae	4 5 9
Maytenus silvestris	-	Celastraceae	5
Melaleuca ericifolia	-	Myrtaceae	1c
Melaleuca linariifolia	Snow in Summer	Myrtaceae	2 4c 5 6c 7 8 9
Melaleuca nodosa	-	Myrtaceae	4 5 8c 9
Melaleuca quinquenervia	Broad-leaved Tea Tree	Myrtaceae	2c 4 5
Melaleuca styphelioides	Prickly-leaved Tea Tree	Myrtaceae	4 5 8 9
Monotoca elliptica	Tree Broom-heath	Epacridaceae	9
Nematolepis squamea	Satinwood	Rutaceae	4
Notelaea longifolia	Mock Olive	Oleaceae	5
Notelaea longifolia	Mock Olive	Oleaceae	5 9

Table A1.1 - Native Flora Observations for the subject site (Cont.)

Scientific Name	Common Name	Family	Community*
Shrubs (Cont.)			
Ozothamnus diosmifolius	Ball Everlasting	Asteraceae	5 7 9
Persoonia linearis	Narrow-leaved Geebung	Proteaceae	3 4 5 7 9
Pittosporum undulatum	Sweet Pittosporum	Pittosporaceae	4 7 9
Podocarpus spinulosus	-	Podocarpaceae	5
Polyscias sambucifolia	Elderberry Panax	Araliaceae	5 7 8 9
Pultenaea retusa	-	Faboideae	5 7 8 9
Tasmannia insipida	Brush Pepperbush	Winteraceae	3
Trema tomentosa	Native Peach	Ulmaceae	9
Zieria smithii	Sandfly Zieria	Rutaceae	5 9
Vines and Mistletoe			
Amyema congener	-	Myrtaceae	4c 5 6c
Billardiera scandens	Apple Dumplings	Pittosporaceae	3 5 7 9
Cassytha pubescens	Devil's Twine	Lauraceae	5 7 9
Cayratia clematidea	Slender Grape	Vitaceae	3 4 5
Cissus antarctica	Native Grape	Vitaceae	4
Clematis aristata	Toothed Clematis	Ranunculaceae	5
Desmodium rhytidophyllum	Rusty Tick-trefoil	Faboideae	5 7 9
Eustrephus latifolius	Wombat Berry	Luzuriagaceae	3
Geitonoplesium cymosum	Scrambling Lily	Luzuriagaceae	3 5
Glycine clandestina	Twining Glycine	Faboideae	3 5
Hardenbergia violacea	False Sarsparilla	Faboideae	3 5 7
Hibbertia scandens	Climbing Guinea Flower	Dilleniaceae	2 3c 5 9
Kennedia rubicunda	Dusky Coral Pea	Faboideae	2 3 4 5 7 9
Morinda jasminoides	-	Rubiaceae	3 4
Muellerina celastroides	Mistletoe	Loranthaceae	5 9
Parsonsia straminea	Common Silkpod	Apocynaceae	2 4 5 6
Polymeria calycina	Bindweed	Convolvulaceae	5 9
Rubus moluccanus	Broad-leaf Bramble	Rosaceae	3 4 5 7 9
Rubus parvifolius	Native Raspberry	Rosaceae	3 4 5 7 9
Sarcopetalum harveyanum	Pearl Vine	Menispermaceae	3 5
Smilax australis	Lawyer Vine	Smilacaceae	5
Smilax glyciphylla	Sarsparilla	Smilacaceae	5
Stephania japonica	Snake Vine	Menispermaceae	4 7 9
Herbs			
Acianthus aconitiflora	Helmet Orchid	Orchidaceae	5
Acianthus fornicatus	Pixie Caps	Orchidaceae	5
Ajuga australis	Austral Bugle		3
Aristida vagans	Threeawn Speargrass	Poaceae	5 8 9
Bacopa monieri	-	Scrophulariaceae	2
Baloskion tetraphyllum	Tassel-rush	Restionaceae	2 9
Baumea articulata	Jointed Twigrush	Cyperaceae	1
Caesia parviflora	Pale Grass Lily	Anthericaceae	5 9
Calotis dentex	-	Asteraceae	5
Carex appressa	Tussock Sedge	Cyperaceae	2 4 6
Carex maculata	-	Cyperaceae	6
Centella asiatica	Swamp Pennywort	Apiaceae	2 3 4 6 7 8 9
Chiloglottis sp.	-	Orchidaceae	3
Chorizandra sphaerocephala	-	Cyperaceae	9
Cryptostylis erecta	Bonnet Orchid	Orchidaceae	2 5
Cyathochaeta diandra	-	Cyperaceae	5
Cymbopogon refractus	Barbwire Grass	Poaceae	9
Cynodon dactylon	Common Couch	Poaceae	4 9

Table A1.1 – Native Flora Observations for the subject site (Cont.)

Scientific Name	Common Name	Family	Community*
Herbs (Cont.)			
Cyperus exaltatus	-	Cyperaceae	4 6
Cyperus fulvus	-	Cyperaceae	2
Cyperus polystachios	-	Cyperaceae	2 4 6 9
Desmodium gunnii (varians)	-	Faboideae	3
Dianella caerulea	Flax Lily	Phormiaceae	3 5 7 9
Dichondra repens	Kidney Weed	Convolvulaceae	3 5 9
Digitaria parviflora	Summer Grass	Poaceae	5
Digitaria ramularis	Summer Grass	Poaceae	3 5
Digitaria sp.	-	Poaceae	3 5
Drosera peltata	Sundew	Droseraceae	5 8 9
Drosera spatulata	Sundew	Droseraceae	5 9
Echinopogon caespitosus	Tufted Hedgehog Grass	Poaceae	5 7 8 9
Eleocharis sphacelata	Tall Spike-rush	Cyperaceae	4 6
Entolasia marginata	Bordered Panic	Poaceae	3 4 5 7 9
Entolasia stricta	Wiry Panic	Poaceae	3 5 7 8 9
Enydra fluctuans	-	Asteraceae	2 3 4 6
Eragrostis brownii	Brown's Lovegrass	Poaceae	8 9
Eragrostis leptostachya	Paddock Lovegrass	Poaceae	9
Euchiton sphaericus	-	Asteraceae	9
Fimbristylis dichotoma	Common Fringe-rush	Cyperaceae	9
Fimbristylis velata	-	Cyperaceae	2
Gahnia sieberiana	Red-fruited Saw-sedge	Cyperaceae	2c 3 4c 5 6 7 9
Geranium homeanum	-	Geraniaceae	3
Gonocarpus micranthus	Creeping Raspwort	Haloragaceae	2
Gonocarpus teucroides	Raspwort	Haloragaceae	5 8 9
Goodenia heterophylla	-	Goodeniaceae	5 9
Hydrocotyle laxiflora	-	Apiaceae	3
Hydrocotyle peduncularis	Pennywort	Apiaceae	2 3 4 5 7 8 9
Hypericum gramineum	Little St Johns Wort	Clusiaceae	9
Imperata cylindrica	Blady Grass	Poaceae	3 5 7c 8 9c
Isachne globosa	Swamp Millet	Poaceae	1
Isolepis inundata	-	Cyperaceae	2
Juncus continuus	-	Juncaceae	1
Juncus usitatus	Common Rush	Juncaceae	2 3 4 6 9
Lagenifera gracilis	-	Asteraceae	5
Lepidosperma laterale	Variable Sword-sedge	Cyperaceae	5
Lomandra longifolia	Spiky-headed Mat-rush	Lomandraceae	3c 4 5 6 7 8c 9
Luzula densiflora	-	Juncaceae	2 9
Microlaena stipoides	Weeping Grass	Poaceae	9
Oplismenus aemulus	Australian Basket Grass	Poaceae	3 5
Oplismenus imbecillis	Creeping Beard Grass	Poaceae	3
Oxalis perennans	-	Oxalidaceae	4 5 9
Panicum simile	Two Colour Panic	Poaceae	5 9
Persicaria decipiens	Slender Knotweed	Polygonaceae	2 9
Persicaria lapathifolia	Pale Knotweed	Polygonaceae	4 6
Persicaria praetermissa	-	Polygonaceae	2
Persicaria strigosa	-	Polygonaceae	2c 4 6c 9
Philydrum lanuginosum	Woolly Frogmouth	Philydraceae	2 6c 9
Bacopa monnieri	-		2
Stellaria flaccida	Chickweed	Caryophyllaceae	3

Table A1.1 – Native Flora Observations for the subject site (Cont.)

Scientific Name	Common Name	Family	Community*
Herbs (Cont.)			
Phragmites australis	Common Reed	Poaceae	1c 2c
Poa sieberiana	Poa Tussock	Poaceae	5 9
Pomax umbellata	Pomax	Rubiaceae	3 5
Poranthera microphylla	Small Poranthera	Euphorbiaceae	3 9
Potamogeton tricarinatus	Floating Pondweed	Potamogetonaceae	6
Pratia purpurascens	Whiteroot	Lobeliaceae	4 5 8
Pterostylis sp.	Greenhood	Orchidaceae	5
Ranunculus inundatus	River Buttercup	Ranunculaceae	2 3 4 5 6 9
Schoenoplectus mucronatus	-	Cyperaceae	6
Schoenoplectus validus	River Club-rush	Cyperaceae	1 2
Solanum prinophyllum	Forest Nightshade	Solanaceae	3 9
Sphaerolobium vimineum	-	Faboideae	8
Themeda australis	Kangaroo Grass	Poaceae	3 7 8 9
Trachymene incisa	-	Apiaceae	7 9
Tricostularia pauciflora	-	Cyperaceae	2 5 9
Triglochin procerum	Water Ribbons	Juncaginaceae	6c
Typha orientalis	Broad-leaved Cumbungi	Typhaceae	2 6
Vernonia cinerea	-	Asteraceae	4 5
Viola hederacea	Ivy-leaved Violet	Violaceae	2 3 4 5 9
Wahlenbergia gracilis	Australian Bluebell	Campanulaceae	9
Wurmbea dioica	Early Nancy	Colchicaceae	9
Xanthorrhoea macronema	-	Xanthorrhoeaceae	3 4 5 7 9
Xanthorrhoea minor	-	Xanthorrhoeaceae	3 5 7
Ferns			
Adiantum aethiopicum	Common Maidenhair	Adiantaceae	4 5 7 9
Blechnum cartilagineum	Gristle Fern	Blechnaceae	5
Blechnum indicum	Swamp Water Fern	Blechnaceae	1 2c 6
Calochlaena dubia	Common Ground Fern	Dicksoniaceae	2 3c 4c 5 7 9
Cheilanthes sieberi	Mulga Fern	Sinopteridaceae	8
Christella dentata	-	Thelypteridaceae	9
Hypolepis muelleri	Harsh Ground Fern	Dennstaedtiaceae	2c 3 4c 5
Platycerium bifurcatum	Elkhorn	Polypodiaceae	2 3 4 6
Pteridium esculentum	Bracken Fern	Dennstaedtiaceae	2 3c 4c 5c 7 9
Pyrrosia rupestris	Rock Felt Fern	Polypodiaceae	2
Selaginella uliginosa	Swamp Selaginella	Selaginellaceae	4 5 9

Vegetation Community

1 – Phragmites
2 – SSF
3 – Dune
4 – Riparian
5 – Mixed Forest
6 – Upper wetland
7 – Oak
8 – Spotty
9 – Open

Table A1.2 - Exotic Flora Observations for the subject site

Scientific Name	Common Name	Family	Community
Ageratina adenophora	Crofton Weed	Asteraceae	4c 5 9
Ambrosia artemisiifolia	Annual Ragweed	Asteraceae	5 9
Anagalis arvensis	Pimpernel	Primunlaceae	9
Andropogon virginicus	Whisky Grass	Poaceae	3 4 5 8 9
Axonopus fissifolius	Narrowleaf Carpet Grass	Poaceae	4 5 9c
Bidens pilosa	Cobblers Pegs	Asteraceae	3 4 9
Callitriche stagnalis	Common Starwort	Callitrichaceae	4
Chloris gayana	Rhodes Grass	Poaceae	4 9
Cinnamomum camphora	Camphor Laurel	Lauraceae	9
Cirsium vulgare	Spear Thistle	Asteraceae	3 9
Conyza albida	Tall Fleabane	Asteraceae	4 9
Cyclospermum leptophyllum	Slender Celery	Apiaceae	9
Digitaria sanguinalis	Summer Grass	Poaceae	9
Eragrostis pilosa	Soft Lovegrass	Poaceae	9
Erechtites valerianifolia	Brazilian Fireweed	Asteraceae	4 9
Gomphocarpus fruticosus	Narrow Leaf Cotton Bush	Asclepiadaceae	3
Grevillea sp cultivar	-	Proteaceae	9
Hypochaeris radicata	Flatweed	Asteraceae	3 4 5 7 9
Lantana camara	Lantana	Verbenaceae	3 4 5 7 8 9
Ludwigia peploides	Water Primrose	Onagraceae	6
Modiola caroliniana	Red-flowered Mallow	Malvaceae	9
Nymphaea mexicana	-		6
Panicum maximum	Guinea Grass	Poaceae	9
Paspalum wettsteinii	Broad-leaf Paspalum	Poaceae	4
Paspalum dilatatum	Paspalum	Poaceae	5 9
Paspalum urvillei	Vasey Grass	Poaceae	4
Passiflora edulis	Passionfruit	Passifloraceae	2
Pennisetum clandestinum	Kikuyu	Poaceae	9
Phytolacca octandra	Inkweed	Phytolaccaceae	4 5 9
Pinus eliotii	Slash Pine	Pinaceae	7 9
Plantago lanceolata	Ribwort	Plantaginaceae	9
Plectranthus ciliatus	-	Lamiaceae	4
Senecio madagascariensis	Fireweed	Asteraceae	3 4 5 7 8 9
Senna pendula	Cassia	Caesalpinioideae	3 4
Setaria gracilis	Slender Pigeon Grass	Poaceae	5 9
Setaria sphacelata	Setaria	Poaceae	4c 5 7 9c
Solanum americanum	Glossy Nightshade	Solanaceae	9
Solanum mauritianum	Tobacco Bush	Solanaceae	4 5
Solanum pseudocapsicum	Jerusalem Cherry	Solanaceae	2 3
Soliva anthemifolia	Jojo	Asteraceae	9
Sonchus asper	Prickly Sowthistle	Asteraceae	9
Sporobolus africanus	Parramatta Grass	Poaceae	5 9c
Sporobolus pyramidalis	-	Poaceae	9
Stellaria media	Chickweed	Caryophyllaceae	9
Verbena bonariensis	Purple Top	Verbenaceae	9

Table A1.3 – Floristic Quadrat Results

Scientific Name	Common Name	Family	Quadrat			
			1	2	3	4
Acacia maidenii	Maiden's Wattle	Mimosoideae		3		
Acianthus aconitiflora	Helmet Orchid	Orchidaceae			2	
Acianthus fornicatus	Pixie Caps	Orchidaceae			2	2
Allocasuarina littoralis	Black She-oak	Casuarinaceae				1
Allocasuarina torulosa	Forest Oak	Casuarinaceae		1		
Angophora costata	Sydney Red Gum	Myrtaceae			2 ind	1 ind
Aristida vagans	Threeawn Speargrass	Poaceae				2
Banksia serrata	Old Man Banksia	Proteaceae	1			
Billardiera scandens	Apple Dumplings	Pittosporaceae	1			
Breynia oblongifolia	Coffee Bush	Euphorbiaceae		1	1	
Callistemon salignus	Willow Bottlebrush	Myrtaceae			1	1
Calochlaena dubia	Common Ground Fern	Dicksoniaceae	1	5		1
Corymbia intermedia	Pink Bloodwood	Myrtaceae	2 ind	2 ind		3 ind
Cyathochaeta diandra	-	Cyperaceae			2	
Desmodium gunnii	-	Faboideae	1	2		
Desmodium rhytidophyllum	Rusty Tick-trefoil	Faboideae				1
Dianella caerulea	Flax Lily	Phormiaceae		1	2	2
Digitaria ramularis	-	Poaceae	1			
Digitaria sp.	-	Poaceae			1	11
Dodonaea triquetra	Hop Bush	Sapindaceae			3	3
Echinopogon caespitosus	Tufted Hedgehog Grass	Poaceae			2	2
Entolasia marginata	Bordered Panic	Poaceae	1	2		2
Entolasia stricta	Wiry Panic	Poaceae				2
Eucalyptus microcorys	Tallowwood	Myrtaceae			5 ind	
Eucalyptus pilularis	Blackbutt	Myrtaceae	2 ind	3 ind	2 ind	5 ind
Eucalyptus resinifera	Red Mahogany	Myrtaceae				1 ind
Gahnia sieberiana	Red-fruited Saw-sedge	Cyperaceae			1	1
Geitonoplesium cymosum	Scrambling Lily	Luzuriagaceae		1		
Geranium homeanum	-	Geraniaceae		1		
Glochidion ferdinandi	Cheese Tree	Euphorbiaceae		2		
Glycine clandestina	Twining Glycine	Faboideae	1	2		2
Gonocarpus teucroides	Raspwort	Haloragaceae				2
Goodenia heterophylla	-	Goodeniaceae			1	2
Hibbertia aspera	Rough Guinea Flower	Dilleniaceae			2	2
Hibbertia scandens	Climbing Guinea Flower	Dilleniaceae		2	1	
Hydrocotyle laxiflora	-	Apiaceae		2		
Hydrocotyle peduncularis	Pennywort	Apiaceae			2	2
Hypochaeris radicata	Flatweed	Asteraceae			1	
Imperata cylindrica	Blady Grass	Poaceae	1		2	2
Lagenifera gracilis	-	Asteraceae			2	
*Lantana camara**	Lantana	Verbenaceae		1	1	
Lepidosperma laterale	Variable Sword-sedge	Cyperaceae			2	2
Leptospermum polygalifolium	Yellow Tea Tree	Myrtaceae				1
Lomandra longifolia	Spiky-headed Mat-rush	Lomandraceae		2	2	2
Maytenus silvestris	-	Celastraceae			1	
Melaleuca linariifolia	Snow in Summer	Myrtaceae			2 (juv)	2 (juv)

Table A1.3 – Floristic Quadrat Results

Scientific Name	Common Name	Family	Quadrat			
			1	2	3	4
Acacia maidenii	Maiden's Wattle	Mimosoideae		3		
Acianthus aconitiflora	Helmet Orchid	Orchidaceae			2	
Acianthus fornicatus	Pixie Caps	Orchidaceae			2	2
Allocasuarina littoralis	Black She-oak	Casuarinaceae				1
Allocasuarina torulosa	Forest Oak	Casuarinaceae		1		
Angophora costata	Sydney Red Gum	Myrtaceae			2 ind	1 ind
Aristida vagans	Threeawn Speargrass	Poaceae				2
Banksia serrata	Old Man Banksia	Proteaceae	1			
Billardiera scandens	Apple Dumplings	Pittosporaceae	1			
Breynia oblongifolia	Coffee Bush	Euphorbiaceae		1	1	
Callistemon salignus	Willow Bottlebrush	Myrtaceae			1	1
Calochlaena dubia	Common Ground Fern	Dicksoniaceae	1	5		1
Corymbia intermedia	Pink Bloodwood	Myrtaceae	2 ind	2 ind		3 ind
Cyathochaeta diandra	-	Cyperaceae			2	
Desmodium gunnii	-	Faboideae	1	2		
Desmodium rhytidophyllum	Rusty Tick-trefoil	Faboideae				1
Dianella caerulea	Flax Lily	Phormiaceae		1	2	2
Digitaria ramularis	-	Poaceae	1			
Digitaria sp.	-	Poaceae			1	11
Dodonaea triquetra	Hop Bush	Sapindaceae			3	3
Echinopogon caespitosus	Tufted Hedgehog Grass	Poaceae			2	2
Entolasia marginata	Bordered Panic	Poaceae	1	2		2
Entolasia stricta	Wiry Panic	Poaceae				2
Eucalyptus microcorys	Tallowwood	Myrtaceae			5 ind	
Eucalyptus pilularis	Blackbutt	Myrtaceae	2 ind	3 ind	2 ind	5 ind
Eucalyptus resinifera	Red Mahogany	Myrtaceae				1 ind
Gahnia sieberiana	Red-fruited Saw-sedge	Cyperaceae			1	1
Geitonoplesium cymosum	Scrambling Lily	Luzuriagaceae		1		
Geranium homeanum	-	Geraniaceae		1		
Glochidion ferdinandi	Cheese Tree	Euphorbiaceae		2		
Glycine clandestina	Twining Glycine	Faboideae	1	2		2
Gonocarpus teucroides	Raspwort	Haloragaceae				2
Goodenia heterophylla	-	Goodeniaceae			1	2
Hibbertia aspera	Rough Guinea Flower	Dilleniaceae			2	2
Hibbertia scandens	Climbing Guinea Flower	Dilleniaceae		2	1	
Hydrocotyle laxiflora	-	Apiaceae		2		
Hydrocotyle peduncularis	Pennywort	Apiaceae			2	2
Hypochaeris radicata	Flatweed	Asteraceae			1	
Imperata cylindrica	Blady Grass	Poaceae	1		2	2
Lagenifera gracilis	-	Asteraceae			2	
*Lantana camara**	Lantana	Verbenaceae		1	1	
Lepidosperma laterale	Variable Sword-sedge	Cyperaceae			2	2
Leptospermum polygalifolium	Yellow Tea Tree	Myrtaceae				1
Lomandra longifolia	Spiky-headed Mat-rush	Lomandraceae		2	2	2
Maytenus silvestris	-	Celastraceae			1	
Melaleuca linariifolia	Snow in Summer	Myrtaceae			2 (juv)	2 (juv)

Table A1.3 - Floristic Quadrat Results (Cont.)

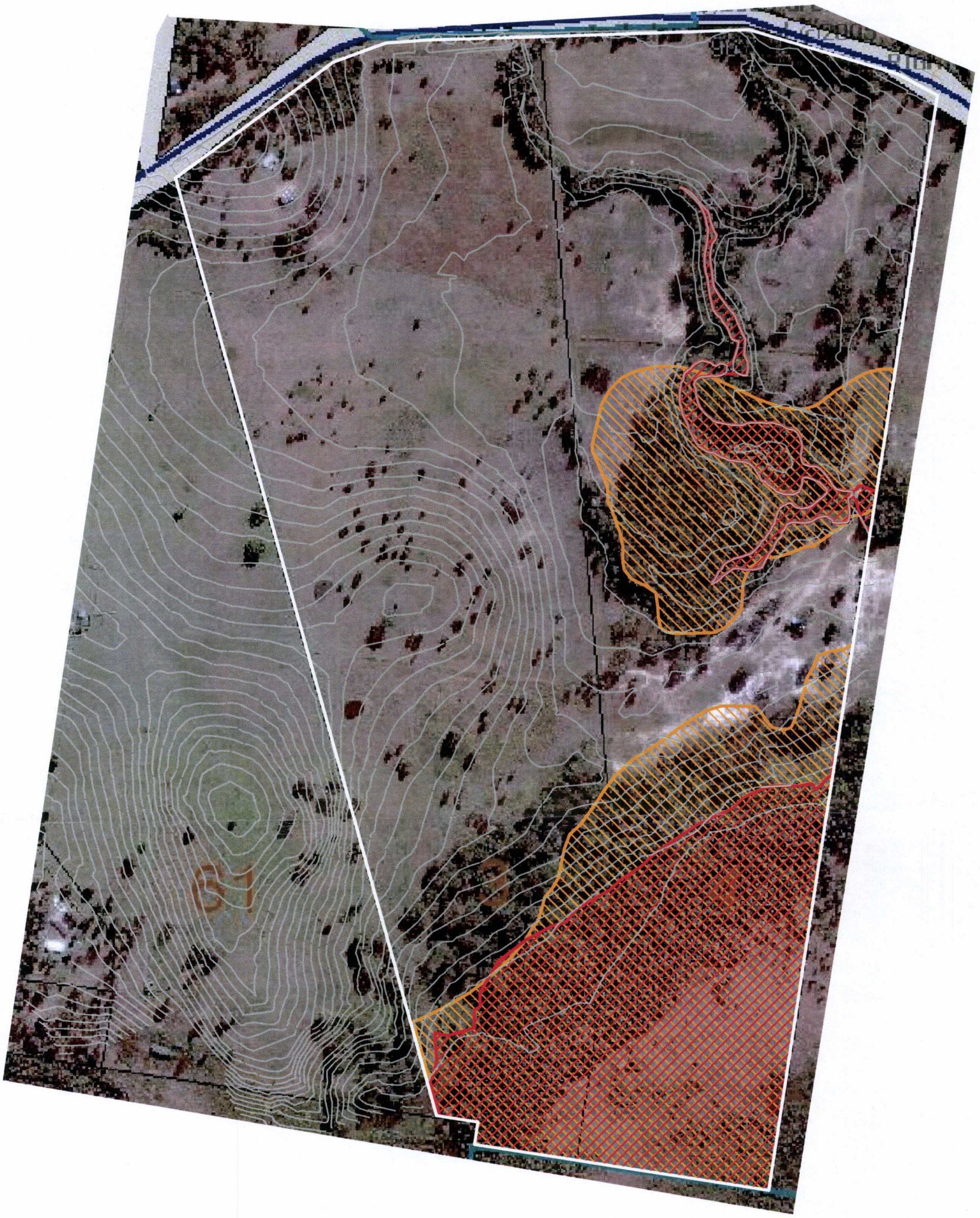
Scientific Name	Common Name	Family	Quadrat			
			1	2	3	4
Melaleuca nodosa	-	Myrtaceae				1
Melaleuca styphelioides	Prickly-leaved Tea Tree	Myrtaceae				1
Morinda jasminoides	-	Rubiaceae		1		
Muellerina celastroides	Mistletoe	Loranthaceae				1
Oplismenus aemulus	Australian Basket Grass	Poaceae		2		2
Oxalis perennans	-	Oxalidaceae			2	2
Panicum simile	Two Colour Panic	Poaceae			2	2
Parsonsia straminea	Common Silkpod	Apocynaceae			1	
Persoonia linearis	Narrow-leaved Geebung	Proteaceae	1		1	1
Poa sieberiana	Poa Tussock	Poaceae			1	
Podocarpus spinulosus	-	Podocarpaceae			1	
Polyscias sambucifolia	Elderberry Panax	Araliaceae			1	1
Pomax umbellata	Pomax	Rubiaceae	1	2		
Pratia purpurascens	Whiteroot	Lobeliaceae			2	2
Pteridium esculentum	Bracken Fern	Dennstaedtiaceae		3		
Pultenaea retusa	-	Faboideae				1
Rubus parvifolius	Native Raspberry	Rosaceae		1	1	
Sarcopetalum harveyanum	Pearl Vine	Menispermaceae		1		
Solanum prinophyllum	Forest Nightshade	Solanaceae		1		
Themeda australis	Kangaroo Grass	Poaceae	1			
Vernonia cinerea	-	Asteraceae			1	
Viola hederacea	Ivy-leaved Violet	Violaceae			2	
Xanthorrhoea macronema	-	Xanthorrhoeaceae	1			
Xanthorrhoea minor	-	Xanthorrhoeaceae			2	

In order to assess the species density of the trees on the site, observations were made from four points, two each, in Vegetation Communities 3 and 5. From each point, all trees observed within approximately 30 metres of the point were noted. Table A1.4 shows the results of those observations.

Table A1.4 - Tree Density Observations

Point	Blackbutt	Tallowwood	Sydney Red Gum	Grey Gum	Bloodwood	Banksia	Iron bark	Flooded Gum	Red Mahogany	Total
1	37	5	19	-	18	14	-	-	-	93
2	18	13	-	1	27	13	-	4	-	76
3	18	9	8	1	10	-	3	-	4	53
4	16	5	10	1	8	-	2	-	12	54
Com. 3	55	18	19	1	45	27	-	4	-	169
%	32.5	10.6	11.2	0.6	26.6	16	-	2.45	-	
Com. 5	34	14	18	2	18	-	5	-	16	107
%	31.8	13	16.8	1.9	16.8		4.7		15	
Total	89	32	37	3	63	27	5	4	16	276
%	32.2	11.6	13.4	1.1	22.8	9.8	1.8	1.5	5.8	

APPENDIX 2 - FAUNA SURVEY DETAILS (Cont.)				
Fauna Group	**Date**	**Weather Conditions**	**Survey Method**	**Survey Effort / Time (24hr)**
Reptiles	16/08/05	0/8 cloud, light NE, temp 22°C	Habitat search	5 hrs 15 mins 10.15 – 16.00
	16/08/05	0/8 cloud, no wind, temp 18°C	Spotlighting	2 hours 18.45 – 20.45
	17/08/05	0/8 cloud, no wind, temp 20°C	Habitat search	4 hrs 45 mins 09.15 – 14.00
	17/08/05	0/8 cloud, no wind, temp 18°C	Spotlighting	2 hrs 30 mins 17.30 – 20.00
	19/04/07	7/8 cloud, no wind, no rain, temp 24°C	Diurnal Opportunistic	1hr 30min 16:00 – 17:30
	20/04/07	0/8 cloud, no wind, no rain, temp 22°C	Diurnal Opportunistic	3hrs 08:30 – 11:30
	19/04/07	8/8 cloud, no wind, no rain, temp 21°C	Spotlighting	2hrs 45min 18:05 – 21:50
Amphibians	16/08/05	0/8 cloud, light NE, temp 22°C	Habitat search	5 hrs 15 mins 10.15 – 16.00
	16/08/05	0/8 cloud, no wind, temp 18°C	Spotlighting + call detection	2 hours 18.45 – 20.45
	17/08/05	0/8 cloud, no wind, temp 20°C	Habitat search	4 hrs 45 mins 09.15 – 14.00
	17/08/05	0/8 cloud, no wind, temp 18°C	Spotlighting + call detetction	2 hrs 30 mins 17.30 – 20.00
	19/04/07	8/8 cloud, no wind, no rain, temp 21°C	Spotlighting + call detection	2hrs 45min 18:05 – 21:50



Legend

- Subject Site
- SEPP 14 "Frogalla Swamp" (Surveyed by Conacher Travers)
- SEPP 14 Mapping

Note: SEPP 14 Wetland Boundary extrapolated from 1:25,000 scale SEPP 14 Wetland Maps

0 100 200 300 Meters

1:5,000

Original plan produced in A3 colour

N

Travers environmental

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Figure 2 -

SEPP 14 Wetlands & Actual Wetlands Locations

Blackhead Road - Hallidays Point

Ver:F1
19/08/08
Ref.No.7055F

Source: Orthophotomap supplied by Lidbury , Summers & Whiteman