Flora & Fauna Assessment

For A

Proposed Rezoning to Facilitate a

Recreation Facility

AT

"COORANBONG TOWN COMMON"

Lot 2 DP 517245 & Lot 34 DP 736908,

FREEMAN'S DRIVE and MARTINSVILLE ROAD

COORANBONG, NSW

Prepared for

Johnson's Property Group Pty Ltd
PO BOX A1308
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Job Reference No: 24274 – June 2007

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PROJECT: FLORA & FAUNA ASSESSMENT – COORANBONG TOWN COMMON	
CLIENT:	JOHNSON PROPERTY GROUP PTY LTD
OUR REF	24274
DATE:	JUNE 2007
APPROVED BY:	ALLAN RICHARDSON
SIGNATURE:	
CHECKED BY:	MATTHEW DOHERTY
SIGNATURE:	

EXECUTIVE SUMMARY

INTRODUCTION

RPS Harper Somers O'Sullivan (RPS HSO) has been engaged by Johnson Property Group Pty Ltd (JPG) to undertake a Flora and Fauna Assessment for Lot 2 DP 517245 and Lot 34 DP 736908, Cooranbong, Lake Macquarie City Council (LMCC) LGA, commonly referred to as Cooranbong Town Common (hereafter referred to as the site). Targeted Flora and Fauna Assessments of the site have been undertaken in support of a rezoning proposal, to facilitate a future recreation facility on the site. This assessment has been undertaken principally to identify any ecological constraints / opportunities that would require consideration as part of rezoning the land for the development of sporting and community facilities.

This report aims to recognise the relevant requirements of the *Environmental Planning and Assessment Act 1979* (*EP&A Act 1979*) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (*EP&AA Act 1997*) and the *Threatened Species Conservation Act 1995* (*TSC Act 1995*). Assessment of the site under the requirements of State Environmental Planning Policy No. 44 (SEPP 44) – 'Koala Habitat Protection' is also included. Consideration of potential constraints has also been undertaken in relation to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EP&BC Act 1999*).

Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, including the Lake Macquarie Flora and Fauna Guidelines.

FLORA

Four vegetation assemblages have been delineated on the site, namely Cleared Managed Land, Alluvial Tall Moist Forest (ATMF), Freshwater Wetland Complex and Landscape Plantings. The north-eastern boundary of Lot 34 DP 736908 is defined by the present course of Dora Creek with a riparian strip of vegetation (ATMF) varying from 50m to 90m into the site. The southern corner of Lot 34 has been fenced off and maintained as what is locally known as Cooranbong Park. The vegetation within the site is predominantly managed pasture and lawn grass species and landscape plantings of both native and exotic trees, whilst shrubs have been added to compliment remnant trees. The remainder of Lot 34 has been used for dairy cattle grazing for a sustained period of time and is predominantly characterised by exotic pasture grasses and herbaceous weeds. Throughout Lot 34 previous courses of Dora Creek remain as backwater freshwater wetlands often surrounded by residual elements of ATMF. These wetlands are commensurate with descriptions of "Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" (FWCF), which is listed as an Endangered Ecological Community (EEC) under the *TSC Act 1995*.

Lot 2 DP 517245 is generally similar in vegetation to Lot 34 with a predominant covering of exotic grass and herbaceous pasture species. ATMF occurs as a 20m to 60m strip against the northern boundary and there are a number of billabongs commensurate with FWCF EEC along a previous course of Dora Creek through the northern portion of the lot. At the southern end of Lot 2 is an ephemeral freshwater wetland dominated by the native sedge *Carex appressa*. This habitat is commensurate with FWCF EEC and has recently been managed.

HABITAT

For the most part habitat within site is open grazing land providing open habitats for common open country native bird species. ATMF on the north-eastern boundary of the site is diverse both structurally and floristically, offering a suite of habitat opportunity for a rich diversity of native animals including a number of threatened species such as such as Grey-headed Flying-foxes and Microchiropteran bats, Squirrel Gliders and Forest Owls. The creek habitats provide habitat for aquatic mammals, such as the Water Rat and Platypus and semi-aquatic reptiles such as Eastern Water Dragons. The creek may also represent hunting habitat for the Black Bittern, which is listed as Vulnerable under the *TSC Act 1995,* although most records for this species occur below the Cooranbong weir where Dora Creek is tidal.

The billabong habitats provide foraging habitats for a range of birds, including herons kingfishers, waterfowl and rails. It is also possible that the billabongs represent breeding habitat for *Litoria brevipalmata* (Green-thighed Frog), which is listed as Vulnerable under the *TSC Act 1995*. The ephemeral wetland dominated by *Carex appressa* has been managed in recent times, but previously supported a diverse range of native grassland bird species.

Despite the general open nature of habitats within the site the juxtaposition of open habitats, wet habitat, ATMF and the creek inflate the number of species recorded, which does not accurately portray the general degraded state of the open habitats within the site.

FAUNA

Fauna recorded during field investigations varied depending upon the habitat surveyed. Open areas of the site were limited to common open country bird species and the wetland areas are currently supporting common waterbird species. A number of common wet forest bird species were recorded during fauna surveys and one threatened dry forest bird species, being *Callocephalon fimbriatum* (Gang-Gang Cockatoo), was recorded within the site during fauna surveys. *C. fimbriatum* is listed as Vulnerable under the *TSC Act 1995*.

Few native mammal species were noted within the site apart from common diurnal and nocturnal species, introduced species and stock.

Four species of microchiropteran bat were detected within the site, two of which are listed as Vulnerable under the *TSC Act 1995*, those being, *Miniopterus schreibersii* subsp. *oceanensis* (Eastern Bentwing-bat) and *Mormopterus norfolkensis* (East Coast Freetail Bat). Furthermore, due the mobility of this fauna guild and the occurrence of suitable foraging habitat within the site, it is not unlikely that other Microchiropteran bat species, including threatened species would use the site for foraging purposes on at least an intermittent basis. Roosting habitat for tree-hollow roosting species occurs within the site and in the forest habitats surrounding the site.

ENVIRONMENTAL LEGISLATION ASSESSMENT

Section 5A of the EP&A Act 1979

Application of Section 5A of the *EP&A Act 1979* (7-part Tests) indicated that there may be loss of breeding habitat for *Litoria brevipalmata* (Green-thighed Frog) if there is an overall loss of billabong area within subsequent development of the site, as the billabongs may represent breeding habitat for this species and associated vegetation may provide the species with shelter. Furthermore, the EEC FWCP may be impacted upon if billabongs within the site and the wetland in the site's southwestern corner are reduced in extent within the site. Assessment of potential threats to these ecological entities concluded that no significant impact would be brought to bear upon *L. brevipalmata* and the EEC FWCF within

the site, provided the recommendations within Section 7 are incorporated into Conceptual and Strategic Planning and subsequent development of the site.

A 7-part test of significance also concluded that habitat for other threatened species recorded within the site, including the Gang-Gang Cockatoo, Grey-headed Flying-fox, Eastern Bentwing-bat and East-coast Freetail Bat will remain essentially unchanged during the process of development and that the introduction of increased artificial light might provide increased foraging opportunities for the two Microchiropteran bat species.

Key Threatening Processes

Key Threatening Processes (KTP are listed in Schedule 3 of the *TSC Act 1995)*. Those potentially applicable to the current rezoning and a future development proposal are "Clearing of Native Vegetation", "Invasion by Exotic Perennial Grasses" and "Human Caused Climate Change". The extent to which the proposal is likely to represent "Clearing of Native Vegetation", "Invasion by Exotic Perennial Grasses" and "Human Caused Climate Change" KTP's is not considered to be significant at a regional or local scale, provided full consideration is given to the recommendations contained in Section 7.

No other KTP's are believed to be relevant to the current proposal.

SEPP 44 'Koala Habitat Protection'

One tree species listed in Schedule 2 of SEPP No. 44 – 'Koala Habitat Protection' occurs on site, namely *E. microcorys* (Tallowwood) and a further two Schedule 2 tree species, being, *Eucalyptus robusta* (Swamp Mahogany) and *E. tereticornis* (Forest Red Gum) occur in the immediate vicinity of the site.

E. microcorys does not constitute >15% of the canopy within the site so the site cannot be considered as constituting Potential Koala habitat as defined within SEPP 44.

Furthermore, searches for secondary indications of Koala activity and fauna surveys concluded that it is unlikely that the site or habitats within its immediate vicinity have been used by Koalas in recent history.

Therefore no further provisions of this policy apply to the site.

EPBC Act 1999

A total of 15 nationally listed threatened species under the *EPBC Act 1999* have been recorded within the proximate region of the site as follows:

- *Syzygium paniculatum* Magenta Lilly Pilly
- *Acacia bynoeana* Bynoe's Wattle
- *Angophora inopina* Charmhaven Apple
- *Melaleuca biconvexa* Biconvex Paperbark
- *Tetratheca juncea* Black-eyed Susan
- *Chelonia mydas* Green Turtle
- *Heleioporus australiacus* Giant Burrowing Frog
- *Litoria littlejohni* Littlejohn's Tree Frog
- *Mixophyes iteratus* Giant Barred Frog
- *Chalinolobus dwyeri* Large-eared Pied Bat
- *Dasyurus maculatus* Spotted-tailed Quoll
- *Petrogale penicillata* Brush-tailed Rock-Wallaby
- *Pteropus poliocephalus* Grey-headed Flying-fox
- *Lathamus discolor* Swift Parrot
- *Xanthomyza phrygia* Regent Honeyeater

Four nationally listed migratory species have been recorded within the locality of the site,

- Merops ornatus — Rainbow Bee-eater (M*)
- *Pandion haliaetus* — Osprey (V, M*)
- *Haliaeetus leucogaster* — White-bellied Sea Eagle (M*)
- *Xanthomyza phrygia* — Regent Honeyeater (E, M*)

Assessment under the provisions of the *TSC Act 1995* concluded that it is considered unlikely the current proposal will have a significant impact upon local populations of Commonwealth listed threatened and Migratory species such that local extinctions would occur. Thus referral to the Department of Environment and Heritage is not necessary.

Recommendations

The following recommendations have been generated to provide ecological guidelines for rezoning and development of the site to offset potential impacts as a result of the proposal.

- It is recommended that areas of the site not utilised for recreation facilities be rezoned as conservation lands.

- The sporting oval section of the development overlays a small section of Billabong in the northern section of Lots 2 and 34 and the unformed section of Babers Road. This billabong area constitutes the EEC 'Freshwater Wetlands on Coastal Floodplains' and may also represent breeding habitat for *L. brevipalmata*, which is listed as vulnerable under the *TSC Act 1995*. It is recommended that a similar area of billabong be established above the displaced area as it is considered that this habitat provision would adequately ensure continuity of habitat and offset the loss of EEC area during development.

- It is further recommended that an ecologist conduct targeted habitat searches for *L. brevipalmata* individuals immediately prior to excavation and fill works within the vicinity of the billabong areas.

- The occurrence of the EEC 'Freshwater Wetlands on Coastal Floodplains' within close proximity to excavation areas, place them at risk from the movement of sediments during rainfall events. It is recommended that a strategic sediment and water management plan be developed and incorporated into subsequent development works to prevent impacts to waterways and EEC's within the site and adjacent areas as a consequence of earthworks on the site.

- An area of 'Freshwater Wetlands on Coastal Floodplains' EEC, represented by a *Carex appressa* sedgeland, occurs in the southern section of Lot 2. The sporting oval area of proposed subsequent development will overlay a small area of the northeastern ecotonal edge of this wetland and it is recommended that a similar area of wetland be re-established elsewhere on the site. The remainder of the wetland area should be conserved and allowed to naturally regenerate. It is considered that these conservation measures will adequately protect this EEC within the site.

- The area of 'Freshwater Wetlands on Coastal Floodplains' EEC in the southern section of Lot 2 is currently in a managed state, although the dominant native species *Carex appressa* is still present within the site. It is recommended that this area be allowed to regenerate to suppress potential impacts upon the EEC from the KTP "Invasion by Exotic Perennial Grasses", which is likely to place this area at greater risk of extinction.

- Mature trees, particularly those containing hollows should be retained within landscape planning for the site, where ever they can be safely retained with regard to public safety.

- A mature stand of *Melaleuca biconvexa* occurs in the northeast of Lot 34 and this stand should be retained within strategic planning for the site.

CONTENTS

1 INTRODUCTION

RPS Harper Somers O'Sullivan (RPS HSO) has been engaged by Johnson Property Group Pty Ltd (JPG) to undertake a Flora and Fauna Assessment for Lot 2 DP 517245 and Lot 34 DP 736908, Cooranbong, Lake Macquarie City Council (LMCC) LGA, colloquially referred to as Cooranbong Town Common (hereafter referred to as the site) (Figure 1-1). Targeted Flora and Fauna Assessments of the site have been undertaken in support of a rezoning application and subsequent Recreation Facility Development. This assessment has been undertaken principally to identify any ecological constraints / opportunities that would require consideration as part of rezoning of the land for the development of sporting facilities (Figure 1-2).

This report aims to recognise the relevant requirements of the *Environmental Planning and Assessment Act 1979* (*EP&A Act 1979*) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (*EP&AA Act 1997*) and the *Threatened Species Conservation Act 1995* (*TSC Act 1995*). Assessment of the site under the requirements of State Environmental Planning Policy No. 44 (SEPP 44) – 'Koala Habitat Protection' is also included. Consideration of potential constraints has also been undertaken in relation to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EP&BC Act 1999*).

Commonwealth, state and local government policies and Lake Macquarie City Council Flora and Fauna Assessment guidelines formed the basis of project surveying methodology.

1.1 Site Particulars

Locality – Cooranbong Town Common, Cooranbong

LGA – Lake Macquarie

Title(s) – Lot 2 DP 517245 and Lot 34 DP 7369088

Area – 14.1 Hectares

Zoning – Rural Living 1(2)

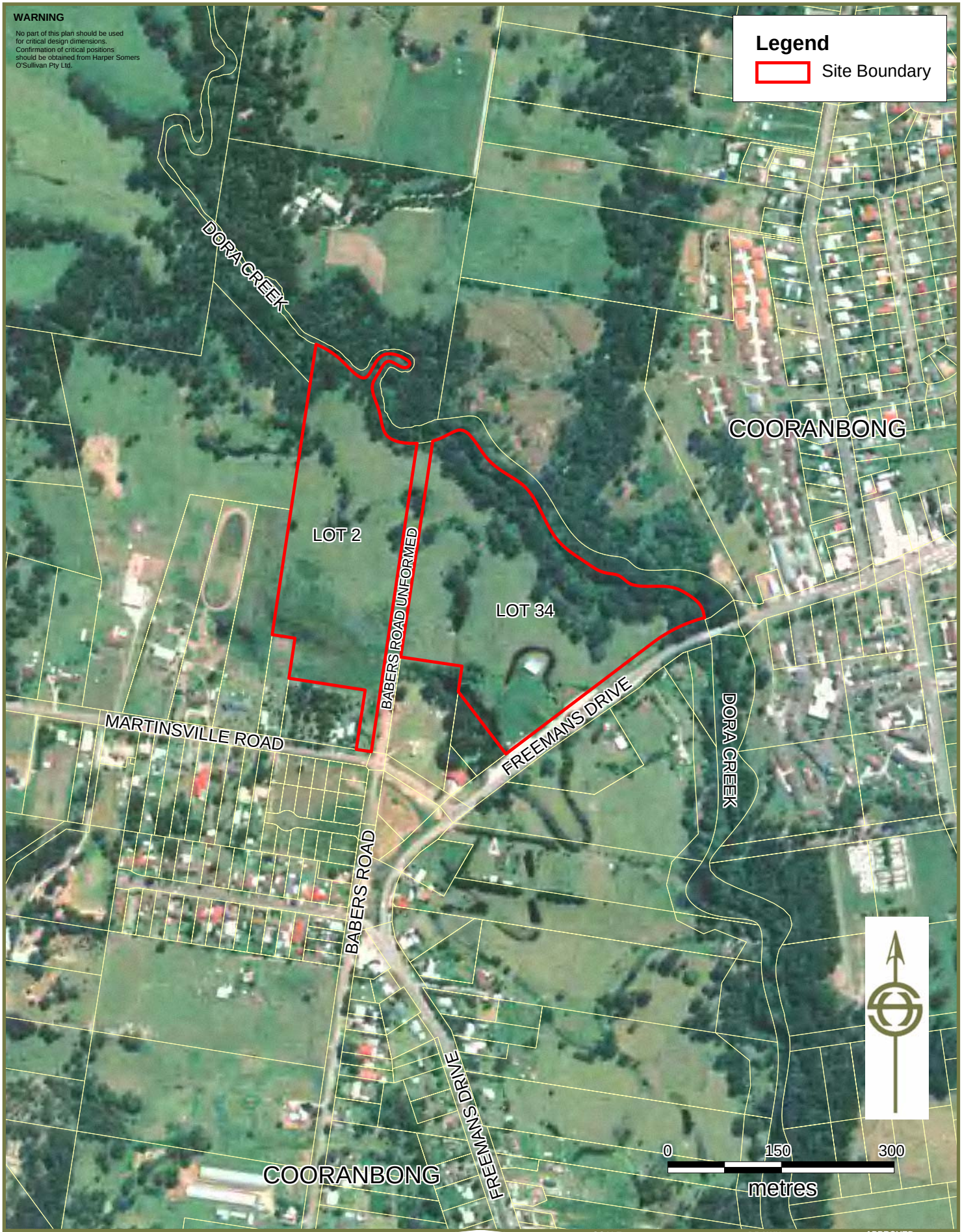
Boundaries – The site is bounded to the northeast by Dora Creek, which is zoned 7(1) Conservation (Primary), to the west by Rural Living 1(2) zoned land and to the southeast by Freeman's Drive with Rural Living 1(2) zoned land beyond. Land to the south of Lots 2 and 34 are also zoned Rural Living 1(2). Lots 2 and 34 are divided by an unformed northern section of Babers Road.

Current Land Use – The southeastern portion of Lot 34 is currently managed as what is colloquially known as Cooranbong Park the remainder of Lots 34 and Lot 2 has been in use for many years as grazing land for Dairy Cattle.

Topography – The land is generally flat and constitutes the floodplain of Dora Creek. Undulations and billabongs occur throughout the site as the remnants of past meanderings of Dora Creek. Low lying land in the south of Lot 2 represents a broad wetland area.

Vegetation – Four vegetation assemblages have been delineated on the site, namely Cleared Managed Land, Alluvial Tall Moist Forest (ATMF), Freshwater Wetland Complex and Landscape Plantings (Figure 3-1). The northeastern boundary of Lot 34 DP 736908 is defined by the present course of Dora Creek with a riparian strip of vegetation (ATMF) varying form 50m to 90m into the site. The southern corner of Lot 34 has been fenced off and maintained as what is locally known as Cooranbong Park. The vegetation is predominantly managed pasture and lawn grass species and landscape plantings of both native and exotic trees and shrubs have been added to compliment remnant trees. The remainder of Lot 34 has been used for dairy cattle grazing for a sustained period of time and is predominantly characterised by exotic pasture grasses and herbaceous weeds. Throughout Lot 34 previous courses of Dora Creek remain as backwater freshwater wetlands often surrounded by residual elements of ATMF.

Lot 2 DP 517245 is generally similar in vegetation to Lot 34 with a predominant covering of exotic grass and herbaceous pasture species. ATMF occurs as a 20m to 60m strip against the northern boundary and there are a number of billabongs along a previous course of Dora Creek through the northern portion of the lot. At the southern end of Lot 2 is an ephemeral freshwater wetland dominated by the native sedge *Carex appressa*.



TITLE:
FLORA & FAUNA ASSESSMENT
SITE LOCATION MAP

FIGURE: 1-1
PAGE: 3

CLIENT: JOHNSON PROPERTY GROUP

SCALE: 1: 6500 at A4 Size
DRAWN: A. Richardson
APPROVED: M. Doherty
DATUM: MGA Zone 56 (GDA 94)
DATE: 5/6/2007
LAYOUT REF: J:\JOBS\24k\24274 Cooranbong\Drafting\MapInfo 24274 SITE LOCATION MAP A-A4
CONTOUR INTERVAL: N/A
JOB REF: 24274

PLANNING SURVEYING ECOLOGY

HARPER SOMERS O'SULLIVAN
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
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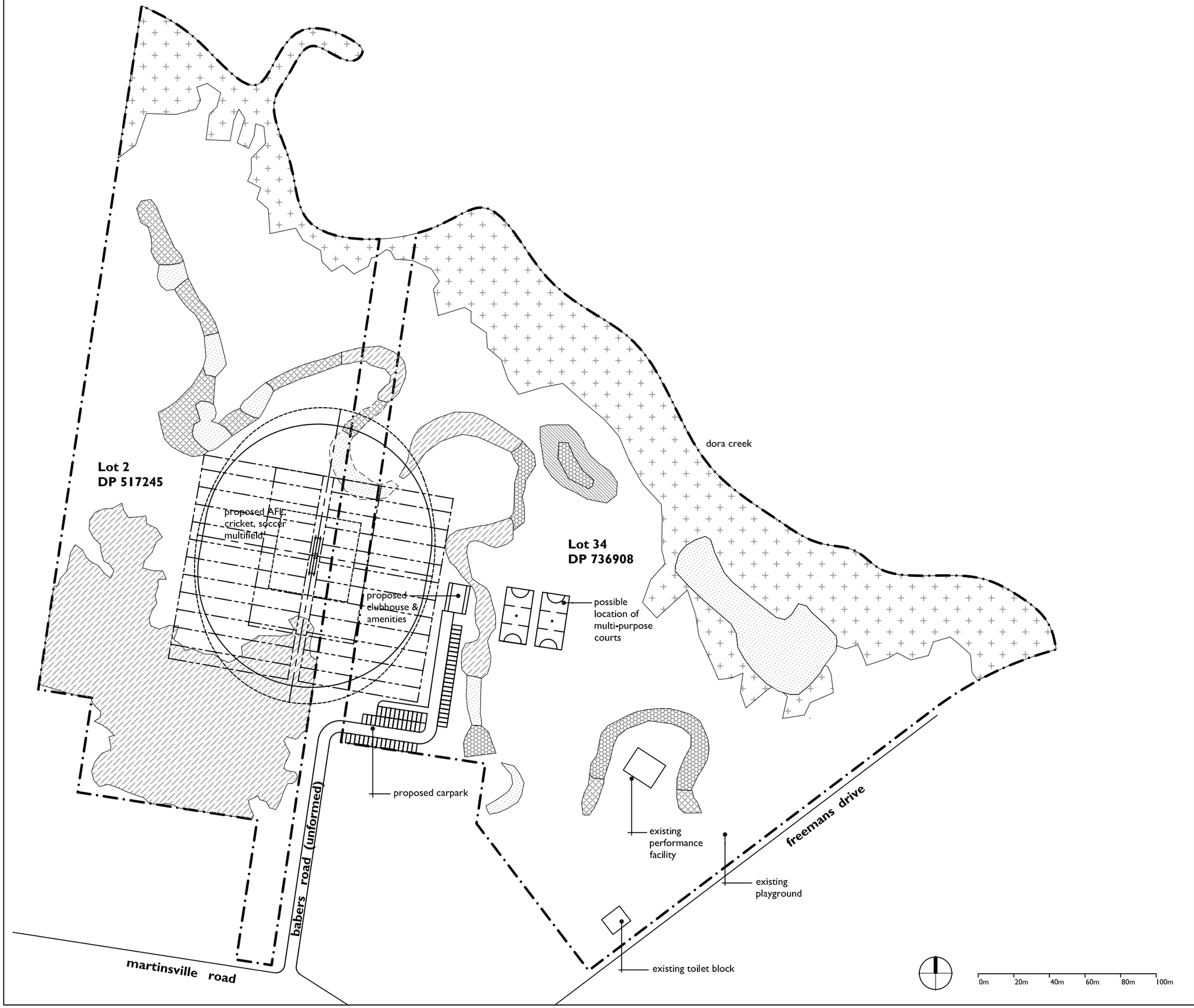

Legend

- site boundary
- possible path location
- grade 3 freshwater wetland
- grade 2-3 freshwater wetland
- grade 2 freshwater wetland
- grade 1 freshwater wetland
- melaleuca biconvexa stand
- alluvial tall moist forest
- re-aligned and revegetated watercourse

ISSUE	DATE	COMMENTS
C	10.08.07	FINAL CONCEPT
B	31.07.07	FINAL DRAFT
A	29.05.07	FOR REVIEW

Client
Johnson Property Group

Cooranbong Common Proposed Sports Facility

PROJECT NO.
0712 10/08/07

MANSFIELD BRODBECK

1.2 Description of the Proposal

This assessment has been undertaken to support a rezoning of the site from primarily Rural Living 1(2) to a mix of 6(a) Open Space and 7 Conservation for the provision of sporting facilities. It is envisaged that the rezoning will allow the provision of a multi-purpose oval, multi-purpose tennis / netball courts, cricket practice nets, clubhouse and parking facilities.

1.3 Scope of the Study

The scope of this flora, fauna and ecological constraints assessment report is to:

- identify vascular plant species found on the site;
- identify and map existing vegetation communities;
- assess the status of identified plant species and vegetation communities under relevant legislation;
- identify existing habitat types on the site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- through preliminary research identify threatened fauna potentially using the site;
- employ targeted survey techniques to identify fauna, in particular threatened species using the site; and
- assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat on the site.

Whilst survey work has been undertaken wholly within the bounds of the site, consideration has been afforded to areas off the site in order to appreciate the environmental context of the site.

The purpose of this report is to:

- ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site;
- provide information to enable compliance with applicable assessment requirements contained within the *TSC Act (1995), EP&A Act (1979)*, the Commonwealth *EPBC Act (1999)*, and any other relevant state, regional and local environmental planning instruments; and
- enable the provision and analysis of ecological data that is comparable with data for other sites within the region to ensure continuity and consistency for survey and results.

1.4 Qualifications and Licensing

Qualifications

This report was written by Allan Richardson BEnvSc (Hons), Matthew Doherty BLMC, and Craig Anderson BAppSc (EAM) of Harper Somers O'Sullivan Pty Ltd. The academic qualifications and professional experience of all RPS HSO consultants involved in the project are documented in Appendix D.

Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S10300 (Valid 30 October 2007);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2007);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2007); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 26 May 2008).

1.5 Sub-consultants, Personal Communications and Observations

Sub-consultants

The following sub-consultants / organisations were used by Harper Somers O'Sullivan during this study where appropriate input was required.

Anabat Bat Call Analysis: Maria Adams
Tel. (02) 4982 2350
Email maria.adams@optusnet.com.au

Personal Observations

Relevant observations made by the authors or other RPS HSO ecologists outside of the project or other published studies have been included within this report as 'personal observations' (pers. obs.).

1.6 Certification

As the principal author, I, Allan Richardson make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site;
- Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, or where the survey work has been undertaken with specified departures from industry standard guidelines, details of which are discussed and justified in Section 2;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995, National Parks and Wildlife Act 1974* and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Signature of Principal Author and Certifier:

Allan Richardson
Ecologist
RPS Harper Somers O'Sullivan Pty Ltd

2 METHODOLOGY

A variety of field survey techniques were employed over the course of fieldwork for this assessment to record the full suite of flora species and fauna guilds across the site.

RPS HSO have undertaken numerous assessments of this nature within the region and wider NSW. Considerable local knowledge and experience supports an excellent understanding of the key ecological issues for this locality, and in particular the management strategies required to appropriately address and accommodate these issues in accordance with the requirements of determining authorities. Our extensive portfolio coupled with commonwealth, state and local government policies and guidelines form the basis for our adopted project methodology.

Targeted and general spotlighting surveys and targeted habitat searches were undertaken across the site in place of trapping surveys.

2.1 Flora Survey

2.1.1 Vegetation Mapping

Flora surveys and vegetation mapping carried out on the site has been undertaken as follows.

- Aerial Photograph Interpretation (API) to map the community(s) extent into definable map units.
- Confirmation of the community type(s) present (dominant species) via undertaking flora surveys and identification.
- Review of Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) vegetation mapping (NPWS 2000, House 2003).
- Consideration was given to the potential for the derived vegetation communities to constitute 'Endangered Ecological Communities' (EEC) as listed within the *TSC Act (1995)*.
- Flora surveys were carried out across the site, with an emphasis on potentially significant species, as outlined below. The general flora survey also included both the formal consideration of vegetation plots and transects with each of the distinctive vegetation assemblages, as well as the casual consideration of the site in line with methodology such as the "Random Meander Technique" described by Cropper (1993).
- Map the type and general extent of the community(s) present into definable map units where appropriate.

2.1.2 Significant Flora Survey

A list of potentially occurring significant flora species from the locality (10km radius) was compiled, which included threatened species (Endangered or Vulnerable) and EEC's listed under the *TSC Act (1995)*, those species listed on the *EPBC Act (1999),* Rare or Threatened Australian Plants (ROTAP) listed flora species (Briggs and Leigh 1996), as well as any other species deemed to be of local importance.

The results of the above search indicated that one threatened flora species, namely *Melaleuca biconvexa* (Biconvex Paperbark), and one EEC, being 'Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions' (FWCF), were found to occur within the site. Consideration was given to those species identified as occurring within the region (10km radius) given past records. Targeted searches were undertaken throughout the site for these species during the survey period.

2.2 Habitat Survey

An assessment of the relative value of the habitat present on site was carried out. This assessment focused primarily on the identification of specific habitat types and resources on the site favoured by known threatened species from the region. The assessment also considered the potential value of the site (and surrounds) for all major guilds of native flora and fauna.

The assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

The results of the above assessment concluded that the billabongs across the site may constitute breeding habitat for *Litoria brevipalmata* (Green-thighed Frog), which is listed as Vulnerable under the *TSC Act 1995* and that forest vegetation within and around the edges of the site are likely to provide foraging and roosting / nesting habitat for a number of threatened fauna guilds, including, Microchiropteran bats, forest owls, nectivorous bats, cockatoos and arboreal mammals.

2.3 Fauna Survey

The fauna survey methodology initially consisted of the production of an Expected Fauna Species List for the area (Appendix C) and an assessment of the potential use of the site by threatened fauna species (as listed under the *TSC Act 1995*) identified from the vicinity of the site. This was achieved by undertaking literature and database reviews followed by confirmation through field surveys and any additional species observed were noted on the list.

2.3.1 Bat Call Detection

Bat echolocation calls were detected and recorded using an Anabat II Detector and CF ZCAIM. Emphasis was placed on those areas deemed likely to provide potential hunting site's for bats, including the canopy, open flyways, ecotones, water, and well-lit areas. The recorded calls were given to a recognised expert in bat species call identification, Maria Adams, for analysis.

2.3.2 Avifauna Survey

The presence of avifauna on the site was carried out via targeted diurnal surveys as well as opportunistic observations during all other phases of fieldwork.

Diurnal surveys were carried out during peak activity periods, that is dawn and dusk, to maximise chances of species encountered. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers, and owl regurgitation pellets etc.

Nocturnal surveys undertaken during spotlighting, attempted to identify roosting birds in a similar fashion to methods employed during diurnal surveys. Pre-recorded calls of owl species with the potential to occur within the site were broadcast in an effort to elicit vocal responses from the owls or to attract an owl to the playback site. The calls were broadcast through an amplification system (loud haler) designed to project the sound for at least 1km under still night conditions. As described by Kavanagh and Peake (1993), Debus (1995), and NPWS (1997), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species censused included *Ninox strenua* (Powerful Owl), *N. connivens* (Barking Owl), *Tyto tenebricosa* (Sooty Owl) and *T. novaehollandiae* (Masked Owl).

2.3.3 Herpetofauna Survey

Specific herpetofauna (frog and reptile) searches were carried out in each of the habitat units present. Both diurnal and nocturnal searches were made in areas of appropriate habitat. Such habitat included areas of thicker vegetation, in ground litter, near and under fallen timber, around piles of refuse, along and under sandstone bench ledges, and wet / damp areas such as drainage lines and areas of poor infiltration capacity and / or periodic inundation.

Reptile searches were largely concentrated to the hottest part of the day (early afternoon). Frog searches were largely concentrated to nocturnal survey periods. Physical frog searches were augmented by call recognition and spotlighting. Frogs were either identified on site or calls were recorded on tape for later identification. Opportunistic encounters during all other phases of fieldwork were also noted.

2.3.4 Spotlighting

Spotlighting was undertaken on site via the use of 35-Watt hand-held spotlights and head torches during walking. This was undertaken within each of the habitat assemblages identified, with priority given to those areas that were deemed most likely to contain nocturnal species, particularly arboreal and terrestrial mammals. One ecologist undertook the spotlighting surveys for a duration of 1.5 hours, giving a total of 1.5 man hours of spotlighting.

2.3.5 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators included:

- Distinctive scats left by mammals. Any scats unable to be positively identified in the field were collected for further analysis, and scats of predator species containing fur / bones were sent for analysis if appropriate;

- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;
- Scats consistent with Koalas;
- Feeding scars on *Eucalyptus* trees made by Gliders;
- Chewed *Allocasuarina* ssp. cones indicative of past feeding by Glossy Black-Cockatoos.
- Chewed fruit remains indicative of past feeding by frugivorous birds such as Fruit-Doves; and
- Whitewash, regurgitation pellets and prey remains from Owls.

Any other incidental observations of fauna were recorded during all phases of fieldwork.

3 RESULTS

The prevailing weather conditions during the survey period are presented in Table 1 below.

Table 1 Prevailing Weather Conditions

May 27 2007		
Temperature		12-24^{o}C
Wind		Low
Cloud		Clear
Rain *(24 hrs to 9:00am)*		0mm
Sun	*Rise*	06:02
	Set	17:58
Moon	*Rise*	13:58
	Set	02.07

3.1 Flora Survey

Vegetation Community Mapping

Native vegetation communities extant within the site were delineated and mapped using existing Regional vegetation community mapping (LHCCREMS), API and ground-truthing as required. A Vegetation Community Map for the site is provided in Figure 3-1. Note that this map indicates broad-scale vegetation community boundaries only.

Consultation with vegetation classification contained within the LHCCREMS Vegetation Mapping, and ground truthing of the site determined that remnant areas of native vegetation within the site corresponded to the following native vegetation communities:

- Alluvial Tall Moist Forest (MU 5), and
- Freshwater Wetland Complex (MU 46)

LHCCREMS Freshwater Wetland Complex (MU 46) is contained within the NSW Scientific Committee's final determination for the EEC 'Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions' (FWCF), which is listed under the *TSC Act 1995*. The presence of these communities was confirmed by analysis of flora species composition within the respective communities.

Mapping of FWCF contained in Figure 3-1 observes a graded scale of EEC condition, which has been derived by assessing the ephemerality of wetland areas. Those areas

that would remain wet under all conditions apart from sustained drought conditions have been designated as Grade 3 and those areas that would remain relatively dry apart from during significant periods of rainfall have been designated as Grade 1. Generally those areas designated as Grade 1 wetlands are dominated by exotic pasture species, with a minimum of wetland flora species present. The wetlands within the site are characterised by two different structural forms, linear wetlands, forming a string of relatively deep billabongs along a previous channel of Dora Creek: generally traversing the north of Lots 2 and 34,and through the central section of Lot 34. These wetlands are characterised by the presence of *Cyperus* spp. and *Persicaria* spp. with a range of other emergent, floating and submerged flora species. The other structural form, occurring in the site's southwest, is characterised by a wet depression dominated by *Carex appressa* and merges at its edges with cleared pasturelands. This area is currently in a slashed condition, but as excellent regeneration potential.

Alluvial Tall Moist Forest (ATMF) within the site is largely limited to the riparian corridor occurring along Dora Creek on the site's northern boundary. Remnant elements of ATMF persist around the edges of billabongs and within the Cooranbong Park section of Lot 34.

Outside of wetland and forested community areas, the majority of the site is cleared and it is apparent that it has been managed for a sustained period of time, as evidenced by the dominance of most cleared areas by exotic pasture grasses and introduced herbaceous plants.

In the south of Lot 34, an area commonly known as Cooranbong Park, is highly managed with mown lawns covering the site and relatively small numbers of mature trees from previously occurring vegetation communities. Landscaping works within the park have added non-endemic native tree species and gardens.

In the northeast of Lot 34 there is a mature stand of *Melaleuca biconvexa* (Biconvex Paperbark). *M. biconvexa* is listed as Vulnerable under the *TSC Act 1995*.

WARNING

Note that this Vegetation Community Map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries 'on the ground'.

Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities.

Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.

Legend

- Site Boundary
- Grade 3 FWCF EEC
- Grade 2-3 FWCF EEC
- Grade 2 FWCF EEC
- Grade 1 FWCF EEC
- *Melaleuca biconvexa*
- Hollow-bearing Tree
- Alluvial Tall Moist Forest

BABERS ROAD UNFORMED

MARTINSVILLE ROAD

FREEMANS DRIVE

0 100 200

metres

TITLE: FLORA & FAUNA ASSESSMENT
VEGETATION & CONSTRAINTS MAP

FIGURE: 3-1
PAGE: 14

CLIENT: JOHNSON PROPERTY GROUP

PLANNING SURVEYING ECOLOGY

HARPER SOMERS O'SULLIVAN

SCALE: 1: 3000 at A3 Size
DRAWN: A. Richardson
APPROVED: M. Doherty
DATUM: MGA Zone 56 (GDA 94)
DATE: 5/6/2007
LAYOUT REF: J:\JOBS\24k\24274 Cooranbong\Drafting\MapInfo 24274 VEGETATION & CONSTRAINTS MAP A-A3
CONTOUR INTERVAL: N/A
JOB REF: 24274

241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4961 6500 F: 02 4961 6794 E: survey@hso.com.au W:www.hso.com.au ABN 11 093 343 858

3.2 Habitat Survey

Habitat Description and Distribution in the Vicinity

Habitat within the site varies considerably, due to a relatively diverse range of vegetation types. The southern portion of Lot 34, commonly known as Cooranbong Park, is characterised by mown lawns, a small number of large remnant Eucalypts around the billabong to the west and landscape plantings. Generally the openness of the park provides little cover for native fauna apart from common open country species, but the inclusion of gardens around the western billabong provides cover for common small bird species. Blossom produced by canopy plants provides foraging opportunities for nectivorous birds and bats and the insects attracted by seasonal blossom and artificial lighting attracts insectivorous bats.

Billabongs within the site provide foraging areas for common water birds, including herons, kingfishers, waterfowl and rails and vegetation around the edges provide cover for small bird species. The combination of permanence and ephemerality of the billabongs constitute breeding habitat for frogs and it is possible that this habitat provides breeding habitat for *Litoria brevipalmata* (Green-thighed Frog), which is listed as Vulnerable under the *TSC Act 1995* and has been recorded within 1km of the site. The wetland area in the southwest of the site currently provides foraging for water bird and common frog species and in a regenerated state, the *Carex appressa* sedge land, which defines the perimeter of this wetland, is capable of supporting a diverse range of grassland fauna species, including birds, reptiles and amphibians.

ATMF within the site provides habitat for a range of fauna guilds including wet forest bird species, arboreal and terrestrial mammals, bats, reptiles and amphibians. ATMF within the site is likely to represent part of the foraging range of a number of threatened guilds, such as forest owls, arboreal mammals, bats and birds due to its continuity with similar habitat outside the site; although, some areas exhibit a limited structural diversity within the understorey, which reduces its potential for supporting those species that require extensive areas of dense cover.

The adjacent Dora Creek provides foraging habitat for native fishes, semi-aquatic reptiles, amphibian and semi-aquatic mammals such as *Ornithorhynchus anatinus* (Platypus) and *Hydromys chrysogaster* (Water Rats).

Despite the general open nature of habitats within the site, the juxtaposition of open habitats, wet habitat, ATMF and the creek inflate the number of species recorded, which does not accurately portray the general degraded state of the open habitats within the site.

3.3 Fauna Survey

The fauna survey methodology initially consisted of the production of an Expected Fauna Species List for the area (Appendix C) and an assessment of the potential use of the site by threatened fauna species (as listed under the *TSC Act 1995*) identified from the vicinity of the site. This was achieved by undertaking literature and database reviews followed by confirmation through field surveys where additional species observed were noted on the list.

Terrestrial mammal species recorded during recent surveys of the site were limited to introduced species, *Vulpes vulpes* (Red Fox) and domestic stock, *Bos taurus* (Cow).

Two arboreal mammals, *Pseudocheirus peregrinus* (Common Ringtail Possum) and *Trichosurus vulpecula* (Common Brushtail Possum) were observed in ATMF and at least four species of Microchiropteran bat.

3.3.1 Bat Call Detection

At least four species of microchiropteran bat were detected within the site, two of which are listed as Vulnerable under the *TSC Act 1995*, those being, *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) and *Mormopterus norfolkensis* (East Coast Freetail Bat). The site provides excellent foraging habitat for Microchiropteran bat species and due to their mobility it is likely that a diverse range Microchiropteran bat species use the site on at least an intermittent basis, including locally occurring threatened species.

3.3.2 Avifauna Survey

The combination of habitats within the site and its proximity to extensive riparian forest habitat generally inflate the species list beyond what the majority of the site is capable of supporting. By and large the site only supports common open country bird species, such as Australian Magpie, Noisy Miner, Eastern Rosella, Australian Raven and Galahs. ATMF in the site's north and its continuity with large riparian forest areas allow a diverse range of wet forest bird species to exist within the site, but their presence is limited to these forested areas.

One threatened bird species, being the Gang-Gang Cockatoo, which is listed as Vulnerable under the *TSC Act 1995*, was recorded within the site during fauna surveys. This species is limited to the canopy where it feeds upon the seed capsules of native tree species, predominantly eucalypts.

FWCF within the billabong areas provides habitat for common water bird species, including, Purple Swamphen, Pacific Black Duck, Egrets and Herons. During fauna surveys Australian White Ibis, Straw-necked Ibis, Pacific Black Duck, Chestnut Teal, Grey Teal, Masked Lapwing and White-faced Heron were noted using the wetland area in the site's southwest. In a regenerated state, the *Carex appressa* sedge land, which defines the perimeter of this wetland, is capable of supporting a diverse range of grassland bird species.

Targeted surveys for threatened forest owls did not find evidence of Powerful Owls, Masked Owls, Sooty Owls or Barking Owls, but habitat within the site is suited to forest owl species, although the occurrence of Barking Owls within the vicinity of the site is not considered likely. Recent observations of Powerful Owls have been made further down stream along Dora Creek (Local residents pers. com.) and Powerful Owls have been observed to the north of the site in previous years (RPS HSO Ecologist pers. obs.). The site is therefore likely to represent a part of the foraging range of Powerful Owls occurring within the area

Surveys were conducted at a time of year when migratory bird species are unable to surveyed within the site due to northern migratory movements, but there are no summer migrant species, which might occur within the site, that are listed within threatened species schedules.

3.3.3 Herpetofauna Survey

The cooler time of year in which surveys were conducted prevented the observation of reptile species, but a number of common reptiles, including *Lampropholis delicata* (Grass Skink), *Physignathus lesueurii* ssp. *lesueurii* (Eastern Water Dragon), *Egernia major* (Land Mullet) and *Morelia spilota* ssp. *spilota* (Diamond Python), have been previously observed within ATMF on the site. Habitat assessment of the site found that those areas likely to most important to reptile species, including any potential threatened species, will be rezoned as conservation areas.

Seven frog species were detected on the site, being *Litoria fallax* (Dwarf Tree Frog) and *Litoria verreauxii* (Verreaux's Frog), *Crinia signifera* (Common Eastern Froglet), *Limnodynastes peronii* (Striped Marsh Frog), *L. tasmaniensis* (Spotted Grass Frog) and two *Uperoleia* ssp. *U. fusca* and *U. laevigata*. Conditions within the site were not optimum for frog surveys due to the relatively low temperature and the absence of rain. Habitat assessment based upon frog species known to occur within the Cooranbong locality found that the site is largely likely to represent potential habitat for common frog species. However, the occurrence of a record for *Litoria brevipalmata* (Green-thighed Frog) within 1km of the site is noted and the billabong habitats within the site may constitute potential breeding sites for this species. *L. brevipalmata* is listed as Vulnerable within the *TSC Act 1995* and is difficult to detect, as males only call for a very limited period throughout the year and breeding advertisement is associated with very heavy rainfall events.

3.3.4 Spotlighting

Spotlighting surveys revealed the presence of two arboreal mammals, Brush-tailed Possum and Ringtail Possum on the site. No other species were observed, but the presence of arboreal mammals suggests that the site is suitable foraging habitat for Powerful Owls.

3.3.5 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) noted, during ecological surveys, were limited to scent markings by *Vulpes vulpes* (Red Fox).

4 THREATENED SPECIES AND COMMUNITIES ASSESSMENT

4.1 Identification of Subject Species and Communities

Threatened flora and fauna species (listed under the *TSC Act 1995* and/or the *EPBC Act 1999*) that have been gazetted / recorded from within the vicinity of the site have been considered within this assessment. EEC's known from the broader area have also been addressed. Each species / community is considered for its potential to occur on the site and the likely level of impact as a result of the proposal. This assessment deals with each species / community separately and identifies the ecological parameters of significance associated with the proposal.

Those species / communities that have been identified as having either a moderate or greater chance of occurring within the site or that have been recorded on site during field investigations have been subject to 7-part tests of significance in Appendix A.

This assessment deals with the following heads of consideration in tabulated form (refer to Table 2 overleaf):

'Species / Community' – Lists each threatened species / EEC's known from the vicinity. The status of each threatened species under the *TSC Act (1995)* and the Commonwealth *EPBC Act (1999)* are also provided. Note that no Endangered Populations occur in the vicinity of the site.

'Habitat Description' – Provides a brief account of the species / community and the preferred habitat attributes required for the existence / survival of each species / community.

'Chance of Occurrence on Site' – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the site in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as Atlas of NSW Wildlife, Hunter Bird Observer Club records etc) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Likely Level of Impacts from Proposal' – Assesses the likely level / significance of impacts to each species / community that would result from the proposed rezoning and subsequent development, taking into account both short and long term impacts. This assessment is largely based on the chance of occurrence of each species / community on site with due recognition to other parameters such as home range, habitat utilisation, connectivity etc. It also considers the scope of the proposal, including the likely extent of disturbance, duration of construction works etc. The 'subject species / communities' are identified within this part of the assessment process and have been recommended where necessary for the application of the Seven-part test of significance in Appendix A.

Table 2 Threatened Species and Communities Considered and Assessment of Potential Impacts

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Plants			
Acacia bynoeana Bynoe's Wattle (E, V*)	Small, prostrate shrub found in low heath and open woodland, generally on loamy clays and sand. Occurs from the Lower Hunter south to Southern Highlands. Recently found in several locations within the HEZ and other parts of the Cessnock LGA where it has been found growing in Kurri Sand Swamp Woodland (KSSW). Has also been recently recorded as isolated populations within Yellow Bloodwood Woodland and Blue-leaved Stringybark Woodland. Records for this species occur to the south of Morisset and north of Dora Creek in dry forest habitats (Atlas of NSW Wildlife data).	**Low** *A. bynoeana* occurs within the wider locality in dry sclerophyll forest, which does not occur on or within the near vicinity of the site.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Angophora inopina Charmhaven Apple (V, V*)	Small to medium tree found in shallow sandy soils in open woodland, swamp woodland and wet heath. The main occurrences of this species are in the Wyong and Lake Macquarie LGA's (from Charmhaven to Wyee and Morisset, and north to near Toronto), with disjunct populations also in Port Stephens LGA (south of Karuah).	**Low** *A. inopina* occurs within the wider locality in dry sclerophyll forest, which does not occur on or within the near vicinity of the site.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Melaleuca biconvexa Biconvex Paperbark (V, V*)	A shrub to small tree, which grows in poorly drained areas from Jervis Bay to Port Macquarie. Records in the Hunter Region are confined to western Lake Macquarie (Atlas of NSW Wildlife data).	**High** A stand of mature individuals of this species was found to occur in the northeast of Lot 34. No other individuals of this species were observed within the site	**Low** The area where this species occurs within the site will remain unchanged throughout the process of Rezoning and subsequent provision of community facilities. *Notwithstanding, as this species has been recorded within the site it has been assessed by Seven-part test in Appendix A.*
Syzygium paniculatum Magenta Lilly Pilly (V, V*)	A shrub to small tree found in sub-tropical and littoral rainforest on sandy soils or sheltered gullies mostly near watercourses. Distribution between Bulahdelah and Jervis Bay. Hunter Region records confined to the Lake Macquarie hinterland (Atlas of NSW Wildlife data).	**Low – Moderate** There is suitable habitat for this species to occur in the riparian vegetation along Dora Creek on the northeast boundary of the site. No individuals of this species were observed during flora surveys within the site.	**Low** Habitat within which this species is likely to occur within the site will remain unchanged as a consequence of the proposal.
Tetratheca juncea Black-eyed Susan (V, V*)	Occurs in a variety of forested and heathy habitats. Locally found in Open Forests and Woodlands with dense, undisturbed understorey, often in association with *Angophora costata* / *Corymbia gummifera* on slopes with south-easterly aspects.	**Low** *T. juncea* occurs within the wider locality in open forest type habitats exhibiting a dense understorey stratum and this habitat does not occur on or within the near vicinity of the site.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Herpetofauna			
Crinia tinnula Wallum Froglet (V)	Occurs in coastal, low-lying acid Paperbark forest, within the 'wallum country' (often on sandy soils). Regional records for this species are confined to three main areas; Lake Macquarie, Central Coast and Medowie and Port Stephens (DEC 2005).	**Low** Within the wider locality *C. tinnula* has been recorded within poorly draining open forest habitats with heathy understoreys and Swamp Sclerophyll Forests where paperbarks are often present. The site is characterised by open grassland and wet sclerophyll forests, which are not suitable habitat for this species	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Heleioporus australiacus Giant Burrowing Frog (V, V)	This species is mostly restricted to Hawkesbury Sandstone. Usually found around sandy creek banks, with crayfish burrows in this area (Robinson, M. 1996). Hunter Region records confined to Olney State Forest (Atlas of NSW Wildlife data).	**Low** Records for this species occur in the sandy forests occurring on weathered tops of the Watagan Range. Habitat within the site contrasts markedly with known habitat.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Litoria brevipalmata Green-thighed Frog (V)	Occurs in a range of habitats in areas where surface water gathers after rains. Males congregate around temporary pools that form after very heavy rains. Only record within the catchment of Hunter River from two separate locations within the HEZ, otherwise found in Olney State Forest (Atlas of NSW Wildlife data).	**Moderate – High** This species has been recorded elsewhere in the Martinsville valley and a record (Atlas of NSW Wildlife data) occurs within 1km of the site. Billabongs within the site may represent breeding habitat for this species when conditions are favourable.	**Low** The provision of a sporting oval, within Lot 2, as proposed within concept planning, subsequent to proposed rezoning of the site, will displace a small area of billabong in the northern section of Lot 2, which may represent breeding and shelter habitat for this species. The provision of additional habitat north of the displaced habitat area, sediment and water management plans and pre-works habitat searches, as contained within recommendations provided in Section 7, if adopted, will ensure that this species is unlikely to be significantly impacted upon by the Rezoning process or subsequent provision of community facilities. *Notwithstanding, as this species has a moderate- high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Litoria littlejohni Little John's Tree Frog (V, V*)	A pale brown frog with dark speckles, which occurs along permanent rocky creeks with thick fringing vegetation, associated with eucalypt woodlands and heaths among sandstone outcrops. Occurs on the plateaus and eastern plains of the Great Dividing Range. Records within the Hunter Region occur from within the Watagan State Forest.	**Low** Records for this species occur in the sandy forests occurring on weathered tops of the Watagan Range. Habitat within the site contrasts markedly with known habitat.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Mixophyes balbus Southern Barred Frog (E, V*)	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breed in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.	**Low** Occurs within the locality along mountain streams, but unlikely to occur in lowland habitats such as occur within the site.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Mixophyes iteratus Giant Barred Frog (V)	Mostly restricted to wet sclerophyll forest and rainforest, including Antarctic Beech forest. Usually found within close proximity to permanent running water (Robinson, M, 1996). Hunter Region records are largely confined to the Watagan National Park and to the north of Heaton State Forest (Atlas of NSW Wildlife data).	**Low** Occurs within the locality along mountain streams, but unlikely to occur in lowland habitats such as occur within the site.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.
Pseudophryne australis Red-crowned Toadlet (V)	Generally restricted to Hawkesbury Sandstone where it may be found beside temporary creeks, gutters and soaks and under rocks and logs. Breeds in deep leaf litter inundated with heavy rain (Robinson, M, 1996). Records from the Hunter Region exist in Olney State Forest (DEC).	**Low** Records for this species occur in the sandy forests occurring on weathered tops of the Watagan Range. Habitat within the site contrasts markedly with known habitat.	**Low** Highly unlikely to occur due to the lack of suitable habitat within the site, therefore no impact is expected.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Hoplocephalus stephensii Stephens' Banded Snake (V)	*Hoplocephalus stephensii* is a nocturnal, partly arboreal snake. It inhabits wet sclerophyll forest and rainforest from Gosford (N.S.W.) north to southern Queensland. This snake is usually found under loose bark on trees or in hollow limbs. The diet of *H. stephensii* consists of lizards, frogs, birds and small mammals.	**Moderate – High** Riparian vegetation along Dora Creek provides suitable habitat for this species, although no individuals have been recorded within the site.	**Low** Habitat within which this species is most likely to occur within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate - high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Avifauna			
Ephippiorhynchus asiaticus Black-necked Stork (E)	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	**Low** This species has been recorded in freshwater swamps within the locality and a record (Atlas of NSW Wildlife data) exists within 0.5km of the site from 1992. Although local records exist other habitat in the locality is of greater suitability for this species and it is unlikely to use the site for more than a rare occurrence.	**Low** Unlikely to occur based on known local movements (RPS HSO ecologist pers. obs.) and the lack of highly suitable habitat within the site, therefore no significant impact is expected.
Ixobrychus flavicollis Black Bittern (V)	Solitary species, living near water (estuarine to brackish) in mangroves and other trees which need to form only a narrow fringe of cover. A riparian species that occasionally ventures into the open within estuarine habitats.	**Moderate** This species is known to be resident along Dora Creek, but it appears to prefer the brackish waters below the Cooranbong weir (RPS HSO Ecologist pers. obs.) and is unlikely to use the freshwater reaches adjacent to the site on more than an intermittent basis.	**Low** This species is restricted to Riparian habitats and those areas suitable for this species within the subject site will remain unchanged as a consequence of the proposed development. *Notwithstanding, as this species has a moderate chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Pandion haliaetus Osprey (V, M*)	Requires water bodies for fishing in close proximity (usually <1km) to suitably tall nesting site such as dead tree, power pole etc. Recorded from various sites around Lake Macquarie, Port Stephens and the Hunter River Estuary. Mostly an accidental species in inland / freshwater wetland habitats.	**Low** Although this species may fly over the site on rare occasions and there are mature trees large enough for nesting purposes within the site, it is unlikely that ospreys would use the site due to its distance from estuarine hunting habitats that they frequent. Known nesting sites in the area (RPS HSO ecologist per. obs.) are much closer to Lake Macquarie.	**Low** Highly unlikely to use the site due to the lack of suitable habitat, therefore no impact is expected.
Callocephalon fimbriatum Gang-Gang Cockatoo (V)	Found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Within the Hunter Region this species has been found in the Kurri Kurri and occurs in the Watagan Mountains and adjacent areas.	**High** One individual of this species was observed within the site during fauna surveys and groups of up to ten individuals have been observed elsewhere in the locality during the Autumn of 2007. In the local area, at this altitude, this species is generally found within dry-sclerophyll forests and it is unlikely to use canopy tree species within the site on more than an intermittent basis.	**Low** Unlikely to occur within the site on a continuous basis, based on known local movements (RPS HSO ecologist pers. obs.). and the lack of highly suitable habitat within the site, therefore no significant impact is expected. *Notwithstanding, as this species has a high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones. Requires large Eucalypt tree hollows for nesting.	**Moderate** Feed trees for this species do occur within the site and local populations of this species are known to occur regularly within dry sclerophyll forests to the north of Cooranbong and the foothills of the Watagan mountains.	**Low** Potential foraging habitat for this species within the site will remain unchanged during the process of development. *Notwithstanding, as this species has a moderate chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Ninox strenua Powerful Owl (V)	Occurs in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas.	**High** A number of records for this species occur within the vicinity of the site and riparian vegetation along Dora Creek is likely to represent important hunting habitat for locally occurring individuals due to the suitability of this habitat for arboreal mammals, which are the favoured prey of Powerful Owls. Furthermore this species has been recorded roosting in the vicinity of the site (RPS HSO ecologist pers. obs.) (Local residents pers. obs.), as the dense riparian vegetation is highly suitable for the roosting purposes of this species. It is likely that breeding hollows occur within the vicinity of the site.	**Low** Habitat most suitable for this species will remain unchanged as a consequence of the proposal therefore no impact is expected. *Notwithstanding, as this species has a high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Lathamus discolor Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging sites often vary from year to year. Nests only in Tasmania, but regularly visits the Hunter Region in winter.	**Low – Moderate** This species visits the local area from late Autumn to late winter. It feeds on the blossoms of winter-flowering eucalypts and lerps occurring on the leaves. There are no winter-flowering eucalypts within the site although they do occur in the immediate vicinity. The site is unlikely to represent significant habitat for this species.	**Low** Unlikely to use the site for foraging purposes based on known local movements (RPS HSO ecologist pers. obs.) and the lack of suitable foraging habitat within the site, therefore no significant impact is expected.
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate / preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well.	**Low** This species was not detected during targeted field surveys and the site does not contain suitable habitat for the terrestrial mammal prey favoured by this species. There are no trees containing hollows that might represent potential nesting or roosting opportunities for this species within the site,	**Low** Unlikely to occur based on the lack of highly suitable habitat within the site, therefore no significant impact is expected.
Tyto tenebricosa Sooty Owl (V)	Occurs in wet Eucalypt forest and rainforest with tall emergent trees, often in easterly facing gullies. Within these areas this species hunts for a range of mainly mammalian prey at all levels of the forest strata. Roosts in tree hollow or dense canopy vegetation. Also nests in large Eucalypt tree hollows. Most Hunter records exist from the Watagan mountains (DEC 2005), but this species has also been observed to the southwest of Awaba (RPS HSO pers. obs.).	**Moderate** Known to occur locally in type habitat within the Watagan Mountains (RPS HSO ecologist pers. obs.) and records occur with 2.5km of the site at Matthews Valley Road. Riparian vegetation occurring along Dora Creek provides suitable hunting and breeding habitat for this species.	**Low** Habitat most suitable for this species will remain unchanged as a consequence of the proposal therefore no impact is expected. *Notwithstanding, as this species has a moderate chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Xanthomyza phrygia Regent Honeyeater (E, E*)	Nomadic honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Nests mainly west of the divide, although more easterly breeding attempts have occurred at Quorrobolong in the lower Hunter Valley. Uses Swamp Mahogany blossom in the Lake Macquarie LGA intermittently.	**Low** This species only uses coastal habitats on an intermittent basis when western blossom is in low abundance. Records for this species occur within 0.5km of the site, but they are old records (1958 & 1968) and may have been made at a time when winter flowering *Eucalyptus* sp. occurred in higher densities within the vicinity. There are winter-flowering eucalypts (*E. tereticornis* and *E. robusta*) in the immediate vicinity of the site, but they are not considered of sufficient extent to attract this species on more than an accidental basis	**Low** This species is unlikely to be threatened by the proposed development due to minimal habitat opportunity within the site.
Mammals			
Dasyurus maculatus Spotted-tailed Quoll (V, V*)	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges (Atlas of NSW Wildlife data).	**Low** Although seemingly suitable habitat exists within the vicinity of the site, this species is known to avoid areas of human habitation and potential habitat within the vicinity is adjacent to urban areas. Records occur in the Watagan Mountains, but not recorded within the vicinity of the site.	**Low** Unlikely to occur based on the lack of highly suitable habitat within the site, therefore no significant impact is expected.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Petaurus norfolcensis Squirrel Glider (V)	Occurs in Eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.	**Moderate – High** Forested habitats occurring along Dora Creek represent potential habitat for this species and it is possible that the site represents part of the range of locally occurring populations.	**Low** Those areas of potential habitat most important to this species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate - high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Petaurus australis Yellow-bellied Glider (V)	Usually associated with tall, mature wet Eucalypt forest. Also known from tall dry open forest and mature woodland. The diverse diet of this species is primarily made up of Eucalypt nectar, sap, honey dew, manna and invertebrates found under decorticating bark and pollen. Tree hollows for nest sites are essential, as are suitable food trees in close proximity. Most records in the Lower Hunter Region occur in the Watagan Mountains and other areas exhibiting significant stands of forest (Atlas of NSW Wildlife data).	**Moderate – High** Forested habitats occurring along Dora Creek represent potential habitat for this species and it is possible that the site represents part of the range of locally occurring populations.	**Low** Those areas of potential habitat most important to this species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate - high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Macropus parma Parma Wallaby (V)	Forested areas with dense understorey, often in wet sclerophyll and rainforests. Records exist from the Watagan Mountains in the south of the Hunter Region (Atlas of NSW Wildlife data).	**Low** No suitable habitat exists within the site for this species.	**Low** Unlikely to occur based on the lack of suitable habitat within the site, therefore no significant impact is expected.
Petrogale penicillata Brush-tailed Rock Wallaby (E, V*)	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with suitable caves and rocky overhangs for shelter. Records exist from the Watagan Mountains where it is associated with the above habitats (DEC 2005; RPS HSO pers. obs.).	**Low** No suitable habitat exists within the site for this species.	**Low** Unlikely to occur based on the lack of suitable habitat within the site, therefore no significant impact is expected.
Phascolarctos cinereus Koala (V)	Occurs in forests and woodlands where it requires suitable feed trees (particular *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Records from the Lower Hunter Region are largely confined to the greater Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains, with a small number of records from Cessnock LGA (DEC 2005).	**Low** Habitat within the site does represent is defined by SEPP 44 as potential Koala habitat due to the occurrence of *Eucalyptus microcorys* within the site and *E. robusta* and *E. tereticornis* immediately adjacent to the site, but the site cannot be considered to constitute actual Koala habitat as defined within SEPP 44 due to the lack of recent records for this species in the vicinity of the site.	**Low** Unlikely to occur based on the lack of suitable habitat within the site, therefore no significant impact is expected.
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Roosts in communal base camps situated within wet sclerophyll forests or rainforest. Likely to forage in Eucalypts when flowering.	**High** This species has been observed in the local area and is known to range widely to access the fruits of rainforest trees and the seasonal blossom of *Eucalyptus* spp. It is therefore highly likely that it would use habitat within the site when resources are available. The site is not known to be used by this species as a roosting camp.	**Low** Although this species is likely to use the site on a seasonal basis, habitat that is considered most important to this species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Hunter Region records for this species are largely confined to the Watagan Mountains, but it has been recorded on the southern side of Port Stephens and locally in the LMCC LGA (Atlas of NSW Wildlife data).	**Moderate – High** This species has been recorded within the locality of the site and due to its mobility and the suitability of on site habitat for foraging it is likely to visit the site on at least an intermittent basis. No roosting habitat for this species occurs within the vicinity.	**Low** Although this species is likely to use the site for foraging, habitat that is considered important to this species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate - high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Miniopterus australis Little Bentwing-bat (V) *Miniopterus schreibersii* Eastern Bentwing-Bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests. Requires caves or similar structures for roosting habitat. This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat.	**Moderate – High** *M. schreibersii* was recorded within the site during bat surveys and due to its far ranging foraging movements *M. australis* is likely to use the site on at least an intermittent basis. The site provides foraging habitat for both these species, but there are no roosting opportunities for them within the vicinity of the site.	**Low** Although these species are likely to use the site for foraging, habitat that is considered important to these species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate - high chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Myotis adversus Large-footed Myotis (V)	Usually found near bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost site. Although usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest, woodland, and swamp forest. Roosts in small colonies of between 15 and several hundred individuals in caves, mines and disused railway tunnels. A number of records from the Central Coast, with fewer numbers in the Lower Hunter Region (DEC 2005) and Central Hunter Region (RPS HSO pers. obs.).	**Moderate – High** Although not recorded within the site foraging habitat occurs within and adjacent to the site and it is likely to use the site on at least an intermittent basis. Buildings within the site may provide roosting opportunities for this species	**Low** Although these species are likely to use the site for foraging, habitat that is considered important to these species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Lower Hunter Region (Atlas of NSW Wildlife data).	**Moderate – High** Although not recorded within the site this species is far ranging in its foraging movements and is likely to use the site on at least an intermittent basis. The site provides foraging habitat for this species and it may roost within tree hollows on the site or within its vicinity.	**Low** Although these species are likely to use the site for foraging, habitat that is considered important to these species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows. A limited number of records occur on the central coast and the Lower Hunter Region (Atlas of NSW Wildlife data).	**Moderate – High** Although not recorded within the site this species is far ranging in its foraging movements and may use the site on at least an intermittent basis. The site provides foraging habitat for this species and it may roost within tree hollows on the site or within its vicinity.	**Low** Although these species are likely to use the site for foraging, habitat that is considered important to these species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as this species has a moderate chance of occurring on the site it has been assessed by Seven-part test in Appendix A.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Mormopterus norfolkensis East-coast Freetail-bat (V) *Scoteanax rueppellii* Greater Broad-nosed Bat (V)	This species forages predominantly in dry forests and woodlands east of the divide. It roosts in tree hollows, under bark and within man-made structures. Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces / ecotones. This species roosts in tree hollows.	**Moderate – High** *S. rueppellii* has been recorded within the site previously (Atlas of NSW Wildlife data) and *M. norfolkensis* was recorded within the site during bat surveys. The site provides both foraging and roosting habitat for both these species.	**Low** Although these species are likely to use the site for foraging and roosting on at least an intermittent basis, habitat that is considered important to these species within the site will remain unchanged as a consequence of the proposal. *Notwithstanding, as these species have a high chance of occurring on the site they have been assessed by Seven-part test in Appendix A.*
Endangered Ecological Communities			
Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions	Associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands. They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. Wetlands or parts of wetlands that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by amphibious plants including *Paspalum distichum*, *Leersia hexandra* and *Carex appressa*. Wetlands or parts of wetlands subject to regular inundation and drying may include large emergent sedges over 1 metre tall, such as *Baumea articulata, Eleocharis equisetina* and *Lepironia articulata*. Correlates with LHCCREMS Map Unit (MU) 46 – 'Freshwater Wetland Complex'.	**High** Occurs within the site as a series of billabongs defining a previous course of Dora Creek, a large wetland area dominated by *Carex appressa* in the south of Lot 2 and at least two isolated wetlands that are likely remnants of previous Dora Creek channels.	**Low** The provision of a sporting oval, within Lot 2, as proposed within concept planning subsequent to proposed rezoning of the site, will displace a small area of billabong in the northern section of Lot 2, which has been identified as this EEC. Furthermore, the above-mentioned sporting oval will displace a small area at the ecotonal edge of the *Carex appressa* sedgeland that represents part of this EEC in the southwest corner of the site. The provision of additional replacement habitat north of the displaced habitat area, allowance for the natural regeneration of the southwestern sedgeland and sediment and water management plans, as contained within recommendations provided in Section 7, if adopted, will ensure that this EEC is not significantly impacted upon by the Rezoning process or subsequent provision of community facilities. *A Seven-part test of significance will need to be applied for this community at a later stage of the assessment process to accurately determine the significance of potential impacts upon areas of FWCF within the site.*
River-flat Eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Composition of the tree stratum varies considerably; the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (Forest Red Gum), *E. amplifolia* (Cabbage Gum), *Angophora floribunda* (Rough-barked Apple) and *A. subvelutina* (Broad-leaved Apple). Correlates with LHCCREMS communities - 'Central Hunter Riparian Forest' Map Unit (MU) 13, 'Wollombi Redgum-River Oak Woodland' MU14 and 'Redgum Roughbarked Apple Swamp Forest' MU38.	**Low** A small number of representative elements from previously existing 'Red Gum Rough-barked Apple Swamp Forest' occur both within and immediately adjacent to the site, namely, a small stand of *E. tereticornis* off site to the south and *A. floribunda* in the southeast of Lot 34. No other structural elements of this community occur within the site and as such no area of vegetation within the site can be considered to represent this EEC.	**Low** Unlikely to occur based on the lack of significant vegetation components within the site, therefore no significant impact is expected.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Swamp Sclerophyll Forest on Coastal Floodplains	The community is associated with humic clay or sandy loams on waterlogged or episodically flooded alluvial flats and drainage lines within coastal floodplains. It is generally characterised by an open to dense canopy of eucalypts and / or paperbarks. Canopy heights generally vary from 8m to 25m depending on species composition. In the Hunter Region the canopy often contains *Eucalyptus robusta* and / or *Melaleuca quinquinervia* although other plant species, such as *Callistemon salignus*, *Casuarina glauca*, *Eucalyptus resinifera* subsp. *hemilampra*, *Livistona australis* may be present. Small trees and shrubs, including *Melaleuca* sp., *Glochidian ferdinandi*, *Acacia* sp. *Leptospermum polygalifolium* subsp. *polygalifolium* and *Dodanaea triquetra*, are often present in the lower strata. Correlates with LHCCREMS Map Unit (MU) 42 'Riparian Melaleuca Swamp Woodland', MU42a – 'Melaleuca Scrub', MU43 – 'Wyong Paperbark Swamp Forest' and MU43a – 'Melaleuca Scrub'.	**Low** A small number of *E. robusta* trees occur immediately off site to the southwest of lot 34, but there is no other evidence that this vegetation community occurred within the site in the past and it cannot be considered to occur on the site in the present.	**Low** This species is unlikely to be threatened by the proposed development due to the lack of its existence within the site.

Key: ***(V)*** *= Vulnerable Species listed under Threatened Species Conservation Act 1995 (TSC Act 1995).*
(E) *= Endangered Species listed under TSC Act 1995.*
(V*) *= Vulnerable Species listed under Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).*
(E*) *= Endangered Species listed under EPBC Act 1999.*
(CE*) *= Critically Endangered Species listed under EPBC Act 1999*
(M*) *= Listed as a Migratory species under the EPBC Act 1999*

4.2 Key Threatening Processes

A Key Threatening Process (KTP) 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. Something can be a threat if it:

- *adversely affects two or more threatened species, populations or ecological communities; or*

- *could cause species, populations or ecological communities that are not currently threatened to become threatened.*

KTP's are listed in Schedule 3 of the *TSC Act (1995)*. Those potentially applicable to the current rezoning and a future development proposal (both directly and indirectly) are summarised below and detailed in Appendix A (Section G).

- The proposed development will require the removal of some small areas of native vegetation and as such could contribute to the KTP "Clearing of Native Vegetation". Clearing of vegetation at this scale represents a small cumulative impact and as such it is unlikely to significantly contribute to this process on a regional scale.

- The proposal is likely to contribute to the KTP "Invasion by Exotic Perennial Grasses" as a result of excavation works and ongoing vegetation management within the site. The extent to which the proposal could contribute to this process is, for the most part, considered unlikely to be significant, given that this KTP is already prevalent within the site, but ongoing management of EEC areas, particularly in the southwest of Lot 2, would be likely to provide opportunity for this KTP into the future.

- The proposal is likely to contribute to the Key Threatening Process "Human Caused Climate Change" as a result of clearing vegetation. It is considered that clearing and modification of the landscape would constitute a minor incremental change. Thus the extent to which the proposal could contribute to this process is considered unlikely to be significant.

No other KTP's are believed to be relevant to the current proposal.

5 CONSIDERATIONS UNDER SEPP 44 – 'KOALA HABITAT PROTECTION'

5.1.1 First Consideration – Is the Land 'Potential Koala Habitat'?

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

> *"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".*

One tree species listed in Schedule 2 of SEPP No. 44 – 'Koala Habitat Protection' occurs on site, namely *E. microcorys* (Tallowwood) and a further two Schedule 2 tree species, being, *Eucalyptus robusta* (Swamp Mahogany) and *E. tereticornis* (Forest Red Gum) occur in the immediate vicinity of the site.

E. microcorys occurs as a component of ATMF along Dora Creek and *E. robusta* and *E. tereticornis* occur immediately over the southwestern boundary fence of Lot 34. None of these species occur at a density of greater than 15% of the existing canopy within the site. Therefore, the site is considered not to constitute 'Potential Koala Habitat' as defined by the SEPP.

5.1.2 Second Consideration – Is the Land 'Core Koala Habitat'

Nevertheless searches were made for any secondary indications of Koalas on the site including scats, scratches on tree trunks, scent markings on tree trunks, tracks in the soil and audible noises including territorial or mating calls, fighting and movement in the trees. Searches for direct observations of Koalas were also conducted during a nocturnal survey. No animals were noted on site and no secondary evidence of the presence of Koalas could be found.

Therefore no further provisions of this policy apply to the site.

6 CONSIDERATIONS UNDER THE EPBC ACT 1999

Considerations have been made under the Commonwealth *EPBC Act (1999*). Searches of the Department of Environment and Heritage On-line Database were undertaken to gather baseline data on the site and general locality. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed on the site will have, or is likely to have a significant impact upon a matter of National Environmental Significance (NES), or on the environment of Commonwealth land*.

* The site is not land owned by the Commonwealth, and hence this portion of the Act is not applicable. The matters of NES and site-specific responses are listed below.

- *World Heritage areas:*

The site is not a World Heritage area, and is not in close proximity to any such area.

- *Wetlands protected by international treaty (the RAMSAR convention):*

The site is not part of any RAMSAR Wetland area, and is not in proximity to any such area.

- *Nationally listed threatened species and ecological communities:*

A total of 15 nationally listed threatened species under the *EPBC Act 1999* have been recorded within the proximate region of the site as follows:

- *Syzygium paniculatum* Magenta Lilly Pilly
- *Acacia bynoeana* Bynoe's Wattle
- *Angophora inopina* Charmhaven Apple
- *Melaleuca biconvexa* Biconvex Paperbark
- *Tetratheca juncea* Black-eyed Susan
- *Chelonia mydas* Green Turtle
- *Heleioporus australiacus* Giant Burrowing Frog
- *Litoria littlejohni* Littlejohn's Tree Frog
- *Mixophyes iteratus* Giant Barred Frog
- *Chalinolobus dwyeri* Large-eared Pied Bat
- *Dasyurus maculatus* Spotted-tailed Quoll
- *Petrogale penicillata* Brush-tailed Rock-Wallaby
- *Pteropus poliocephalus* Grey-headed Flying-fox
- *Lathamus discolor* Swift Parrot
- *Xanthomyza phrygia* Regent Honeyeater

The potential for the proposal to significantly impact on individuals or local populations for the above species has been assessed under the provisions of the *TSC Act 1995*. This assessment concluded that it is considered unlikely the current proposal will have a significant impact upon a local population such that local extinctions would occur. Likewise, it is considered that no significant impacts are likely to occur on a Commonwealth level. Thus referral to the Department of Environment and Water Resources (DEW) is not necessary.

- *Nationally listed migratory species:*

Four nationally listed migratory species have been recorded within the locality of the site,

- *Merops ornatus* Rainbow Bee-eater (M*)
- *Pandion haliaetus* Osprey (V, M*)
- *Haliaeetus leucogaster* White-bellied Sea Eagle (M*)
- *Xanthomyza phrygia* Regent Honeyeater (E, M*)

The potential for the proposal to significantly impact on individuals or local populations for the above species has been assessed under the provisions of the *TSC Act 1995* or based on potential to be impacted upon by the proposal. This assessment concluded that it is considered unlikely the current proposal will have a significant impact upon a local population of nationally listed migratory species such that local extinctions would occur. Thus referral to the DEW is not necessary.

- *All nuclear actions:*

No type of nuclear activity is proposed for the site.

- *The environment of commonwealth marine areas:*

The proposed activity on the site will not have a significantly adverse effect on any Commonwealth marine area.

Summary Statement:

Based on the above, it is considered the current proposal will not have a significant impact on any matters of NES under the *EPBC Act (1999)*; hence referral to the DEW is not necessary.

7 CONCLUSION AND RECOMMENDATIONS

Conclusion

RPS Harper Somers O'Sullivan (RPS HSO) has been engaged by Johnson Property Group Pty Ltd (JPG) to undertake a Flora and Fauna Assessment for Lot 2 DP 517245 and Lot 34 DP 736908, Cooranbong, Lake Macquarie City Council (LMCC) LGA, commonly referred to as Cooranbong Town Common (hereafter referred to as the site). Vegetation, within the site is generally open pastureland, which supports a common avian and introduced or domestic mammals. The northeastern portions of Lots 34 and 2 are characterised by ATMF, which form part of the riparian wet sclerophyll forest that is associated with Dora Creek. Previous meanderings of Dora Creek traverse both Lots 2 and 34 and are represented by a line of permanent to ephemeral billabongs. The billabongs were identified as the EEC "Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions" (FWCF). FWCF is listed as an EEC under the *TSC Act 1995*. FWCF within the site is also represented by a wetland area in the south of Lot 2, which is dominated by *Carex appressa*. A mature stand of *Melaleuca biconvexa* (Biconvex Paperbark) occurs in the northeast of Lot 34. *M. biconvexa* is listed as Vulnerable under *TSC Act 1995*. Habitat suited to threatened species within the site is largely limited to ATMF and FWCF within the site, but landscape plantings and artificial lighting associated with the Cooranbong Park area of Lot 34 provide good hunting conditions, suited to locally occurring Microchiropteran bats, including threatened species.

Although fauna surveys recorded limited diversity within the site, habitat assessment concluded that the site has the potential to represent part of the range of a number of threatened species guilds, specifically, within ATMF, potential foraging habitat for Forest Owls, Microchiropteran bats, Flying-foxes, Gliders, Cockatoos and Reptiles, potential roosting / nesting habitat for Forest Owls, Microchiropteran bats, Gliders, Cockatoos and Reptiles. FWCF within the site has the potential to represent breeding habitat for *Litoria brevipalmata* (Green-thighed Frog), which has been recorded within 1km of the site (Atlas of NSW Wildlife data) and is known to breed in ephemeral wetlands proximate to wet riparian forest habitats. *L. brevipalmata* is listed as Vulnerable under the *TSC Act 1995*.

For the most part, finalised concept planning for the site has positioned community sporting facilities and amenities within open areas where potential impacts to significant ecological entities has been avoided. However the positioning of a sporting oval within Lot 2 overlays a small section of FWCF billabong in the north of Lot 2 and the ecotonal edge of the *Carex appressa* sedgeland in the south of Lot 2. The billabong area also represents potential breeding habitat for *L. brevipalmata*. Impact to areas of EEC and potential *L. brevipalmata* habitat have been kept to a minimum by careful placement of onsite facilities and total impacts to these areas will be offset, by the replacement of billabong habitat to the north of the displaced area, the regeneration of remaining *Carex appressa* sedgeland EEC in the southwest of the site and the re-establishment of a similar sized area of *Carex appressa* sedgeland to that displaced elsewhere within the site.

An assessment was undertaken of the potential effects of the proposal under the guidelines of Section 5A of the *EP&A Act 1979* (Seven-part Test) for the threatened species/populations/ecological communities recorded on site and known from the region. This assessment determined that no significant impact was likely to result from the proposal, given that appropriate reference to recommendations provided is incorporated into future development planning.

Recommendations

The following recommendations have been generated to provide ecological guidelines for rezoning and development of the site to offset potential impacts as a result of the proposal.

- It is recommended that areas of the site not utilised for recreation facilities be rezoned as conservation lands.

- The sporting oval section of the development overlays a small section of Billabong in the northern section of Lots 2 and 34 and the unformed section of Babers Road. This billabong area constitutes the EEC 'Freshwater Wetlands on Coastal Floodplains' and may also represent breeding habitat for *L. brevipalmata*, which is listed as vulnerable under the *TSC Act 1995*. It is recommended that a similar area of billabong be established above the displaced area as it is considered that this habitat provision would adequately ensure continuity of habitat and offset the loss of EEC area during development.

- It is further recommended that an ecologist conduct targeted habitat searches for *L. brevipalmata* individuals immediately prior to excavation and fill works within the vicinity of the billabong areas.

- The occurrence of the EEC 'Freshwater Wetlands on Coastal Floodplains' within close proximity to excavation areas, place them at risk from the movement of sediments during rainfall events. It is recommended that a strategic sediment and water management plan be developed and incorporated into subsequent development works to prevent impacts to waterways and EEC's within the site and adjacent areas as a consequence of earthworks on the site.

- An area of 'Freshwater Wetlands on Coastal Floodplains' EEC, represented by a *Carex appressa* sedgeland, occurs in the southern section of Lot 2. The sporting oval area of proposed subsequent development will overlay a small area of the northeastern ecotonal edge of this wetland and it is recommended that a similar area of wetland be re-established elsewhere on the site. The remainder of the wetland area should be conserved and allowed to naturally regenerate. It is considered that these conservation measures will adequately protect this EEC within the site.

- The area of 'Freshwater Wetlands on Coastal Floodplains' EEC in the southern section of Lot 2 is currently in a managed state, although the dominant native species *Carex appressa* is still present within the site. It is recommended that this area be allowed to regenerate to suppress potential impacts upon the EEC from the KTP "Invasion by Exotic Perennial Grasses", which is likely to place this area at greater risk of extinction.

- Mature trees, particularly those containing hollows should be retained within landscape planning for the site, where ever they can be safely retained with regard to public safety.

- A mature stand of *Melaleuca biconvexa* occurs in the northeast of Lot 34 and this stand should be retained within strategic planning for the site.

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APPENDIX A: SEVEN-PART TESTS

CONSIDERATION UNDER SECTION 5A OF THE *EP&A ACT 1979*

Considerations of the effects of the proposed development under the guidelines of Section 5A of the *Environmental Planning and Assessment Act 1979 (EP&A Act 1979)* for the concerned threatened species/populations/ecological communities are given below.

The majority of information used for the assessment has been sourced from NSW DECC Threatened Species Information and Environmental Impact Assessment Guidelines, DECC Atlas of NSW Wildlife 2005) and other published or widely available literature sources such as scientific journals and reports. For the purposes of the Seven-Part Test, threatened species have been grouped into 'guilds', that is species sharing similar habitat or ecological requirements have been grouped and assessed together.

The following species / communities have been considered:

1. *Melaleuca biconvexa* Biconvex Paperbark
2. *Litoria brevipalmata* Green-thighed Frog
3. *Hoplocephalus stephensii* Stephen's Banded Snake
4. *Ixobrychus flavicollis* Black Bittern
5. *Callocephalon fimbriatum* Gang-Gang Cockatoo
6. *Calyptorhynchus lathami* Glossy Black-Cockatoo
7. *Ninox strenua* Powerful Owl
8. *Tyto tenebricosa* Sooty Owl
9. *Petaurus norfolcensis* Squirrel Glider
10. *Petaurus australis* Yellow-bellied Glider
11. *Pteropus poliocephalus* Grey-headed Flying-fox
12. Cave dwelling Bats
    - *Miniopterus australis* Little Bentwing-bat
    - *Miniopterus schreibersii* Eastern Bentwing-Bat
13. *Myotis adversus* Large-footed Myotis
14. Hollow dwelling Bats
    - *Falsistrellus tasmaniensis* Eastern False Pipistrelle
    - *Saccolaimus flaviventris* Yellow-bellied Sheathtail Bat
    - *Mormopterus norfolkensis* East-coast Freetail-bat
    - *Scoteanax rueppellii* Greater Broad-nosed Bat
15. Freshwater Wetland on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions

Species Profiles

Melaleuca biconvexa **Biconvex Paperbark**

Melaleuca biconvexa occurs in disjunct populations in coastal NSW from Jervis Bay to Port Macquarie with the main concentration of records in the Gosford / Wyong Area. *M. biconvexa* is a shrub to small tree with papery bark, which flowers in summer. It may occur in dense stands adjacent to watercourses, in association with other Melaleuca species or as an understorey species in wet forest. Present populations are threatened by land clearing, filling, excavation for construction of floodwater detention basins and alteration to water tables. This species is not ROTAP-listed.

Litoria brevipalmata **Green-thighed Frog**

The Green-thighed Frog occurs in isolated localities from the NSW Central coast to southeast Queensland. They occur in a range of habitats from rainforest and moist Eucalypt forest to dry eucalypt forest and heath.

The species is one of only a handful of eastern temperate Australian frog species that exhibit "explosive" breeding (Lemckert and Slatyer, 2002). Breeding occurs following heavy rainfall events in late spring and summer, with frogs congregating around large, temporary pools where males generally only call for one or two nights. Breeding may occur just once or twice per year or not at all and breeding success may be highly variable (Lemckert *et al*. 1997). How these frogs utilise forested environments during non-breeding times has not been documented (Lemckert and Slatyer, 2002), although it is suspected that they forage in leaf litter and dense groundcover vegetation. Although the species breeding sites have not been determined, it is considered likely that any creekline and/or low lying area capable of holding water for extended periods may provide potential habitat for this species.

This species has been recorded from only one location in the Hunter River catchment, being along creekline habitat within the HEZ study area (Harper Somers O'Sullivan 2004a). Populations of this species are also known to exist in the region within the Watagan National Park (Ehmann, 1997).

Hoplocephalus stephensii **Stephen's Banded Snake**

Hoplocephalus stephensii is a nocturnal, partly arboreal snake. It inhabits wet sclerophyll forest and rainforest from Gosford (N.S.W.) north to southern Queensland. This snake is usually found under loose bark on trees or in hollow limbs. The diet of *H. stephensii* consists of lizards, frogs, birds and small mammals. Females reproduce every second year giving birth to an average of six live young in February-March.

The average length of *H. stephensii* is 65cm and the body is described as being light brown to yellow with a series of black bands ventrally while the underside is cream with black spots. The black head is distinct from the neck and white blotches mark the lips, the area behind the eyes and the nape. A brown patch marks the top of the head.

Ixobrychus flavicollis **Black Bittern**

The Black Bittern lives in south-eastern Asia, New Guinea and western, northern and eastern Australia (chiefly coastal areas). It is solitary, living near water in mangroves and other trees, which need to form only a narrow fringe of cover. In the southwest region it lives in thicker vegetation such as paperbark woodland surrounding running water or coastal swamps. Pairs may be within hearing distance along a watercourse. The Black Bittern feeds on small fish and invertebrates. Its decline in the southwest region coincided with increases in the rate of clearing

for agriculture and in the salinity of streams. The nest consists of a platform of sticks placed in a tree, usually on a branch overhanging water with the breeding season from September to January.

Callocephalon fimbriatum **Gang-gang Cockatoo**

The Gang-gang Cockatoo is a distinctive Cockatoo species, being generally dark grey patterned by pale margins and squarish feathers. The male has a red head whilst the female lacks any head pattern. A small crest exists, which is generally more obvious in the male. The species is distributed from southern Victoria through south and central-eastern New South Wales (NSW) to the mid-north coast and Hunter Region. Isolated records are known from as far north as Coffs Harbour and as far west as Mudgee (Chambers 1995).

In summer, the Gang-gang Cockatoo occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, this species occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). The species in general, and crèches of young birds in particular, undertake nomadic as well as seasonal movements and may occur at apparently random points within the range described above. The Gang-gang Cockatoo requires hollows in the trunks or large limbs of large trees in which to breed (Gibbons and Lindenmayer 2000). Breeding usually occurs in tall mature sclerophyll forests that have a dense understorey, and occasionally in coastal forests. Breeding usually occurs between October and January, and individuals are likely to breed from around four years of age (Chambers 1995).

Data from the Birds Australia 'Atlas of Australian Birds' clearly indicate that the Gang-gang Cockatoo has declined dramatically within NSW. A comparison of the first and second 'Atlas of Australian Birds' (Barrett and Silcocks 2002) showed that between atlas periods (1977-1981 and 1998-2001), the overall reporting rate for Gang-gang Cockatoos declined by 44% across its NSW range.

Calyptorhynchus lathami **Glossy Black-Cockatoo**

The Glossy Black-Cockatoo is sparsely distributed along the east coast and immediate inland districts from western Victoria to Rockhampton in Queensland (Crome & Shields 1992). In NSW, the species is found as far west as Cobar and Griffith in isolated mountain ranges (Pizzey 1997). A subspecies, *C. l. halmaturinus* exists on Kangaroo Island, South Australia. The inland distribution of the species is restricted by the occurrence of the various Casuarinaceae spp..

The Glossy Black-cockatoo characteristically inhabits forests on sites with low soil-nutrients status, reflecting the distribution of key *Allocasuarina* spp. (Tanton 1994). The drier forest types with intact and less rugged landscapes are preferred by the species (NPWS 2002). It prefers highlands towards the north but may be found closer to the coast where conditions are suitable. In the south they are widespread in lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering watercourses.

It forages primarily on the seeds of Casuarinas, but will also take woodborers from large *Acacia* stems. *Allocasuarina torulosa, A. littoralis, A. distyla* and *A. verticillata* are the predominant food trees, however, on Kangaroo Island *Casuarina stricta* is the predominant food source. They have also been observed eating *Angophora, Acacia* and *Eucalyptus* seeds. It now appears to supplement its diet with the seeds of exotic pine trees. A sign that foraging individuals have recently fed at a site is a scattering of leaves, twigs and freshly chewed cones under the Casuarinas. While feeding they are tame and relatively easy to approach. Flocks of Glossy Black-Cockatoos have been seen but are not common. They are usually seen in threes, a pair and their young, or feeding groups consisting of 10-12 birds, which are loose

family aggregations. Glossy Black-Cockatoos generally occupy an area permanently and have a distinctive flight pattern of slow, shallow wing-beats. Nesting takes place from March through August in the hollows of large Eucalypts, 10-20m above the ground, where a single egg is laid.

Ninox strenua **Powerful Owl**

The Powerful Owl is found in the coastal areas and adjacent ranges of eastern Australia from South Australia to around Rockhampton in Queensland, generally within 200km from the coast. Within NSW, Powerful Owls are distributed throughout the length of the Great Dividing Range, which is their stronghold, and extend from the coast to the western slopes where they occur in much lower numbers. The Powerful Owl inhabits a wide range of vegetation types from wet Eucalypt forests with a rainforest understorey to dry open forests and woodlands. The species has been recorded using disturbed habitats such as exotic pine plantations and large trees in parks and gardens. The Powerful Owl is the largest predator of nocturnal forest-dwelling animals in Australian forests. Major prey species in NSW forests are the Greater Glider, Common Ringtail Possum, Sugar Glider, Grey-headed Flying-fox, and several species of diurnal birds, including the Pied Currawong, Magpie and Lorikeets. It rests during the day amid thick foliage, often grasping food-remains. The male of the species employs a slow, far-carrying 'whoo-hoo' call, more deliberate than the female's call, which is higher pitched with the second note slightly higher than the first.

Powerful Owls nest in a slight depression in the wood-mould on the base of a cavity in a large old tree, sometimes in excess of 25 metres above the ground. These trees are usually found growing on a hillside in heavy forest and may be used intermittently for several years. The breeding season of the Powerful Owl is highly synchronised, being strictly winter breeders. One or two young are produced, although some pairs do not breed in every year. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.

Records of this species in the region are known from many conservation reserve areas. These include the Gardens of Stone National Park, Tingira Heights and Munghorn Gap Nature Reserves (authors pers. obs.) as well as Wollemi, Botany Bay, Brisbane Water, Bouddi, Marramarra, Nattai, Blue Mountains, Cattai, Heathcote, Goulburn River, Kanangra Boyd, Ku-ring-gai Chase and Yengo National Parks (Atlas of NSW Wildlife 2005). A well-documented resident breeding pair of *N. strenua* has established in Blackbutt Council Reserve, in the outer suburbs of Newcastle.

Tyto tenebricosa **Sooty Owl**

The Sooty Owl occurs along the coastal margins of eastern Australia ranging from southeast Queensland to Victoria. The species prefers dense dimly lit forests, inhabiting pockets of rainforest and wet sclerophyll forest mainly in mountainous areas, often in southeast facing gullies. A secretive species, it roosts by day in tree hollows. When disturbed, it may fumble its way out of the hollow and often appears clumsy and drowsy to an intruder. The Sooty Owl possesses massive feet and preys upon both terrestrial and arboreal mammals including rodents, bandicoots, possums and gliders. Sooty Owls are territorial and may have a territory ranging form 200-800ha or more. Breeding mainly takes place during the cooler months but also during autumn and spring. The nest is found on decayed debris in tree hollows, which are often at a considerable height, up to over 30m from ground level. 1-2 eggs are laid.

Petaurus norfolcensis **Squirrel Glider**

P. norfolcensis is distributed throughout the dry sclerophyll forests and woodlands of eastern Australia from SA to Cairns. In Vic its range was considered to be narrow where it inhabited remnant woodlands and open forests that have mature or mixed-age stands of more than one Eucalypt species. It is absent from the dense coastal ranges in the south, but is present

in coastal forests and wet areas bordering rainforests in NSW (north of Sydney) and in Qld (Suckling 1995). This species usually inhabits dry open sclerophyll forests and woodland but there have been some observations in moist regenerating forest, moist gullies and coastal forest. Recent studies have identified the coastal Lake Macquarie / Wyong regional population as the largest known population of this species (Smith and Murray *in print* in Forest Fauna Surveys 2002) and this area as containing the highest density and quality habitat for this species (Smith *et al* 2002). Other studies conducted in Vic have shown that this species can occur in equal densities in linear remnant networks as in continuous forested areas and that such linear remnants can support viable populations of *P. norfolcensis.*

Individuals have been recorded in a diverse range of vegetation communities, including Blackbutt Forest, Red Gum and Red Bloodwood Forests, Coastal Banksia heathland and Grey Gum / Spotted Gum / Grey Ironbark dry hardwood forests of the Central NSW Coast (Quin, 1995). Important habitat includes areas where one or more Eucalypt species occur that flower heavily in winter, or the presence of good stands of winter-flowering Banksias (Quin 1995). The Squirrel Gliders preference for mixed-species Eucalypt open forest may be related to the more predictable availability of pollen and nectar in such communities. Where *Acacias* are present, the gum of these species may compensate for any unreliability in nectar flows, and might explain the apparent link between *P. norfolcensis* and the presence of certain *Acacia* species in some localities (Menkhorst 1996). Other known food items include Eucalypt sap, nectar, honeydew, manna, pollen, sugary extracts from fruits and berries, and a range of insects (Quin 1995).

The breeding biology of *P. norfolcensis* is similar to that of *P. breviceps* (Sugar Glider). The two species are sometimes found living together in the same area and when this situation exists the larger *P. norfolcensis* usually dominates and there is evidence to suggest that interbreeding may result in the outbreeding of the smaller *P. breviceps* (Quin 1995). It nests in a leaf-lined hollow in a tree or stump. Tree hollows, when available, are the preferred nesting site, particularly those with a tight entrance diameter, presumably to exclude potential predators. It is possible that disused Ringtail Possum dreys and bird nests are used in the absence of suitable hollows.

Movements of up to one kilometre from foraging sites to a favoured den hollow have been recorded (Menkhorst 1996). Recent research on the home ranges and movements of this species indicate a home range of about 13 ha and population densities of 0.4 - 1 per ha is reported for a Vic population and 3.0 - 3.5 ha with a density of 0.89 - 1.54 per ha in a central north coast population (Quin 1995). Radio-tracking studies at Tingira Heights, near Lake Macquarie, estimated home ranges of between 6 and 7.5 ha for this species (Shortland Wetlands Consultancy 1996).

It has been reported that *P. norfolcensis* is consistently preyed upon by cats and foxes and it has been believed that an increase in this predation may result from the opening up of bushland through rural-residential or other development. While this increased predation may adversely impact upon populations of this species it may not be the only impact causing the extinction of populations in developed areas. However, in the absence of detailed studies, it is believed that provided domestic cats are excluded, a rural-residential subdivision with a minimal amount of clearing and retention of adequate habitat connections may not have a significantly deleterious effect upon a population of this species.

Petaurus australis **Yellow-bellied Glider**

The Yellow-bellied Glider is distributed along the coast and mountain ranges of eastern Australia from central Queensland to southeast Victorian, with isolated populations also

occurring in the Atherton Tablelands, Queensland and southwest Victoria. Known to occur in a variety of habitats, Yellow-bellied Gliders are usually associated with tall, mature wet eucalypt forest, but are also known from tall dry open forest and mature woodland. They are present at low densities, even in areas of preferred habitat, probably because of the low food availability. The diverse diet of this species is primarily made up of eucalypt nectar, eucalypt sap, honey dew, manna and invertebrates found under decorticating bark and pollen. Sap is tapped from the trunks of trees via chewed "V" shaped incisions or in some cases extended vertical incisions (Goldingay & Kavanagh 1991). Tree species used varies according to locations and habitats. In the State Forests of the Wingham area, characteristic V-shaped incisions have been observed in range of species including Blue Gum, Brushbox, Red Bloodwood, New England Blackbutt and Silvertop Stringybark trees. The shedding of bark by tree species is considered important for the gathering of invertebrates and honeydew. Hollows for nest sites are essential, as are suitable food trees. Den sites are often located in mature, living smooth-barked eucalypts. The species occupies large and exclusive home ranges of approximately 30-65 ha, with little overlap of adjacent groups.

Pteropus poliocephalus **Grey-headed Flying Fox**

The Grey-headed Flying Fox is endemic to Australia and presently occurs along the east coast from Bundaberg in Queensland to Melbourne, Victoria (NSW National Parks and Wildlife Service, 1999). Regular movements have been recorded over the Great Dividing Range to the western slopes of NSW and QLD (NSW National Parks and Wildlife Service, 2001). Although this species occurs over a large range the total area being utilised at any one time is relatively small. This species utilises subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths swamps and mangroves, as well as urban gardens and fruit crops for foraging (Churchill, 1998; NSW National Parks and Wildlife Service, 1999).

The Grey-headed Flying Fox is considered an important pollinator and seed disperser of native trees, as they forage on nectar and pollen of Eucalypts, Angophoras, Melaleucas and Banksias, as well as fruit of rainforest trees and vines (NSW National Parks and Wildlife Service, 1999; Strahan, 1995). The Grey-headed Flying Fox has been recorded to forage on more than 80 plant species of which eucalypt blossom is considered the major food source and figs to be the most common fruit consumed (Churchill, 1998). These bats will disperse and commute up to 50km daily to foraging areas from their day roost (Strahan, 1995).

Grey-headed Flying Fox roost in large colonies of up to tens of thousands and often share camps with *Pteropus scapulatus* (Little Red Flying-fox) and *P. alecto* (Black Flying-fox) (Churchill, 1998; NSW National Parks and Wildlife Service, 1999). Colonies are usually formed in gullies with a dense vegetation canopy and a water source nearby. Camps have also been formed in modified vegetation in urban areas (NSW National Parks and Wildlife Service, 2001). Site fidelity is high, with some camps in NSW used for over a century (NSW National Parks and Wildlife Service, 1999). These bats usually return annually to particular camps for rearing young (NSW National Parks and Wildlife Service, 2001).

Mating begins in January and females give birth to single young in October/November after a 6-month gestation period. The young are carried continually, flights included, for the first 3 weeks and are then left in the camp for the following 2 months (NSW National Parks and Wildlife Service, 1999). This species migrates (up to hundreds of km) to where a suitable food source is available. The population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany, Forest Red Gum and Paperbark, dispersing south during the summer.

When migration occurs they do not move as a colony, but as individuals or small groups resulting in the intermixing sub-populations (Churchill, 1998). It is estimated that the

population of this species has declined by 30% over the last 10 years. It has been estimated that the population will continue to decrease by at least 20% in the next three generations if the current rate of habitat loss and culling continues (NSW National Parks and Wildlife Service, 2001). Presently less than 15% of suitable habitat and 5% of present roost sites occur in conservation reserves.

Miniopterus australis **Little Bentwing-bat**

This species inhabits tropical rainforest to warm-temperate wet and dry sclerophyll forest occurring along the coastal plains and adjacent ranges from Cape York to north-eastern NSW around the Hunter River. Its distribution within Australia becomes increasingly coastal toward the southern limit of its range in NSW.

It is a sub-canopy hunter with a preference for well-timbered areas but it is also known to hunt in clearings adjacent to forests. Prey items include crane flies, ants, moths and wasps. Flight characteristics include rapid movement with considerable manoeuvrability.

The species is a cave dweller that congregates in the summer months in maternity roost colonies and disperses during winter. In the southern part of their range they hibernate during winter but in the north they remain active throughout the year. Recorded roosts include caves, mines, stormwater drains, disused railway tunnels and houses. Mating, fertilisation and implantation occur in July to August, followed by a period of retarded embryonic development until mid-September. Pregnant females congregate in specified large nursery caves to rear their young. Births occur in December, when single young are born. It is often found to roost with the Large Bentwing-bat (*Miniopterus schreibersii*), and benefits from this larger species' ability to increase the roost temperature using metabolic heat. There is a huge nursery colony of 100,000 adult bats at Mt. Etna caves, in central Queensland.

Miniopterus schreibersii **Eastern Bentwing-bat**

The Eastern (also known as 'Large' or 'Common') Bentwing-bat may occur throughout the world. However, Parnaby (1992) notes that the Australasian populations are unlikely to be the same species that occurs outside this area. Within Australia, it is found across the coastal and near coastal areas of the north of the NT and WA and also down the east coast from Cape York to Adelaide on the coastal plains and adjacent ranges.

It is a cave (and similar man-made structures) roosting species that generally feeds above the forest canopy in wet and dry tall open forest, catching insects on the wing. However, the species has also been recorded utilising rainforest, monsoon forest, open woodland, paperbark forests and open grasslands. Moths are the main prey item. Flight is very fast and typically relatively level with swift shallow dives; the estimated flight speed is 50km per hour.

The species is known to migrate over large distances, apparently utilising different roosts for different seasonal needs. The pattern of movement varies with local climate and the dispersion of suitable roost sites. It hibernates over winter in the southern parts of its range and development of the embryo may be delayed over winter by lowering body temperature using roosts in the cooler areas of a cave. Pregnant females roost in large colonies in nursery caves. Birth generally occurs around December. Females cluster together in a roost that generally possesses a domed roof, which allows for the retention of warm air, which may also promote faster growth. The young can fly by 7 weeks and reach adult size and are weaned by 10 weeks. The mothers then leave the cave to disperse to their winter roosts and

a few weeks later, usually in March, there is a mass exodus of juveniles. The maternity colony is deserted by April.

The longevity record for an Australian bat is from a pregnant female Large Bentwing-bat that was banded and recaptured 18 years later (she was again pregnant).

Myotis adversus **Large-footed Myotis**

The Large-footed Myotis has been recorded along much of the coastal strip of Australia occurring from the east of SA, around the Victorian, NSW, Queensland and NT coasts and into WA as far as the Kimberleys.

In NSW, the Large-footed Myotis is found in various habitats of the coast and adjacent ranges. Recently, it has also been found along the Murray River valley well into South Australia. A variety of foraging habitats are used by this species although it is usually found near large bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost site. Although the Large-footed Myotis is usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest and woodland, and swamp forest. The Large-footed Myotis has been reported feeding on flying insects (including beetles, flies, moths and grasshoppers), aquatic insects (such as boatmen) and small fish. Observations of the feeding behaviour found that it foraged predominantly just above the water (average height of 9 cm from the water surface), but also raked the surface of the water with the recurved claws of its large feet and sometimes also used its tail membrane as a scoop. Flying insects are caught as the bat spirals downward through the air. This species feeds alone, in pairs, or infrequently in small groups. The species has a slow and manoeuvrable flight pattern.

It roosts in small colonies of between 15 and several hundred individuals with recorded roosts including caves, mines and disused railway tunnels as well as dense rainforest foliage in the tropical parts of its range. Some occurrences of roosting in tree hollows are also noted. Males establish territories within the colony and monopolise a cluster of females during the breeding season. Outside the breeding season, males roost separately. The number of pregnancies per year varies with latitude. In NSW and Victoria there is one pregnancy per year, the single young being born in November to December. In southern Queensland they produce two litters of single young in October and January. Males show two peaks of testicular development: in April to June and in September to November. Lactation lasts for about eight weeks and young born in late September suckle until late December. The bond between mother and young extends a further 3 to 4 weeks after weaning; they hunt together and roost together during this period. In northern Queensland they are reported to have three births per year.

Falsistrellus tasmaniensis **Eastern Falsistrelle**

The Eastern Falsistrelle occurs along the coastal ranges from southern Queensland to western Victoria, and is endemic to Australia. These bats inhabit sclerophyll forests from the Great Divide to the east coast. In Tasmania they are found in wet sclerophyll and coastal mallee. A preference has been noted for wet habitats where trees are more than 20m high. Based upon the size and shape of its wings the bat is thought to be highly mobile with a relatively large hunting range. A specimen of this species has been radio-tracked and found to move 12km from where it was hunting to where it was roosting in a very large tree.

On the mainland they eat moths, rove beetles, chafers, weevils, plant bugs, flies and ants. Their flight is swift and direct, within or just below the tree canopy. They tend to fly fast in a

fixed horizontal plane with sudden darting changes in course. It has been observed roosting in holes and hollow trunks of Eucalypts, with recorded colony sizes ranging from 3 to 36 individuals. Colonies are usually almost entirely male or female groups, although evenly mixed colonies sometimes occur. They have been recorded roosting in a cave at Jenolan, NSW, and they are occasionally found in old wooden buildings.

Males produce sperm in late summer and store it in the epididymis over the winter. Females produce a large 'hibernation follicle' in autumn. Ovulation, fertilisation and pregnancy occur in late spring and early summer. Single young are born in December. Lactation continues through January and February. The Eastern Falsistrelle hibernates generally during winter, particularly in the southern extent of its range.

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

This species is widespread across Australia and its apparent rarity is probably due to its flying so high and fast that it is seldom collected. It has been reported from a wide variety of habitats. Hunting height appears to vary depending upon the height of the dominant vegetation in Eucalypt forests it feeds above the canopy, but in mallee or open country it comes lower to the ground. Prey species include beetles, long-horned grasshoppers, shield bugs and flying ants.

Usually solitary, but occasionally occurring in colonies of less than ten individuals, the Yellow-bellied Sheathtail-bat roosts in tree hollows, animal burrows, dry clay cracks, under rock slabs, abandoned Sugar Glider nests, and has been found resting on the walls of buildings in broad daylight, and one such individual, caught at Queanbeyan, NSW, appeared to be so exhausted that it made no effort to escape. Similar reports suggest that it is migratory in southern Australia and that individuals found resting in the open are in the course of a winter migration from the cooler to warmer areas. They have been reported from southern Australia only between January and June.

Males have a prominent throat-pouch, which is devoid of glandular tissue, but a subcutaneous gland lies behind it. The throat-pouch is represented by a rudimentary fold of skin in the female. There is no seasonal difference in testicular size in males and there is no relationship between reproductive condition in males and the size of the throat pouch. Pregnancy is always restricted to the right uterine horn. Single young are born between December and mid-March. Sub-adults have only been collected in January and February.

Mormopterus norfolkensis **East Coast Freetail-bat**

This species is distributed along the east coast of New South Wales from south of Sydney extending north into south-eastern Queensland, near Brisbane. There are no records west of the Great Dividing Range. Although the habitat preferences are not clear (and critical or specific habitat for this species is not known), most records of this species have been reported from dry Eucalypt forest and woodland. Individuals have, however, been recorded flying low over a rocky watercourse in rainforest and foraging in clearings on the edge of forested land. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat for this species, and specific foraging activity may be concentrated over small areas of open water, such as dams and creeks, in and near forests. It is a predominantly tree-dwelling species (roosting in hollows or behind loose bark in mature Eucalypts), but one individual was recorded roosting in the roof of a hut, together with a number of Gould's Wattled Bats and an Eastern Broad-nosed Bat (Allison & Hoye 1995). The diet is thought to consist of small insects including leafhoppers, chafers, weevils and other beetles. Foraging is apparently undertaken above the tree canopy or in clearings on forest edges (AMBS 1995). Examination of wing morphology indicates that the bat has a

direct and fast flight more suited for foraging in open habitats, above the canopy and along watercourses.

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

The Greater Broad-nosed Bat occurs only along the eastern coastal strip of Queensland and NSW where it is restricted to the coast and adjacent areas of the Great Dividing Range. In NSW it extends as far south as the Bega Plain. They are only found at low altitudes (below 500m).

This species apparently feeds on large moths and beetles, and some small vertebrates, emerging just after sundown, flying slowly and directly at a height of 3-6 metres, deviating only slightly to catch larger insects. It is also predatory on vertebrates including other bats, and is a noted carnivore on other captured bats in bat traps. *S. rueppellii* is known to hunt along tree-lined creeks, the junction of woodland and cleared paddocks, and low along rainforest creeks. It may have a preference for wet gullies in tall timber country.

The species roosts mainly in tree hollows but it has also been found in the roof spaces of old buildings. Little is known of the reproductive cycle, but it is suggested that the species follows the typical vespertilionid pattern. What is known is that females congregate in maternity colonies and single young are born in January, slightly later than the other Vespertilionid bats that share its range. Males appear to be excluded from the colony during the birthing and rearing of the young.

Seven-part Test of Significance of Impacts to Threatened Species and EEC's

For the purposes of the Environmental Planning and Assessment Act 1979 and, in particular, in the administration of Sections 78A, 79B, 79C, 111 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

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

1. Melaleuca biconvexa **Biconvex Paperbark**

M. biconvexa occurs within the northeast section of Lot 34. This area will not be impacted upon by the proposed rezoning and subsequent development. Based on retention of this stand of *M. biconvexa* there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

2. Litoria brevipalmata **Green-thighed Frog**

Potential breeding habitat for *L. brevipalmata* occurs within the billabongs in Lots 2 and 34 and the unformed section of Babers Road. Concept planning for the Cooranbong Town Commonshows provision of a sporting oval within Lots 2 and 34 and the unformed section of Babers Road. A small area of potential breeding habitat for this species will be displaced as a consequence of the proposed position of the sporting oval. To offset the displacement of potential breeding habitat for *L. brevipalmata*, provision within the concept plan and recommendations contained in Section 7 allow for the replacement of this habitat to the north of the proposed oval position. Furthermore, recommendations within section 7 suggest that an ecologist conduct habitat searches before earthmoving works commence and that potential breeding habitat be protected from potential sediment erosion impacts. If these recommendations are observed throughout the process of development, potential breeding habitat and individuals of this species will not be significantly impacted upon by the proposed rezoning and subsequent development, so there will not be an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

3. Hoplocephalus stephensii **Stephen's Banded Snake**

Potential habitat for *H. stephensii* occurs within ATMF occurring along the northeastern boundary of the site. This area will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

4. Ixobrychus flavicollis **Black Bittern**

Potential habitat for *I. flavicollis* occurs along Dora Creek, which is immediately adjacent to the northern boundary of the site. Earthworks involving the provision of community facilities, subsequent to the proposed rezoning, have the potential to cause sediment erosion impacts upon potential habitat for this species. The protection of waterways and wetland habitats, from potential sediment erosion impacts as a consequence of earth moving works, is provided for within the recommendations contained in Section 7. Therefore, if the recommendations are afforded full consideration the area will remain unchanged during the proposed rezoning and subsequent development and there would be no adverse effect on

the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

5. Callocephalon fimbriatum **Gang-Gang Cockatoo**

Potential habitat for *C. fimbriatum* occurs within ATMF occurring along the northeastern boundary of the site and other trees throughout the site. A small number of trees will be displaced during the preparation of the sporting oval, but this is considered unlikely to cause any significant impact upon this species, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

6. Calyptorhynchus lathami **Glossy Black-Cockatoo**

Foraging trees for *C. lathami* occur within ATMF occurring along the northeastern boundary of the site. This area will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

7. Ninox strenua **Powerful Owl**

Due to the presence of arboreal mammals, roosting habitat and a number of records of this species within the local area, it is likely that the site represents part of the home range of individuals of this species. Those areas considered to be of most significance for this species, being ATMF, will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

8. Tyto tenebricosa **Sooty Owl**

Due to the presence of arboreal mammals and roosting habitat it is possible that the site represents part of the home range of individuals of this species. Those areas considered to be of most significance for this species, being ATMF, will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

9. Petaurus norfolcensis **Squirrel Glider**

Due to the presence of foraging and roosting habitat it is possible that the site represents part of the home range of individuals of this species. Those areas considered to be of most significance for this species, being ATMF, will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

10. Petaurus australis **Yellow-bellied Glider**

Due to the presence of foraging and roosting habitat it is possible that the site represents part of the home range of individuals of this species. Those areas considered to be of most significance for this species, being ATMF, will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

11. Pteropus poliocephalus **Grey-headed Flying Fox**

Due to the presence of foraging habitat it is possible that the site represents part of the foraging range of individuals of this species. Those areas considered to be of most significance for this species, being ATMF, will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

12. **Cave dwelling Microbats**

Miniopterus australis	Little Bentwing-bat
Miniopterus schreibersii	Eastern Bentwing-Bat

One species of cave dwelling Microchiropteran bat, *Miniopterus schreibersii* was identified within the site during bat surveys and due to its mobility and the presence of suitable foraging habitat within the site it is likely that *M. australis* would use the site for foraging on at least an intermittent basis. Those areas considered to be of most significance for this species, being ATMF, scattered trees and artificial lighting, will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

13. Myotis adversus **Large-footed Myotis**

Dora Creek, immediately adjacent to the northern boundary of the site, and open water wetland habitats within the site constitute potential foraging habitat for this species. These areas will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

14. **Hollow dwelling Microbats**

Falsistrellus tasmaniensis	Eastern False Pipistrelle
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat
Mormopterus norfolkensis	East-coast Freetail-bat
Scoteanax rueppellii	Greater Broad-nosed Bat

ATMF and scattered trees within the site represent foraging habitat for these Microchiropteran bat species and tree hollows represent roosting opportunities. Of these species only *Mormopterus norfolkensis* was detected within the site with a reliable degree of certainty, but the site contains foraging and roosting habitat that is likely to be utilised by the other hollow dwelling Microbats on at least and intermittent basis. These habitat attributes will remain unchanged during the proposed rezoning and subsequent development, so there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

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

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the *TSC Act 1995*.

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

A small area (< 0.1ha) of FWCF EEC within the central portion of the site will be displaced by the provision of a sporting oval, subsequent to proposed rezoning. Provision has been made within concept planning and the recommendations contained in Section 7 to offset the loss of this habitat by replacing it to the north of the proposed oval site. In addition to this potential impact, the oval will also displace approximately 0.18ha of FWCF EEC in the southeast of Lot 2, although some of this area is ecotonal between modified pastureland and the *Carex appressa* sedgeland of the FWCF EEC. The *C. appressa* sedgeland is currently in a managed state, but has excellent regeneration potential. If the recommendations contained within Section 7 are observed throughout the process of development, then there will be minimal impact upon this EEC within the local area, although any displacement of EEC area must be considered as an incremental loss on a local scale.

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

Approximately 1.5ha of FWCF EEC in the southeast of Lot 2, represented by *Carex appressa* sedgeland, is currently managed (slashed), although it has excellent regeneration potential. Continued management of this area is very likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. Of this area, <0.18ha will be permanently modified as a consequence of rezoning and subsequent development, although some of this displaced area is currently ecotonal between highly modified pastureland and EEC. However, if the recommendations contained within Section 7 are observed throughout the process of development, it is considered that there will be minimal impact upon this EEC within the local area due to the current proposal and subsequent development, although any displacement of EEC area must be noted as an incremental loss on a local scale.

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

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

Melaleuca biconvexa **Biconvex Paperbark**

No habitat for *M. biconvexa* will be removed during the rezoning process or subsequent provision of community facilities.

Litoria brevipalmata **Green-thighed Frog**

A small area of potential breeding habitat for this species will be displaced as a consequence of the proposed position of the sporting oval in the central area of the site. To offset the displacement of potential breeding habitat for *L. brevipalmata*, provision within the concept plan and the recommendations contained in Section 7 allow for the replacement of this habitat to the north of the proposed oval position. The provision of replacement habitat to the north of the displaced habitat's position is likely to adequately offset displaced habitat such that no loss of potential breeding habitat for this species will occur. No habitat for the remaining species will be removed.

Freshwater Wetland on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions

Approximately 1.5ha of FWCF EEC in the southeast of Lot 2, represented by *Carex appressa* sedgeland, is currently managed (slashed), although it has excellent regeneration potential. Continued management of this area is very likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. Additionally <0.18ha of this area will be permanently modified as a consequence of rezoning and subsequent development, although some of this displaced area is currently ecotonal between highly modified pastureland and EEC. However, if the recommendations contained within Section 7 are observed throughout the process of development, then there will be minimal impact upon this EEC within the local area due to the current proposal and subsequent development, although any displacement of EEC area must be considered as an incremental loss on a local scale.

(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 displacement of billabong habitat within the central area of the site by the provision of a sporting oval will remove continuity between adjacent billabong habitats, which constitute potential habitat for *Litoria breviplamata*; however, continuity between billabong habitats will be restored by the provision of replacement billabong habitat. No other areas of known habitat for the threatened species considered herewith are likely to be isolated 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;

Litoria brevipalmata **Green-thighed Frog**

A small area of potential breeding habitat for this species will be displaced as a consequence of the proposed position of the sporting oval in the central area of the site. To offset the displacement of potential breeding habitat for *L. brevipalmata*, provision within the concept plan and the recommendations contained in Section 7 allow for the replacement of this habitat to the north of the proposed oval position. The provision of replacement habitat to the north of the displaced habitat's position is likely to adequately offset displaced habitat such that no loss of potential breeding habitat for this species will occur.

Freshwater Wetland on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bio-regions

Approximately 1.5ha of FWCF EEC in the southeast of Lot 2, represented by *Carex appressa* sedgeland, is currently managed (slashed), although it has excellent regeneration potential. This area of sedgeland is the only known area of this assemblage of FWCF EEC within the locality. Continued management of this area is very likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. Of this area, <0.18ha will be permanently modified as a consequence of rezoning and subsequent provision of community facilities, although some of this displaced area is currently ecotonal between highly modified pastureland and EEC. However, if the recommendations contained within Section 7 are observed throughout the process of development, then there will be minimal impact upon this EEC within the local area due to the current proposal and subsequent development, although any displacement of EEC area must be considered as an incremental loss on a local scale.

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

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act 1995*.

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

Recovery Plan Forest Owls - *Tyto novaehollandiae* (Masked Owl) and *Ninox strenua* (Powerful Owl)

1. To minimise further loss and fragmentation of habitat outside conservation reserves and State Forests by protection and management of significant owl habitat (including protection of individual nest sites).

The proposal will not involve the removal of any Sooty Owl or Powerful Owl habitat. The proposal could therefore not be considered to be consistent with this objective. No potential nest sites will be removed.

2. To minimise the impacts of development activities on large forest owls and their habitats outside conservation reserves and State Forests.

No large forest owl species will be impacted upon by the rezoning and subsequent development of this site.

3. To assess the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not protected.

No assessment of the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not protected has been carried out in association with this development.

4. To monitor trends in population parameters (number, distribution, territory fidelity and breeding success) across the range of the species and across different land tenures and disturbance history.

No detailed monitoring studies identifying trends in population parameters have been conducted as part of the proposal.

5. To assess the implementation and effectiveness for forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the owl species and, (if necessary), to use this information to refine the prescriptions so that forestry activities in State Forests are not resulting in adverse changes in species abundance and breeding success.

This objective is not relevant to the current proposal.

6. To improve the recovery and management of the large forest owls based on an improved understanding of key areas of their biology and ecology.

The current proposal cannot be regarded as improving the recovery and management of the Powerful Owl or Sooty Owl.

7. To raise awareness of the conservation requirements of large forest owls amongst the broader community, to involve the community in owl conservation efforts and in so doing increase the information base owl habitats and biology.

No schemes, in relation to this proposal, have been put in place that are considered to raise awareness of the conservation requirements of these owl species or involve the community in owl conservation efforts.

8. To coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.

The DECC co-ordinates the implementation of the actions in this recovery plan and carries out a review of the plan in its final year.

Recovery Plan ***Petaurus australis* (Yellow-bellied Glider)**

1. To co-ordinate the recovery of the Yellow-bellied Glider in NSW.

The DECC will co-ordinate the implementation of the actions outlined in this Recovery Plan.

2. To encourage and assist in improving the protection and management of the Yellow-bellied Glider and its habitat.

The current proposal will not involve the removal of vegetation within the site, and may therefore be considered as preserving potential habitat for the Yellow-bellied Glider.

3. To identify and monitor significant populations of the species.

No ongoing monitoring program of this species is being conducted in relation to this proposal.

4. To facilitate strategic research into the ecology of the Yellow-bellied Glider that is relevant to its conservation.

No strategic research into the ecology of the Yellow-bellied Glider has been undertaken in relation to the proposal.

5. To increase community awareness of the Yellow-bellied Glider and encourage community involvement in its conservation.

No schemes, in relation to this proposal, have been put in place that is considered to increase community awareness of the Yellow-bellied Glider or encourage community involvement.

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.

The proposed development will require the removal of some native vegetation and as such could contribute to the Key Threatening Process "Clearing of Native Vegetation". Clearing of vegetation at this scale represents a small cumulative impact, given the relatively small amount of EEC habitat that will be lost. As such it is unlikely to significantly contribute to this process on a regional scale.

The proposal is likely to contribute to the Key Threatening Process "Invasion by Exotic Perennial Grasses" if management of the *Carex appressa* sedgeland in the south of Lot two

is continued, due to increased opportunity for exotic perennial grasses to compete with *Carex appressa*. However, recommendation is made with Section 7 to allow this area of EEC to regenerate naturally and as such potential for this KTP to occur in this area of EEC will be minimised.

The proposal is likely to contribute to the Key Threatening Process "Human Caused Climate Change" as a result of clearing vegetation and modification of the environment. It is considered that clearing and modification of the landscape could constitute a minor incremental change. Thus the extent to which the proposal would contribute to this process is considered unlikely to be significant.

No other KTP's are believed to be relevant to the current proposal.

APPENDIX B: FLORA SPECIES LIST

Flora Species List

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list couldn't be considered comprehensive, but rather indicative of the flora present on the site. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as indicated:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation "sp.", indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark ("?") placed in front of the generic, which is followed by the abbreviation "sp." and;
- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a ("?") placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

> Harden, G. (ed) (2000). *Flora of New South Wales, Volume 1*. Revised edition. UNSW, Kensington, NSW.
>
> Harden, G. (ed) (2002). *Flora of New South Wales, Volume 2*. Revised edition. UNSW, Kensington, NSW.
>
> Harden, G. (ed) (1992). *Flora of New South Wales, Volume 3.* UNSW, Kensington, NSW.
>
> Harden, G. (ed) (1993). *Flora of New South Wales, Volume 4*. UNSW, Kensington, NSW.

Names of families and higher taxa follow a modified Cronquist System (1981). Introduced species are indicated by an asterisk "*".

Threatened species listed under the Threatened Species Conservation Act 1995 (*TSC Act 1995*) or the Environmental Protection of Biodiversity and Conservation (*EPBC Act 1999*) and / or Rare or Threatened Australian Plant (ROTAP) listed species are indicated in **bold font** and marked as:

(V) = Vulnerable Species listed under the TSC Act
(E) = Endangered Species listed under the TSC Act
(EE) = Species listed under the Commonwealth EPBC Act 1999 as Endangered
(EV) = Species listed under the Commonwealth EPBC Act 1999 as Vulnerable
(R) = ROTAP as per Briggs and Leigh (1996)
The following standard abbreviations are used to indicate subspecific taxa:

ssp. - subspecies

var.- variety

agg. aggregate

× - hybrid between the two indicated species

FAMILY	Common Name
Scientific Name	
ADIANTACEAE	
Adiantum aethiopicum	Common Maidenhair Fern
Adiantum hispidulum	Rough Maidenhair Fern
BLECHNACEAE	
Blechnum indicum	Swamp Water Fern
Doodia aspera	Rasp Fern
DENNSTAEDTIACEAE	
Pteridium esculentum	Bracken Fern
DICKSONIACEAE	
Calochlaena dubia	False Bracken Fern
CLASS MAGNOLIOPSIDA (FLOWERING PLANTS)	
SUBCLASS MAGNOLIIDAE (Dicotyledons)	
ASTERACEAE	
**Bidens pilosa*	Cobbler's Pegs
**Cirsium vulgare*	Spear Thistle
**Conyza bonariensis*	Flaxleaf Fleabane
**Hypochoeris radicata*	Cat's Ear
**Senecio madagascariensis*	Fireweed
Sigesbeckia orientalis	Indian-weed
Ozothamnus diosmifolium	Everlasting
BIGNONIACEAE	
**Tecomaria capensis*	Cape Honeysuckle
CARYOPHYLLACEAE	
**Cerastium fontanum*	
CASUARINACEAE	
Allocasuarina torulosa	Forest Oak
CUSCUTACEAE	
Cuscuta australis	Australian Dodder
DILLENIACEAE	
Hibbertia scandens	Golden Guinea Flower
ELAEOCARPACEAE	
Elaeocarpus obovatus	Hard Quandong
EUPHORBIACEAE	
Breynia oblongifolia	Breynia
Glochidion ferdinandi	Cheese Tree
FABOIDEAE	

Glycine microphylla	Love Creeper
Kennedia rubicunda	Dusky Coral Pea
GERANIACEAE	
Geranium solanderi var. *solanderi*	Native Geranium
LAURACEAE	
**Cinnamomum camphora*	Camphor Laurel
LOBELIACEAE	
Pratia purpurascens	White Root
MALVACEAE	
**Sida rhombifolia*	Paddy's Lucerne
MENISPERMACEAE	
Stephania japonica var. *discolor*	Snake Vine
MIMOSOIDEAE	
Acacia irrorata ssp. *irrorata*	
MYRTACEAE	
Acmena smithii	Lilly Pilly
Angophora floribunda	Rough-barked Apple
Callistemon salignus	Willow Bottlebrush
Eucalyptus microcorys	Tallowwood
Eucalyptus pilularis ssp. *pilularis*	Blackbutt
Eucalyptus saligna	Sydney Blue Gum
***Melaleuca biconvexa* (V)**	**Biconvex Paperbark**
Tristaniopsis laurina	Water Gum
Waterhousia floribunda	Weeping Lilly Pilly
OLEACEAE	
**Ligustrum lucidum*	Large-leaved Privett
**Ligustrum sinense*	Small-leaved Privett
PLANTAGINACEAE	
**Plantago lanceolata*	Lamb's Tongues
POLYGONACEAE	
Rumex brownii	Swamp Dock
Persicaria decipiens	Spotted Knotweed
Persicaria hydropiper	Water Pepper
Persicaria praetermissa	
Persicaria strigosa	Knotweed
RANUNCULACEAE	
Ranunculus inundatus	River Buttercup
RHAMNACEAE	
Alphitonia excelsa	Red Ash

ROSACEAE	
Rubus discolor	Blackberry
RUTACEAE	
Melicope micrococca	Hairy-leaved Doughwood
SAPINDACEAE	
Guioa semiglauca	Guioa
SOLANACEAE	
**Cestrum parqui*	Green Cestrum
**Solanum nigrum*	Black Nightshade
STERCULIACEAE	
Commersonia fraseri	Brush Kurrajong
VERBENACEAE	
**Lantana camara*	Lantana
**Verbena bonariensis*	Purple-Top
VIOLACEAE	
Viola hederacea	Native Violet
SUBCLASS LILIIDAE (Monocotyledons)	
COMMELINACEAE	
Aneilema acuminatum	
Commelina cyanea	Hairy Wandering Jew
CYPERACEAE	
Baumea articulata	Jointed Twig-rush
Bolboschoenus fluviatilis	Marsh Clubrush
Cyperus congestus	
Cyperus exaltatus	
Cyperus imbecillis	
Cyperus laevis	
Cyperus sesquiflorus	
Gahnia clarkei	
JUNCACEAE	
Juncus usitatus	Common Rush
LOMANDRACEAE	
Lomandra longifolia	Spiny Mat Rush
LUZURIAGACEAE	
Eustrephus latifolius	Wombat Berry
Geitonoplesium cymosum	Scrambling Lily
PHILYDRACEAE	
Philydrum lanuginosum	Woolly Frogmouth

POACEAE	
**Axonopus affinis*	Narrowleaf Carpet Grass
Cynodon dactylon	Common Couch
Digitaria parviflora	Smallflower Fingergrass
Echinochloa colona	Awnless Barnyard Grass
Echinopogon ovatus	Forest Hedgehog Grass
Entolasia marginata	Bordered Panic
Imperata cylindrica var. *major*	Blady Grass
Microlaena stipoides var. *stipoides*	Weeping Grass
Oplismenus aemulus	Basket Grass
**Paspalum dilatatum*	Paspalum
**Pennisetum clandestinum*	Kikuyu
**Setaria gracilis*	Slender Pigeon Grass
**Setaria pumila*	Pale Pigeon Grass
Sporobolus elongatus	Slender Rats Tail
Themeda australis	Kangaroo Grass
PONTEDERIACEAE	
**Eichhornia crassipes*	Water Hyacinth
SALVINIACEAE	
**Salvinia molesta*	Salvinia
SMILACACEAE	
Smilax australis	Smilax
TYPHACEAE	
Typha orientalis	Bull-rush

APPENDIX C: EXPECTED FAUNA SPECIES LIST

Below is a list of fauna species that could be *reasonably* expected to be found within the site at some occurrence. Such an approach has been taken given the unlikelihood to record *all* potentially occurring species within an area during formal fauna surveys (due to seasonality, climatic limitations, crypticism etc).

Family sequencing and taxonomy follow for each fauna class:

Birds – Christidis and Boles (1994).

Herpetofauna - Cogger (1996).

Mammals - Strahan (ed) (1995) and Churchill (1998).

✓ - Species observed or indicated by scats, tracks etc. on site during this investigation.

* - Indicates an introduced species

Known and Expected Bird List

Appendix Key: ✓ = Species Detected
* = introduced species
(C) = listed as CAMBA species
(J) = listed as JAMBA species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
(EM) = Species listed under the Commonwealth EPBC Act as Migratory
(EMa) = Species listed under the Commonwealth EPBC Act as Marine
Species indicated in **BOLD** font are those threatened species known from within 10km of site (Atlas of NSW Wildlife data)

Data Source: **1** = Species recorded during this survey
2 = Species recorded previously **(RPS HSO Ecologist pers. obs.)**

Family Name	*Scientific Name*	Common Name	1	2
Megapodiidae (Mound Builders)	*Alectura lathami*	Australian Brush-turkey		
Phasianidae (True Quails, Pheasants and Fowls)	*Coturnix pectoralis*	Stubble Quail (EMa)		
	Coturnix ypsilophora	Brown Quail		✓
Anatidae (Swans, Geese and Ducks)	*Anas castanea*	Chestnut Teal (EM)	✓	✓
	Anas gracilis	Grey Teal (EM)	✓	
	Anas platyrhynchos	*Mallard		✓
	Anas superciliosa	Pacific Black Duck (EM)	✓	✓
	Aytha australis	Hardhead (EM)		
	Chenonetta jubata	Australian Wood Duck (EM)	✓	✓
	Cygnus atratus	Black Swan (EM)		
	Biziura lobata	Musk Duck		
Podicipedidae (Grebes)	*Tachybaptus novaehollandiae*	Australasian Grebe		
Anhingidae (Darters)	*Anhinga melanogaster*	Darter		
Phalacrocoracidae (Cormorants)	*Phalacrocorax carbo*	Great Cormorant		

	Phalacrocorax melanoleucos	Little Pied Cormorant		✓
	Phalacrocorax sulcirostris	Little Black Cormorant		
	Phalacrocorax varius	Pied Cormorant		
Pelecanide (Pelicans)	*Pelecanus conspicillatus*	Australian Pelican (EMa)		
Ardeidae (Herons, Bitterns and Egrets)	*Ardea alba*	Great Egret (C,J, EM, EMa)		✓
	Ardea ibis	Cattle Egret (C,J, EM, EMa)	✓	✓
	Ardea intermedia	Intermediate Egret (EMa)		✓
	Ardea pacifica	White-necked Heron		✓
	Botaurus poiciloptilus	Australasian Bittern (V)		
	Butorides striatus	Striated Heron		
	Egretta garzetta	Little Egret		
	Egretta novaehollandiae	White-faced Heron	✓	✓
	Ixobrychus flavicollis	**Black Bittern (V)**		
	Nycticorax caledonicus	Nankeen Night Heron (EMa)		
Threskiornithidae (Ibises and Spoonbills)	*Platalea flavipes*	Yellow-billed Spoonbill		
	Platalea regia	Royal Spoonbill		
	Threskiornis molucca	Australian White Ibis (EMa)	✓	✓
	Threskiornis spinicollis	Straw-necked Ibis (EMa)	✓	✓
Ciconiidae (Storks)	***Ephippiorhynchus asiaticus***	**Black-necked Stork (E)**		
Accipitridae (Hawks, Kites and Eagles)	*Accipiter fasciatus*	Brown Goshawk (EM, EMa)		✓
	Accipiter cirrhocephalus	Collared Sparrowhawk (EM)		
	Accipiter novaehollandiae	Grey Goshawk (EM)		✓
	Aquila audax	Wedge-tailed Eagle (EM, EMa)		
	Aviceda subcristata	Pacific Baza (EM)		
	Circus approximans	Swamp Harrier (EM, EMa)		✓
	Circus assimilis	Spotted Harrier (EM)		
	Elanus axillaris	Black-shouldered Kite (EM)		✓
	Haliaeetus leucogaster	White-bellied Sea-Eagle (C, EM, EMa)		
	Haliastur sphenurus	Whistling Kite (EM, EMa)		✓
	Hamirostra melanosternon	Black-breasted Buzzard (V)		
	Hieraaetus morphnoides	Little Eagle (EM)		
	Pandion haliaetus	**Osprey (V, EMa)**		
Falconidae (Falcons)	*Falco berigora*	Brown Falcon (EM)		
	Falco cenchroides	Nankeen Kestrel (EM, EMa)		✓
	Falco longipennis	Australian Hobby (EM)		
	Falco peregrinus	Peregrine Falcon (EM)		
	Falco subniger	Black Falcon		
Rallidae (Crakes, Rails and Gallinules)	*Fulica atra*	Eurasian Coot		
	Gallinula philippensis	Buff-banded Rail (EMa)		
	Gallinula tenebrosa	Dusky Moorhen		✓
	Porphyrio porphyrio	Purple Swamphen (EMa)		✓
	Porzana fluminea	Australian Spotted Crake		
	Porzana pusilla	Baillon's Crake (EMa)		
	Porzana tabuensis	Spotless Crake (EMa)		
	Rallus pectoralis	Lewin's Rail		

Turnicidae (Button-Quails)	*Turnix pyrrhothorax*	Red-chested Button-quail		
	Turnix varia	Painted Button-quail		
Rostratulidae (Painted Snipe)	*Rostratula benghalensis*	Painted Snipe (EM, V, EMa)		
Jacanidae (Jacanas))	***Irediparra gallinacea***	**Comb-crested Jacana (V)**		
	Vanellus miles	Masked Lapwing (EM)	✓	✓
	Erythrogonys cinctus	Red-kneed Dotterel (EM)		
	Elseyornis melanops	Black-fronted Dotterel (EM)		
Laridae (Gulls and Terns)	*Chlidonias hybrida*	Whiskered Tern (EMa)		
	Larus novaehollandiae	Silver Gull (EMa)		
Columbidae (Pigeons and Doves)	*Columba livia*	Rock Dove #		
	Chalcophaps indica	Emerald Dove		
	Columba leucomela	White-headed Pigeon		✓
	Geopelia humeralis	Bar-shouldered Dove		
	Geopelia striata	Peaceful Dove		
	Leucosarcia melanoleuca	Wonga Pigeon		
	Macropygia amboinensis	Brown Cuckoo-Dove		✓
	Ocyphaps lophotes	Crested Pigeon	✓	✓
	Phaps chalcoptera	Common Bronzewing		
	Phaps elegans	Brush Bronzewing		
	Ptilinopus magnificus	Wompoo Fruit-dove (V)		
	Streptopelia chinensis	Spotted Turtle-Dove #		✓
	Lopholaimus antarcticus	Topknot Pigeon		
Cacatuidae (Cockatoos)	*Calyptrohynchus funereus*	Yellow-tailed Black-Cockatoo	✓	✓
	Calyptorhynchus lathami	**Glossy Black-Cockatoo (V)**		
	Cacatua roseicapilla	Galah	✓	✓
	Cacatua tenuirostris	Long-billed Corella		✓
	Cacatua sanguinea	Little Corella		
	Cacatua galerita	Sulphur-crested Cockatoo	✓	✓
	Callocephalon fimbriatum	Gang-gang Cockatoo	✓	
Psittacidae (Parrots)	*Alisterus scapularis*	Australian King Parrot		✓
	Glassopsitta pusilla	Little Lorikeet		✓
	Lathamus discolor	**Swift Parrot (E, EE, EMa)**		
	Neophema pulchella	**Turquoise Parrot (V)**		
	Platycercus elegans	Crimson Rosella		
	Platycercus eximius	Eastern Rosella		✓
	Psephotus haematonotus	Red-rumped Parrot		
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet		✓
	Trichoglossus concina	Musk Lorikeet		
	Trichoglossus haematodus	Rainbow Lorikeet	✓	✓
Cuculidae (Old World Cuckoos)	*Cuculus saturatus*	Oriental Cuckoo (C,J, EM)		
	Cacomantis flabelliformis	Fan-tailed Cuckoo (EMa)		✓
	Cacomantis variolosus	Brush Cuckoo		✓
	Chrysococcyx basalis	Horsfield's Bronze-Cuckoo (EMa)		
	Chrysococcyx lucidus	Shining Bronze-Cuckoo (EMa)		✓
	Cuculus pallidus	Pallid Cuckoo (EMa)		✓

	Eudynamys scolopacea	Common Koel (EMa)		✓
	Scythrops novaehollandiae	Channel-billed Cuckoo (EMa)		✓
Centropodidae (Coucals)	*Centropus phasianinus*	Pheasant Coucal		
Strigidae (Hawk Owls)	***Ninox strenua***	**Powerful Owl (V)**		
	Ninox connivens	Barking Owl (V)		
	Ninox boobook	Southern Boobook (EMa)		
Tytonidae (Barn Owls)	*Tyto alba*	Barn Owl		
	Tyto capensis	Grass Owl (V)		
	Tyto novaehollandiae	**Masked Owl (V)**		
	Tyto tenebrisco	**Sooty Owl (V)**		
Podargidae (Frogmouths)	*Podargus strigoides*	Tawny Frogmouth		
Caprimulgidae (Nightjars)	*Eurostopodus mystacalis*	White-throated Nightjar (EMa)		
Aegothelidae (Owlet-nightjars)	*Aegotheles cristatus*	Australian Owlet-nightjar		
Apodidae (Typical Swifts)	*Hirundapus caudacutus*	White-throated Needletail (C,J, EM)		✓
	Apus pacificus	Fork-tailed Swift (C,J, EM)		
Alcedinidae (True Kingfishers)	*Alcedo azurea*	Azure Kingfisher		✓
Halcyonidae (Kingfishers and Kookaburras)	*Dacelo novaeguineae*	Laughing Kookaburra	✓	✓
	Todiramphus sanctus	Sacred Kingfisher (EMa)		✓
Meropidae (Bee-eaters)	*Merops ornatus*	Rainbow Bee-eater (J, ,EM, EMa)		✓
Coraciidae (Typical Rollers)	*Eurystomus orientalis*	Dollarbird (EMa)		✓
Menuridae (Lyrebirds)	*Menura novaehollandiae*	Superb Lyrebird		
Climacteridae (Australo-Papuan Treecreepers)	*Cormobates leucophaeus*	White-throated Treecreeper		✓
	Climacteris picumnus	**Brown Treecreeper (V)**		
Maluridae (Fairy-Wrens and Emu-Wrens)	*Malurus cyaneus*	Superb Fairy-wren	✓	✓
	Malurus lamberti	Variegated Fairy-wren		✓
	Stipiturus malachurus	Southern Emu-wren		✓
Pardalotidae (Pardalotes, Scrubwrens, Thornbills)	*Pardalotus punctatus*	Spotted Pardalote	✓	✓
	Paradalotus striatus	Striated Pardalote		✓
	Sericornis frontalis	White-browed Scrubwren	✓	✓
	Sericornis magnirostris	Large-billed Scrubwren		✓
	Chthonicola sagittata	Speckled Warbler (V)		
	Smicrornis brevirostris	Weebill		
	Gerygone mouki	Brown Gerygone	✓	✓
	Gerygone fusca	Western Gerygone		
	Gerygone olivacea	White-throated Gerygone		✓
	Acanthiza pusilla	Brown Thornbill	✓	✓
	Acanthiza reguloides	Buff-rumped Thornbill		
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill		✓

	Acanthiza nana	Yellow Thornbill	✓	✓
	Acanthiza lineata	Striated Thornbill	✓	✓
	Hylacola pyrrhopygia	Chestnut-rumped Heathwren		
Meliphagidae (Honeyeaters)	*Anthochaera carunculata*	Red Wattlebird		✓
	Plectrhyncha lanceolata	Striped Honeyeater		
	Anthochaera chrysoptera	Brush Wattlebird		
	Philemon corniculatus	Noisy Friarbird		✓
	Philemon citerogularis	Little Friarbird		
	Xanthomyza phrygia	**Regent Honeyeater (E, EE, EM)**		
	Manorina melanophrys	Bell Miner	✓	✓
	Manorina melanocephala	Noisy Miner	✓	✓
	Meliphaga lewinii	Lewin's Honeyeater	✓	✓
	Lichenostomus chrysops	Yellow-faced Honeyeater	✓	✓
	Lichenostomus melanops	Yellow-tufted Honeyeater		
	Lichenostomus fuscus	Fuscous Honeyeater		
	Lichenostomus penicillatus	White-plumed Honeyeater		
	Lichenostomus leucotis	White-eared Honeyeater		
	Melithreptus brevirostris	Brown-headed Honeyeater		
	Melithreptus lunatus	White-naped Honeyeater		
	Melithreptus gularis	Black-chinned Honeyeater (V)		
	Entomyzon cyanotis	Blue-faced Honeyeater		
	Lichmera indistincta	Brown Honeyeater		
	Phylidonyris novaehollandiae	New Holland Honeyeater		
	Phylidonyris nigra	White-cheeked Honeyeater		
	Acanthorhynchus tenuirostris	Eastern Spinebill		✓
	Myzomela sanguinolenta	Scarlet Honeyeater		✓
	Epthianura albifrons	White-fronted Chat		
Eopsaltriidae (Robins)	*Microeca fascinans*	Jacky Winter		
	Petroica multicolor	Scarlet Robin		
	Petroica phoenicea	Flame Robin (EMa)		
	Petroica rosea	Rose Robin		✓
	Eopsaltria australis	Eastern Yellow Robin	✓	✓
	Melanodryas cucullata	Hooded Robin (V)		
Cinclosomidae (Quail-thrushes and allies)	*Psophodes olivaceus*	Eastern Whipbird	✓	✓
	Cinclosoma punctatum	Spotted Quail-thrush		
Neosittidae (Sittellas)	*Daphoenositta chrysoptera*	Varied Sittella		✓
Pachycephalidae (Whistlers, Shrike-tit, Shrike-thrushes)	*Falcunculus frontatus*	Crested Shrike-tit		
	Pachycephala pectoralis	Golden Whistler		✓
	Pachycephala rufiventris	Rufous Whistler		✓
	Colluricincla harmonica	Grey Shrike-thrush		✓
Dicruridae (Monarchs, Fantails and Drongo)	*Monarcha melanopsis*	Black-faced Monarch		✓
	Myiagra cyanoleuca	Satin Flycatcher		
	Myiagra rubecula	Leaden Flycatcher		✓
	Myiagra inquieta	Restless Flycatcher		
	Grallina cyanoleuca	Magpie-lark (EMa)		✓
	Rhipidura rufifrons	Rufous Fantail (EMa)		✓

	Rhipidura fuliginosa	Grey Fantail	✓	✓
	Rhipidura leucophyrs	Willie Wagtail	✓	✓
	Dicrurus bracteatus	Spangled Drongo (EMa)		
Campephagidae (Cuckoo-shrikes and Trillers)	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike (EMa)	✓	✓
	Coracina papuensis	White-bellied Cuckoo-shrike (EMa)		
	Coracina tenuirostris	Cicadabird (EM, (EMa)		
	Lalage sueurii	White-winged Triller		
Oriolidae (Orioles and Figbird)	*Oriolus sagittatus*	Olive-backed Oriole		✓
	Sphecotheres viridis	Figbird		
Artamidae (Woodswallows, Butcherbirds,Currawongs)	*Artamus leucorynchus*	White-breasted Woodswallow		✓
	Artamus cyanopterus	Dusky Woodswallow		✓
	Artamus personatus	Masked Woodswallow		
	Cracticus torquatus	Grey Butcherbird	✓	✓
	Cracticus nigrogularis	Pied Butcherbird		✓
	Gymnorhina tibicen	Australian Magpie	✓	✓
	Strepera graculina	Pied Currawong		✓
Corvidae (Crows and allies)	*Corvus coronoides*	Australian Raven	✓	✓
	Corvus orru	Torresian Crow		
	Corvus tasmanicus	Forest Raven (EMa)		
Cororacidae (Mud-nesters)	*Corcorax melanorhamphos*	White-winged Chough		
Ptilinorhynchidae (Bowerbirds)	*Ptilonorhynchus violaceus*	Satin Bowerbird	✓	✓
	Sericulus chrysocephalus	Regent Bowerbird		✓
Motacillidae (Old World Wagtails,Pipits)	*Anthus novaeseelandiae*	Richard's Pipit		✓
Passeridae (Sparrows, Weaverbirds, Waxbills)	*Passer domesticus*	House Sparrow #		
	Taeniopygia bichenovii	Double-barred Finch		
	Neochmia temporalis	Red-browed Finch	✓	✓
	Lonchura castaneothorax	Chestnut-breasted Mannikin		✓
Dicaeidae (Flowerpeckers)	*Dicaeum hirundinaceum*	Mistletoebird		✓
Hirundinidae (Swallows and Martins)	*Hirundo neoxena*	Welcome Swallow (EMa)	✓	✓
	Hirundo nigricans	Tree Martin (EMa)		✓
	Hirundo ariel	Fairy Martin		
Sylviidae (Old World Warblers)	*Acrocephalus stentoreus*	Clamorous Reed Warbler		
	Cincloramphus mathewsi	Rufous Songlark		
	Cisticola exilis	Golden-headed Cisticola		✓
	Megalurus gramineus	Little Grassbird		
	Megalurus timorensis	Tawny Grassbird		✓
Zosteropidae (White-eyes)	*Zosterops lateralis lateralis*	Silvereye (EMa)		
	Zosterops lateralis familiaris	Silvereye (EMa)	✓	✓
Muscicapidae (Thrushes)	*Zoothera lunulata*	Bassian Thrush		
	Zoothera heinei	Russet-tailed Thrush		

Sturnidae (Starlings and allies)	*Sturnus vulgaris*	Common Starling #		✓
	Acridotheres tristis	Common Myna #		✓

Known and Expected Mammal List

Appendix Key: ✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
Species indicated in **BOLD** font are those threatened species known from within 10km of site (NPWS, 2003)

Data Source: **1** = Species recorded during this survey
2 = Species recorded previously **(RPS HSO Ecologist pers. obs.)**

Family Name	*Scientific Name*	Common Name	1	2
Tachyglossidae (Echidnas)	*Tachyglossus aculeatus*	Short-beaked Echidna		
Family Ornithorhynchidae (Platypus)	*Ornythorhynchus anatinus*	Platypus		✓
Dasyuridae (Dasyurids)	*Antechinus flavipes*	Yellow-footed Antechinus		
	Antechinus stuartii	Brown Antechinus		
	Antechinus swainsonii	Dusky Antechinus		
	Dasyurus maculatus	**Tiger Quoll (V, EV)**		
	Phascogale tapoatafa	Brush-tailed Phascogale (V)		
	Planigale maculata	Common Planigale (V)		
	Sminthopsis murina	Common Dunnart		
Peramelidae (Bandicoots and Bilbies)	*Isoodon macrourus*	Northern Brown Bandicoot		
	Peremeles nasuta	Long-nosed Bandicoot		
Phascolarctidae (Koala)	***Phascolarctos cinereus***	**Koala (V)**		
Vombatidae (Wombats)	*Vombatus ursinus*	Common Wombat		
Petauridae (Wrist-winged Gliders)	*Petaurus breviceps*	Sugar Glider		
	Petaurus norfolcensis	**Squirrel Glider (V)**		
	Petaurus australis	**Yellow-bellied Glider (V)**		
Pseudocheiridae (Ringtail Possums, Greater Glider)	*Petauroides volans*	Greater Glider		
	Pseudocheirus peregrinus	Common Ringtail Possum	✓	
Acrobatidae (Feathertail Glider)	*Acrobates pygmaeus*	Feathertail Glider		
Phalangeridae (Brushtail Possums and Cuscuses)	*Trichosurus vulpecula*	Common Brushtail Possum	✓	
Potoroidae (Potoroos and Bettongs)	*Potorous tridactylus*	Long-nosed Potoroo (V, EV)		
Macropodidae (Wallabies and Kangaroos)	*Macropus giganteus*	Eastern Grey Kangaroo		
	Macropus robustus	Common Wallaroo		
	Macropus rufogriseus	Red-necked Wallaby		
	Maropus parma	**Parma Wallaby (V)**		
	Petrogale penicillata	**Brush-tailed Rock-Wallaby (E, EV)**		
	Wallabia bicolor	Swamp Wallaby		

Pteropodidae (Flying-foxes, Blossom-bats)	***Pteropus poliocephalus***	**Grey-headed Flying-fox (V, EV)**		✓
	Pteropus scapulatus	Little Red Flying-fox	✓	
Rhinolophidae (Horseshoe-bats)	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat		
Emballonuridae (Sheathtail-bats)	***Saccolaimus flaviventris***	**Yellow-bellied Sheathtail-bat (V)**	✓	
Molossidae (Freetail-bats)	***Mormopterus norfolkensis***	**East Coast Freetail-bat (V)**	✓	
	Mormopterus sp.1	Little Freetail-bat		
	Mormopterus sp.2	Eastern Freetail-bat		
	Tadarida australis	White-striped Freetail-bat		
Vespertilionidae (Vespertilionid Bats)	***Miniopterus australis***	**Little Bentwing-bat (V)**		
	Miniopterus schreibersii	**Common Bentwing-bat (V)**	✓	
	Nyctophilus geoffroyi	Lesser Long-eared Bat		
	Nyctophilus gouldii	Gould's Long-eared Bat		
	Chalinolobus dwyeri	**Large-eared Pied Bat (V, EV)**		
	Chalinolobus gouldii	Gould's Wattled Bat		
	Chalinolobus morio	Chocolate Wattled Bat	✓	
	Falsistrellus tasmaniensis	**Eastern Falsistrelle (V)**		
	Myotis adversus	**Large-footed Myotis (V)**		
	Scoteanax rueppellii	**Greater Broad-nosed Bat (V)**		
	Scotorepens greyii	Little Broad-nosed Bat		
	Scotorepens orion	Eastern Broad-nosed Bat		
	Vespadelus darlingtoni	Large Forest Bat		
	Vespadelus regulus	Southern Forest Bat		
	Vespadelus pumilus	Eastern Forest Bat	✓	
	Vespadelus vulturnus	Little Forest Bat		
Muridae (Murids)	*Hydromys chrysogaster*	Water Rat		
	Melomys burtoni	Grassland Melomys		
	Mus musculus	House Mouse*		
	Pseudomys novaehollandiae	New Holland Mouse		
	Rattus fuscipes	Bush Rat		
	Rattus lutreolus	Swamp Rat		
	Rattus norvegicus	Brown Rat*		
	Rattus rattus	Black Rat*		
Canidae (Dogs)	*Canis familiaris*	Dog *		✓
	Canis familiaris dingo	Dingo		
	Vulpes vulpes	Red Fox*	✓	✓
Felidae (Cats)	*Felis catus*	Feral Cat*		
Leporidae (Rabbit and Hare)	*Oryctolagus cuniculus*	European Rabbit*		✓
	Lepus capensis	Brown Hare*		
Equidae (Horse and Donkey)	*Equus caballus*	Horse*		
Suidae (Pigs)	*Sus scrofa*	Pig*		
Bovidae (Horned Ruminants)	*Bos taurus*	Cow*	✓	✓
	Capra hircus	Goat*		

Cervidae (Deer)	*Cervus timorensis*	Rusa Deer*		
Camelidae (Alpaca)	*Lama* sp.	Alpaca*		

Known and Expected Reptile List

Appendix Key: ✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
(EMa) = Species listed under the Commonwealth EPBC Act as Marine
Species indicated in **BOLD** font are those threatened species known from within 10km of site (NPWS, 2003)

Data Source: **1** = Species recorded during this survey
2 = Species recorded previously **(RPS HSO Ecologist pers. obs.)**

Family Name	*Scientific Name*	Common Name	1	2
Cheloniidae (Turtles)	***Chelonia mydas***	**Green Turtle (V, EMa)**		
Chelidae (Tortoises)	*Chelodina longicollis*	Long-necked Tortoise		✓
Agamidae (Dragons)	*Amphibolurus muricatus*	Jacky Lizard		
	Physignathus lesuerii	Eastern Water Dragon		✓
	Pogona barbata	Eastern Bearded Dragon		
Pygopodidae (Legless Lizards)	*Lialis burtonis*	Burton's Snake Lizard		
	Pygopus lepidopus	Common Scaly-foot		
	Delma plebeia	Leaden Delma		
Varanidae (Monitors)	*Varanus gouldii*	Gould's Monitor		
	Varanus rosenbergi	Heath Monitor (V)		
	Varanus varius	Lace Monitor		
Scincidae (Skinks)	*Cryptoblepharus virgatus*			
	Ctenotus taeniolatus	Copper-tailed Skink		
	Ctenotus robustus	Striped Skink		
	Cyclodomorphus casuarinae	She-oak Skink		
	Egernia cunninghamii	Cunningham's Skink		
	Egernia major	Land Mullet		✓
	Egernia modesta			
	Egernia striolata	Tree-crevice Skink		
	Egernia saxatilis	Black Rock Skink		
	Egernia whitii	White's Skink		
	Eulamprus quoyii	Eastern Water Skink		✓
	Eulamprus tenuis			
	Lampropholis delicata	Grass Skink		✓
	Lampropholis guichenoti	Garden Skink		
	Lygisaurus foliorum	Tree-base Litter-skink		
	Morethia boulengeri	South-eastern Morethia		
	Pseudomoia platynota	Red-throated Skink		
	Saiphos equalis			
	Saproscincus mustelinus	Weasel Skink		
	Tiliqua scincoides	Eastern Blue-tongued Lizard		
Typhlopidae (Blind Snakes)	*Ramphotyphlops bituberculatus*	Prong-snouted Blind Snake		
	Ramphotyphlops weidii	Brown-snouted Blind Snake		
	Ramphotyphlops nigrescens	Black Blind Snake		
Boidae (Pythons)	*Morelia spilota*	Diamond Python		✓
Colubridae (Tree Snakes)	*Boiga irregularis*	Brown Tree Snake		
	Dendralaphis punctulata	Green Tree Snake		
Elapidae (Venomous Snakes)	*Furina diadema*	Red-naped Snake		
	Acanthopis antarcticus	Death Adder		

Family Name	*Scientific Name*	Common Name	1	2
	Cacophis krefftii	Dwarf Crowned Snake		
	Cacophis squamulosus	Golden Crowned Snake		
	Demansia psammophis	Yellow-faced Whip Snake		
	Furina diadema	Red-naped Snake		
	Hoplocephalus bungaroides	Broad-headed Snake (V, EV)		
	Hoplocephalus bitorquatus	Pale-headed Snake (V)		
	Hoplocephalus stephensii	**Stephen's Banded Snake (V)**		
	Notechis scutatus	Eastern Tiger Snake		✓
	Pseudonaja textilis	Eastern Brown Snake		
	Rhinoplocephalus nigrescens	Eastern Small-eyed Snake		
	Vermicella annulata	Bandy Bandy		
	Hemiaspis signata	Black-bellied Swamp Snake		
	Pseudechis porphyriacus	Red-bellied Black Snake		

Known and Expected Frog List

Appendix Key: ✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
Species indicated in **BOLD** font are those threatened species known from within 10km of site (NPWS, 2003)

Data Source: **1** = Species recorded during this survey
2 = Species recorded previously **(RPS HSO Ecologist pers. obs.)**

Family Name	*Scientific Name*	Common Name	1	2
Hylidae (Tree Frogs)	*Litoria aurea*	Green and Golden Bell Frog (E, EV)		
	Litoria brevipalmata	**Green-thighed Frog (V)**		
	Litoria caerulea	Green Tree Frog		
	Litoria chloris	Red-eyed Green Tree Frog		
	Litoria dentata	Bleating Tree Frog		
	Litoria fallax	Dwarf Green Tree Frog	✓	✓
	Litoria gracilenta	Graceful Tree Frog		
	Litoria latopalmata	Broad-palmed Frog		
	Litoria lesueuri	Lesueur's Frog		
	Litoria littlejohni	**Littlejohn's Tree Frog (V, EV)**		
	Litoris nasuta	Rocket Frog		
	Litoria peronii	Peron's Tree Frog		
	Litoria phyllochroa	Green Leaf Tree Frog		
	Litoria tyleri	Tyler's Tree Frog		
	Litoria verreauxii	Verreaux's Frog	✓	
Myobatrachidae (Ground Frogs)	*Adelotus brevis*	Tusked Frog		
	Crinia signifera	Common Eastern Froglet	✓	✓
	Crinia tinnula	**Wallum Froglet (V)**		
	Heleioporus australiacus	**Giant Burrowing Frog (V, EV)**		
	Limnodynastes dumerilli	Eastern Banjo Frog		
	Limnodynastes ornatus	Ornate Burrowing Frog		
	Limnodynastes peronii	Striped Marsh Frog	✓	
	Limnodynastes tasmaniensis	Spotted Grass Frog	✓	
	Mixophyes balbus	**Stuttering Frog (E1, EV)**		
	Mixophyes fasciolatus	Great Barred Frog		
	Mixophyes iteratus	**Giant Barred Frog (E1, EE)**		
	Pseudophryne australis	**Red-crowned Toadlet (V)**		
	Pseudophryne coriacea	Red-backed Toadlet		
	Pseudophryne bibronii	Brown Toadlet		
	Uperoleia fusca	Dusky Toadlet	✓	
	Uperoleia laevigata	Smooth Toadlet	✓	

APPENDIX D: PERSONNEL INVOLVED IN THE PROJECT

CRAIG ANDERSON BAPPSC(EAM)

Director

Date of Birth	5th November 1971
Qualifications	Bachelor Applied Science (Environmental Assessment & Management) University of Newcastle, New South Wales (1994) Currently undertaking Graduate Diploma in Archaeological Heritage through University of New England
Fields of Special Competence	Production of complex ecological impact assessment documents Detailed understanding of environmental legislation Conflict resolution and environmental impact mediation Land and Environment Court hearings Flora, habitat, and fauna surveys including threatened species Bushfire Threat Assessment & Management reporting Project Management (including areas outside environmental concern)
Professional Affiliations/ Study Groups	Ecological Consultants Association of NSW (ECA) Planning Institute of Australia (PIA) Society for Growing Australian Plants (SGAP) Frog and Tadpole Study Group (FATS) Society of Frogs & Reptiles (SOFAR) Hunter Birds Observers Club (HBOC) Bird Observers Club of Australia (BOCA) Australasian Bat Society (ABS) Hunter Heritage Network (HHN)
Credentials	RFS / PIA NSW Consulting Planners Bushfire Training Course Occupational Health and Safety Induction Training NSW Driver's Licence: Car (Class "C") NSW NPWS Scientific Investigation Licence (No. S10300)

EMPLOYMENT HISTORY

2001 – current	Senior Ecologist & Manager RPS HSO Ecology Harper Somers O'Sullivan, Newcastle. (Company Director as of July 2003)
2000 – 2001	Senior Ecologist & NSW Projects Manager Wildthing Environmental Consultants, Salt Ash.
1996 – 1999	Ecologist Wildthing Environmental Consultants, Salt Ash.
1995 – 1996	Ecologist / Environmental Officer Pulver Cooper & Blackley, Newcastle.
1995	Environmental Officer / Survey Assistant Kel Nagle Cooper & Associates, Newcastle.

ALLAN RICHARDSON BENVSC(HONS)
Ecologist

Date of Birth	06th June 1962
Qualifications	B.Env.Sc. (Environmental Management Major) University of Newcastle, New South Wales (2003) B.Env.Sc. (Hons) (Biology) University of Newcastle, New South Wales (2004)
Fields of Special Competence	Ornithological Surveys and Research Terrestrial flora and fauna surveys Site and Logistics Management Tertiary Tutoring and Demonstrating
Academic Awards	2002 Hunter Environmental Institute Scholarship
Professional Affiliations	Hunter Bird Observers Club
Credentials	NSW Driver's Licence: Car (Class "C") Boat Licence

EMPLOYMENT HISTORY

Jan 2005 – current	Ecologist Harper Somers O'Sullivan
Jul 2003 – May 2004	Casual Tutor/Demonstrator The University of Newcastle
Jul – Nov 2003	Casual Tutor/Demonstrator The University of Newcastle
Jan 2002	Ornithological Surveyor Wetland Care Australia
Nov 1998 – Sep 2000	Manager, Caretaker, Ecologist Yarrahapinni Youth, School and Ecology Centre
Nov 1997	Ornithological Surveyor State Forests

MATTHEW DOHERTY BLMC

Senior Ecologist

Date of Birth 28th September 1978

Qualifications Bachelor of Landscape Management and Conservation University of Western Sydney, NSW
Bush Regeneration Certificate II Western Institute of TAFE, NSW

Fields of Special Competence Planning and Conducting Field Surveys for Flora, Fauna and Habitat Identification
Liaison and Mediation with Clients, Stakeholders and Governing Bodies
Geographic Information System Operation for Project Design and Mapping
Report Preparation including Threatened Species Assessment, Vegetation Management Plans, Constraints Reports and Species Impact Statements
Tree Climbing to Install, Monitor and Maintain Supplementary Habitat (Nestboxes)
Project Management

Credentials Spikeless Tree Climbing Techniques, Total Height Safety
Occupational Health and Safety Induction Training (Greencard)
NSW Driver's Licence (Class C)
NSW NPWS Scientific Investigation Licence (S10300)

EMPLOYMENT HISTORY

April 2005 – Current Ecologist / Senior Ecologist
Harper Somers O'Sullivan, Broadmeadow, NSW

April 2004 – April 2005 Ecologist
Andrews.Neil Pty Ltd, Gosford, NSW

June 2003 – April 2004 Project Officer/ Horticultural Services
Gosford City Council, NSW

Jan 1997 – June 2003 Bar Tender/ Manager
Bars, Pubs, Clubs

Jan 1999 – Dec 1999 Environmental Officer
Dept of Land & Water Conservation, Newcastle, NSW