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FLORA AND FAUNA ASSESSMENT

FOR

CARRINGTON HOSPITAL SITE

LOT 10 DP845472 AND LOT 201 DP734620
WEROMBI ROAD,
GRASMERE

MARCH 2005
(REF: 4418F)

FLORA AND FAUNA ASSESSMENT

OF

**CARRINGTON HOSPITAL SITE
WEROMBI ROAD,
GRASSMERE**

MARCH 2005

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EXECUTIVE SUMMARY

This Flora and Fauna Assessment Report has been prepared by *Conacher Travers Pty Ltd* to identify the flora and fauna characteristics of The Carrington Hospital Site Werombi Road, Grassmere. This report will also identify ecological constraints for further development within the site.

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

In respect of matters required to be considered in the *Environmental Planning & Assessment Act* (1979) and relating to the species / provisions of the *Threatened Species Conservation Act* (1995), three (3) threatened fauna species, no threatened flora species and one (1) endangered ecological community were recorded within or in close proximity to the subject site. These included, Grey-headed Flying-fox (*Pteropus poliocephalus*), Large-footed Myotis (*Myotis adversus*), Cumberland Plain Land Snail (*Meridolum corneovirens*) and Cumberland Plain Woodland. Until a final proposal is determined, it is not possible to determine whether the proposed development will not cause a significant impact upon threatened species, populations and endangered ecological communities and whether a Species Impact Statement may be required for the proposed development.

In respect of matters required to be considered in the *Environment Protection and Biodiversity Conservation Act* (1999) one (1) threatened fauna species, Grey-headed Flying-fox (*Pteropus poliocephalus*) and one (1) endangered ecological community, Cumberland Plain Woodland, were recorded. Until such time as a final proposal is determined, it is not possible to determine whether the proposal is likely to have a significant impact on those species or communities and therefore whether a referral to Department of the Environment & Heritage is required.

In respect of matters relative to the *Fisheries Management Act* 1994 there are no matters requiring further consideration.

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Licences –

National Parks and Wildlife Service

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

Department of Agriculture

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

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FLORA AND FAUNA ASSESSMENT OF CARRINGTON HOSPITAL SITE - WEROMBI ROAD, GRASSMERE

SECTION 1.0 - INTRODUCTION

Conacher Travers Pty Ltd has been requested to carry out a Flora and Fauna Assessment of the Carrington Hospital site Werombi Road, Grassmere within the Camden LGA. Figure 1 provides an aerial appraisal of vegetation and landuses within and adjacent to the subject site.

1.1 Aims of the Assessment

The aims of the flora and fauna assessment are to:

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

1.2 Information Collation

To achieve the above aims, *Conacher Travers Pty Ltd* carried out field surveys on September 28th, 29th, 30th, and October 1st, 20th & 25th 2004.

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

- Aerial photographs (scale 1:25000) and Topographical maps (scale 1:25000);
- Atlas of NSW Wildlife (NPWS 2004) for the relevant 1:100,000 scale map sheet;
- The schedules of the *Threatened Species Conservation Act* (1995);
- The schedules of the *Fisheries Management Act* (1994);
- Lists of threatened species and communities in the *Environment Protection and Biodiversity Conservation Act* (1999);
- Rare or Threatened Australian Plants (ROTAP); and
- Previous reports and surveys within the local area.

1.3 Statutory Requirements

1.3.1 State

Threatened Species Conservation Act (1995)

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

The factors to be taken into account in deciding whether there is a significant effect are set out in Section 5A of the *Environmental Planning & Assessment (EP&A) Act* (1979) and are based on an 8 part test of significance.

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

Fisheries Management Act (1994)

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

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

1.3.2 National

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

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

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

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

1.4 Development Proposal

It is proposed to construct additional buildings as part of the existing Carrington Centennial Hospital and Aged Care Facilities on existing Lot 10 DP845472 and existing Lot 201 DP734620, Camden. The allotments to be developed, namely Lot 10 and Lot 201, occupy land to the north east and south west of the intersection of Smalls Road and Werombi Road. The existing buildings of the facility are located in the central and north western portions of existing Lot 10 DP845472. A final development plan is yet to be finalised.

1.5 Site Description

Location

The subject site consists of two lots. The eastern lot is situated between Werombi Road and the Nepean River. It is bounded to the east by Ferguson Lane and to the north by development fronting Centennial Lane. The site does not include DP 221387, which fronts Werombi Road. Approximate MGA coordinates of the subject site are 385500E and 6229500N. That lot is bounded by predominantly residential land to the north and west and by rural land to the south and east.

The western lot is on the opposite side of Werombi Road, on the south western corner of Smalls Road and Werombi Road. It has frontage to Smalls Road of approximately 300 metres and to Werombi Road of approximately 200 metres. It has frontage to the ends of Rofe Place and Grassmere Grove. It is bounded to the north and west by residential development and to the south and east by rural lands. The subject site encompasses an area of approximately 100 hectares.

Geology

The geology of the subject site is characterised by Wianamatta Shales of the Triassic Period. As is typical of that sequence, the soils are deep and clayey with no rock outcrops.

The Wollongong-Port Hacking 1:100,000 Soil Landscape map sheet (Hazelton, Bannerman and King, 1990) shows that the subject site is located principally within the Blacktown Soil Landscapes, with areas of Hawkesbury Theresa Park Soil Landscape adjoining the river.

Topography and Drainage

The subject site is situated on undulating land. The eastern lot is crossed by a number of ephemeral drainage lines, which discharge directly into the Nepean River. A large farm dam has been constructed on the largest of those drainage lines. The whole of that lot site drains generally north easterly into the Nepean River.

The western lot is crossed by two prominent ephemeral drainage lines, with a small farm dam constructed on eastern drainage line. Other smaller drainage line rise within the lot and drain into the two main drainage lines. The two main drainage lines rise to the south of the lot and flow northerly to north westerly through the lot, before combining near the intersection of Grassmere Grove and Cawdor Farms Road, before discharging into Sickles Creek. Most of the lot drains into the two drainage lines, while a small section to the south west drains generally westerly into an unnamed tributary of Sickles Creek.

Gradients of the subject site are variable, but generally 5-15%. The approximate elevation of the site is 50-110 metres Australian Height Datum (AHD).

Vegetation

Most of the vegetation within the subject site is disturbed, with a number of areas of residual bushland. Apart from a narrow strip of vegetation along the Nepean River, all adjacent lands have been cleared.

Conservation Reserves

There are no nearby conservation reserves.

Land Use

The subject site landscape has been affected by the following impacts:

- **Improvements:** The eastern section of the subject site is being used as an aged care facility and contains a number of buildings, including self contained units, hostel, nursing home and associated offices. A large farm dam has been created in the eastern section of the subject site.
- **Clearing:** Most of the subject site has been previously cleared.
- **Bushfire:** There are no signs of recent bushfire.

- **Agriculture:** There is evidence of agricultural activities in the eastern lot, but it is assumed that agricultural activities occurred before the erection of the Carrington Convalescent Hospital. The western lot was being used for bovine grazing at the time of the survey.
- **Earthworks:** Apart from the dams, no major earthworks have been conducted within the subject site.
- **Introduced weeds:** Significant incursions of a variety of weeds, principally African Lovegrass and African Olive, have occurred throughout the subject site.
- **Feral, Introduced and Domestic Fauna:** Native fauna within the subject site is likely to have been impacted upon by the predation of European Red Fox (*Vulpes vulpes*), Cats (*Felis catus*) and Dogs (*Canis familiaris*).

SECTION 2.0 - SURVEY TECHNIQUES

2.1 Flora Survey Techniques

- **Literature Review** - A review of available literature for the area was undertaken to obtain reference material and background information for this survey. These documents are listed in the Bibliography section of this report.
- **Database Searches** - The Atlas of NSW Wildlife (NPWS 2004) threatened flora records for the Wollongong and Penrith 1:100,000 Scale Map Sheets were analysed to provide a predictive list of threatened flora species that occur locally and could possibly occur throughout the habitats identified within the subject site.
- **Aerial Photograph Interpretation** - Aerial photographs at 1:25,000 scale were utilised to identify the extent of vegetation with respect to the site and surrounding areas.
- **Field Survey** - A flora survey, using a systematic stratified sampling regime within each of the identified vegetation communities, was undertaken on October 20th & 25th 2004. The flora survey targeted all vegetation communities present within the subject site. Random meanders (Cropper 1993) were undertaken throughout the site.
- **Accuracy of Identification** - Specimens of plants not readily discernible in the field were collected for identification. Structural descriptions of the vegetation where relevant were made according to Specht et. al (1995).

2.2 Fauna Survey Techniques

- **Literature Review** - A review of available literature for the area was undertaken to obtain reference material and background information for this survey. These documents are listed in the bibliography of this report.
- **Database Searches** - The Atlas of NSW Wildlife (NPWS 2004) threatened fauna records for the Wollongong and Penrith 1:100,000 Scale Map Sheets were analysed to provide a predictive list of threatened fauna species that occur locally and could possibly occur throughout the habitats identified within the subject site.
- **Field Survey** - Survey dates, times, weather conditions and methods employed are shown in Appendix 2. The location of fauna survey is presented in Figure 1.

2.2.1 Diurnal Birds

Visual observation of birds was carried out during visits to the site;

2.2.2 Nocturnal Birds

The presence of Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*), and Barking Owl (*Ninox connivens*) were targeted by broadcasting taped calls through a 15 watt Toa 'Faunatech' amplifier. Calls were played for 5-minute periods at 3-minute intervals for 30 minutes. This was followed by 1 hr of quiet listening and spotlighting.

2.2.3 Arboreal and Terrestrial Mammals

Elliott type A and B traps were used for trapping arboreal and terrestrial mammals. Trapping consisted of 60 arboreal trap nights and 60 terrestrial trap nights.

Arboreal trap-lines using 10-20 metre separations were placed in the most suitable trees along approximately 80m transects. Elliott type A traps were placed onto platforms that were attached to the trunks of trees 2-3 m above the ground at an incline of 10 degrees to facilitate drainage during inclement weather. A mixture of honey and water was then sprayed onto the trunk 3-5 metres above the trap and around the platform as a lure.

Terrestrial trap-lines of type A and B Elliott traps using 10-20 metre separations were placed along the same line as the arboreal traps in the most suitable terrestrial habitats.

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

Four trap-lines were set on the nights of September 28th, 29th and 30th 2004. The location of the trap-lines is shown in Figure 1. Each trap-line consisted of 5 type A arboreal traps, and 5 type B terrestrial traps.

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

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

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

- i. A search of the Atlas of NSW Wildlife (NPWS 2004) database;
- ii. The site was surveyed on foot, with Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for the presence of Koalas, characteristic scratch and claw marks on the trunk and scats around the base of each tree. The proportion of trees showing signs of Koala use was calculated. Additionally the location and density of droppings if found were documented;
- iii. Koalas were also targeted during spotlight surveys; and
- iv. Identification and an assessment of the density of tree species listed as Koala feed trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site. An estimate of the percentage density of each tree species across the site was determined by averaging the percentage of stems counted.

A Koala Spot Survey was undertaken within areas of remnant forest or woodland according to the Spot Assessment Technique for Determining the Significance of Habitat Utilisation by

Koalas (Phillips and Callaghan, 1995). This involved an assessment of potential Koala activity within a circle of minimum radius 10 metres from any one point around the basal circumference of a tree considered likely to have been utilised by a Koala. A minimum of 20 trees must be contained within the circle. A tree is defined as a live wood stem of any plant species (except palms, cycads, tree ferns and grass trees) which has a diameter at breast height (DBH) of 100mm or more. A systematic faecal pellet search beneath each tree for a maximum of two person minutes was undertaken with any results recorded on a standard field proforma.

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

2.2.4 Bats

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

2.2.5 Amphibians

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

2.2.6 Reptiles

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

2.2.7 Molluscs

Target searches for Cumberland Plain Snail (*Meridolum corneovirens*) were conducted throughout areas of remnant woodland / forest throughout the subject site. These searches were concentrated in areas of dense leaf litter beneath trees.

SECTION 3.0 - SURVEY RESULTS

3.1 Flora Results

Vegetation Condition

The overall vegetation condition of the site varies from fair to very poor.

The weed classification observed on the site ranges from: 2 – Moderate weed density, to 4 – Very high weed density (Ku-ring-gai Municipal Council Bushland Weed Assessment Guidelines (1995)).

Dominant weeds in shrub / subcanopy layer are *Olea europea ssp. africana*, representing canopy coverage of approximately 90% in some areas.

Dominant weeds in groundlayer are *Briza subaristata*, *Bromus* sp., *Cirsium vulgare*, *Eragrostis curvula*, *Hypochaeris* sp., *Lonicera japonica*, *Modiola caroliniana*, *Paspalum*

dilatatum, *Plantago lanceolata* and *Stenotaphrum secundatum*, representing canopy coverage of approximately 90% in many areas.

Approximately 20% of the site is mown.

Observations

A total of 209 species of plants was observed within the subject site. Of these, 98 species were native plants and 111 species were exotic. The native species observed consisted of 9 trees, 20 shrubs, 8 vines and mistletoes, 59 herbs and 2 ferns. The plants observed are listed in Tables A1.1 and A1.2 of Appendix 1. In addition to those species, a number of unidentified exotic species were observed in gardens and in the vicinity of buildings.

Six vegetation communities were identified within the subject site using aerial photographic interpretation and extensive ground truthing:

- Cumberland Plain Woodland (Mixed Species Woodland)
- Cumberland Plain Woodland (Grey Box Woodland)
- Riparian vegetation
- Grassland with Scattered Trees
- Parkland
- Aquatic Herbfield

3.2 Fauna Results

During the course of the survey a total of ninety-nine (99) species were recorded. This included 72 species of birds, 12 species of mammals, 6 species of reptile, 7 species of amphibian and 2 species of mollusc. Three (3) threatened species were recorded within or in close proximity to the subject site. These included Large-footed Myotis (*Myotis adversus*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Cumberland Plain Land Snail (*Meridolum corneovirens*). Species recorded throughout the duration of the fauna survey are listed in Table A1.4 of Appendix 1.

SECTION 4.0 - ECOLOGICAL ASSESSMENT

4.1 Previous Surveys Reviewed

Native Vegetation Maps of the Cumberland Plain Western Sydney (NPWS, 2002)

An extensive mapping and ground truthing exercise was undertaken and completed by the NSW NPWS to determine the presence and distribution of natural vegetation throughout the Cumberland Plain. This project identified the vegetation within the subject site as predominantly cleared, with areas of Shale Hills Woodland, Shale Plains Woodland and Riparian Forest.

Native Vegetation of the Cumberland Plain, Western Sydney (Tozer, NPWS, 2003)

A study to revise the existing classification of vegetation communities on the Cumberland Plain and Wianamatta Shale soils on adjacent plateaux.

Urban Bushland Biodiversity Study of Western Sydney (NPWS, 1997)

The Urban Bushland Biodiversity Study for Western Sydney (NPWS, 1997) surveyed vegetation throughout the Cumberland Plain and adjacent Hawkesbury Sandstone dominated environments. The NPWS (1997) focused on a number of individual bushland remnants throughout the local area, with the nearest study site being Camden Aerodrome, on the opposite side of the river.

That survey was concentrated on 6 ha of alluvial soils. One threatened species, *Eucalyptus benthamii*, was observed during that survey.

4.2 Vegetation Communities

Six vegetation communities were identified within the subject site using aerial photographic interpretation and extensive ground truthing:

- Cumberland Plain Woodland (Mixed Species Woodland)
- Cumberland Plain Woodland (Grey Box Woodland)
- Riparian vegetation
- Grassland with Scattered Trees
- Parkland
- Aquatic Herbfield

Vegetation Community 1 – Cumberland Plain Woodland (Mixed Species Woodland):

Vegetation Communities 1 and 2 are both representative of the endangered ecological community Cumberland Plain Woodland. The Mixed Species Woodland is dominated by a mixture of Forest Red Gum, Grey Box and Ironbark, while the Grey Box Woodland is dominated almost exclusively by Grey Box, except for a small area, shown hatched in the diagram, which is dominated almost exclusively by Forest Red Gum.

The trees in the Mixed Species Woodland are of variable ages. The Grey Box Woodland contains a small number of relatively old trees, while the remainder are juvenile or in early maturity. The understorey in the Grey Box Woodland is distinctly more diverse than that in the Mixed Species Woodland.

Occurrence - This vegetation community occurs in three sections in the eastern lot of the subject site and covers approximately 20% of the lot.

Structure - Woodland with a canopy cover of approximately 10-30 % and height of approximately 15-20 metres. The understorey consists of a sparse shrublayer to 3 metres high and moderate to dense groundcover of herbs and grasses.

Disturbances - This vegetation community has been disturbed by partial clearing, rubbish dumping, trail construction and incursions of weeds.

Common Species

Trees: *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Bursaria spinosa* (Blackthorn).

Groundcovers: *Asperula conferta* (Common Woodruff), *Brunoniella australis* (Blue Trumpet), *Dichondra repens* (Kidney Weed), *Microlaena stipoides* (Weeping Grass) and *Themeda australis* (Kangaroo Grass).

Weeds: *Cirsium vulgare* (Spear Thistle), *Eragrostis curvula* (African Lovegrass), *Hypochaeris radicata* (Flatweed), *Lycium ferocissimum* (African Boxthorn), *Modiola caroliniana* (Red-flowered Mallow) and *Olea europea* ssp. *africana* (African Olive).

Vegetation Community 2 – Cumberland Plain Woodland (Grey Box Woodland):

Occurrence - This vegetation community occurs in two sections of the western lot of the

subject site and covers approximately 50 % of that lot.

Structure - Woodland to open forest with a canopy cover of approximately 25-40% and height of approximately 10-20 metres. The understorey consists of a sparse to moderate shrublayer to 3 metres high and sparse to dense groundcover of herbs and grasses.

Disturbances - This vegetation community appears to be regrowth from previous clearing and has been disturbed by occasional grazing and incursions of weeds.

Common Species

Trees: *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Bursaria spinosa* (Blackthorn).

Groundcovers: *Aristida vagans* (Wire Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Dichondra repens* (Kidney Weed), *Einadia trigonos* (Fishweed), *Microlaena stipoides* (Weeping Grass), *Sida corrugata*, *Themeda australis* (Kangaroo Grass) and *Vittadinia cuneata*.

Weeds: *Chamaesyce supina*, *Eragrostis curvula* (African Lovegrass), *Lycium ferocissimum* (African Boxthorn), *Olea europea* ssp. *africana* (African Olive) and *Plantago lanceolata* (Ribwort).

Vegetation Community 3 – Riparian Vegetation:

This vegetation community consists principally of a dense thicket of African Olive, with occasional emergent trees and groundcover only underneath breaks in the canopy.

Occurrence - This vegetation community occurs as a narrow strip along the Nepean River and covers approximately 5 % of the subject site.

Structure - Closed Shrubland with a canopy cover of approximately 90 % and height of approximately 2-8 metres, with occasional emergent trees. The understorey occurs as a moderate to dense groundcover of herbs and grasses, where breaks occur in the canopy.

Disturbances - This vegetation community has been disturbed by previous partial clearing and incursions of weeds.

Common Species

Trees: *Angophora subvelutina* (Broad-leaved Apple), *Casuarina cunninghamiana* (River Oak), *Eucalyptus amplifolia* (Cabbage Gum), *Eucalyptus baueriana* (Blue Box) and *Eucalyptus elata* (River Peppermint).

Groundcovers: *Dichondra repens* (Kidney Weed) and *Themeda australis* (Kangaroo Grass).

Weeds: *Lonicera japonica* (Honeysuckle), *Olea europea* ssp. *africana* (African Olive) and *Robinia pseudoacacia* (Black Locust).

Vegetation Community 4 – Grassland with Scattered Trees:

Occurrence - This vegetation community occurs in the northern and eastern sections of the subject site and covers approximately 35 % of the subject site.

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

Disturbances - This vegetation community is the result of former clearing activities.

Common Species

Trees: *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum).

Shrubs: *Bursaria spinosa* (Blackthorn).

Groundcovers: *Asperula conferta* (Common Woodruff), *Cheilanthes sieberi* (Mulga Fern), *Einadia trigonos* (Fishweed) and *Themeda australis* (Kangaroo Grass).

Weeds: *Briza subaristata*, *Bromus hordaceus* (Soft Brome), *Cirsium vulgare* (Spear Thistle), *Dactylis glomerata* (Cocksfoot), *Eragrostis curvula* (African Lovegrass), *Hypochaeris radicata* (Flatweed), *Lolium perenne* (Perennial Ryegrass), *Modiola caroliniana* (Red-flowered Mallow), *Olea europea* ssp. *africana* (African Olive), *Paspalum dilatatum* (Paspalum), *Plantago lanceolata* (Ribwort) and *Vulpia myuros* (Rat's Tail Fescue).

Vegetation Community 5 – Parkland:

This vegetation community consists of a mixture of gardens and lawns, with a mixture of native and exotic trees and shrubs. It occurs in the vicinity of the buildings and occupies approximately 30% of the subject site,

Vegetation Community 6 – Aquatic Herbfield:

Occurrence - This vegetation community occurs in the areas normally inundated by the dam, or frequently inundated by the drainage lines and covers approximately 10 % of the subject site. As a result of the ongoing drought, a number of species have become established, which would not normally occur in this environment.

Structure - Moderate to dense herbfield to a height of approximately 1-2 metres.

Disturbances - This vegetation community is generally occupying areas subject to human based disturbance.

Common Species

Groundcovers: *Cynodon dactylon* (Common Couch), *Eleocharis sphacelata* (Tall Spike-rush), *Juncus usitatus* (Common Rush), *Marsilea mutica* (Nardoo) and *Typha orientalis* (Cumbungi).

Weeds: *Conyza albida* (Tall Fleabane), *Cyperus eragrostis* (Umbrella Sedge), *Lotus suaveolens* (Hairy Birds-foot Trefoil), *Ranunculus scleratus* (Celery Buttercup) and *Senecio madagascariensis* (Fireweed).

4.3 Vegetation Connectivity

The vegetation within the subject site is not part of any specific vegetation corridor, other than the vegetation adjoining the river, which is part of an extensive vegetation corridor along the Nepean River.

4.4 Flora Species

The plants observed are listed in Tables A1.1 and A1.2 of Appendix 1. Methodology utilised throughout the duration of flora surveys is presented in Section 2.1.

One threatened ecological community – Cumberland Plain Woodland was observed during the survey and is considered to be suitable habitat for one threatened species – *Pimelia spicata*.

No threatened species were observed during the survey.

No ROTAP species were observed during the survey.

4.5 Regional Significance

Vegetation Communities 1 and 2 are representative of the endangered ecological community Cumberland Plain Woodland and as such are classed as regionally significant. This ecological community will be further discussed in Section 4.7 below.

The few remaining trees in Vegetation Community 3 indicates the presence of a former stand of the endangered ecological community Sydney Coastal River-Flat Forest. However, the existing vegetation, apart from those trees, bears no resemblance to that endangered ecological community and as such its only ecological significance is its physical value as part of a vegetation corridor along the Nepean River. Its value as part of that corridor indicates a degree of regional significance.

Vegetation Community 4 is not representative of any naturally occurring vegetation community and as such has no regional significance.

Vegetation Community 5 is managed as formal gardens and park land and as such is not commensurate with any naturally occurring vegetation community. Individual features, such as hollow bearing trees do have ecological significance, but as a vegetation community it is considered to have low regional significance.

Vegetation Community 6 is floristically similar to the new preliminary determination for an endangered ecological community of Freshwater Wetlands on Coastal Plains. However, as the majority of that vegetation occurs in man made structures, it is not considered to be representative of that ecological community. The vegetation, particularly in the dams, does have high value for avian, reptilian and amphibian ecology and as such is considered to be regionally significant.

Urban Bushland Bio-diversity Study – Stage 1 Western Sydney (NPWS, 1997)

Almost 500 taxa or 50% of the total number of significant species within Western Sydney are considered to be of particular regional significance (NPWS, 1997). Most of these species are rare in Western Sydney due to their low abundance records during the targeted bio-diversity survey or are restricted in their distributions (ie representations within three or less LGA's). One conclusion reached from the results of the UBBS (NPWS, 1997) is that these species should be conserved where practicable.

Almost 72% of the total number of plant species recorded from western Sydney are considered to be either inadequately reserved or are vulnerable. Due to the large number of vulnerable species it was considered that a priority rating should be afforded to each species of significance. Vulnerable species have been referred to as follows:

REG – Regionally significant in Western Sydney

V1 – All regionally significant and / or rare taxa (5 or less records) (except for sandstone species common on surrounding sandstone plateau).

V2 – Uncommon taxa (6-10 records) sandstone species rare in the region but common and well conserved on surrounding sandstone plateau.

V3 – Common to widespread taxa (>10 records). These species are under no immediate threat and some are considered by the general public to be weeds, but in the opinion of NPWS in 1997, were considered to be inadequately represented in secure conservation reserves in western Sydney

Significance of the subject site

Sixteen (16) species considered significant in accordance with the findings of the NPWS (1997) were observed during the survey. Those species are listed in Table 1.

Table 1 – Significant Flora Species (NPWS, 1997)

Scientific Name	Common Name	UBBS Code
<i>Angophora subvelutina</i>	Broad-leaved Apple	V3
<i>Amyema miquelii</i>	Mistletoe	V3
<i>Bothriochloa macra</i>	Redleg Grass	V3
<i>Calotis lappulacea</i>	Yellow Burr-daisy	V3
<i>Carex inversa</i>	Knob Sedge	V3
<i>Chloris ventricosa</i>	Tall Chloris	V3
<i>Chrysocephalum apiculatum</i>	Common Everlasting	V3
<i>Desmodium brachypodium</i>	Large Tick-trefoil	V3
<i>Dodonaea viscosa</i> subsp. <i>angustifolia</i>	-	V3
<i>Einadia nutans</i>	-	V3
<i>Einadia polygonoides</i>	-	V3
<i>Einadia trigonos</i>	Fishweed	V3
<i>Eremophila debilis</i>	Winter Apple	V3
<i>Erodium crinitum</i>	Blue Storksbill	REG V1
<i>Eucalyptus amplifolia</i>	Cabbage Gum	V3
<i>Eucalyptus baueriana</i>	Blue Box	REG V1
<i>Einadia trigonos</i>	Fishweed	V3
<i>Linum marginale</i>	Native Flax	V3
<i>Lythrum hyssopifolia</i>	Hyssop's Loosestrife	V3
<i>Melia azedarach</i>	White Cedar	V3
<i>Oxalis perennans</i>	-	V3
<i>Plantago debilis</i>	-	V3
<i>Plantago gaudichaudii</i>	-	V3
<i>Polymeria calycina</i>	Bindweed	V3
<i>Pomaderris discolor</i>	-	V2
<i>Rumex brownii</i>	-	V3
<i>Senecio quadridentatus</i>	Cotton Fireweed	V3
<i>Sida corrugata</i>	-	V2
<i>Solanum pungetium</i>	Eastern Nightshade	V3
<i>Sporobolus creber</i>	Slender Rat's Tail Grass	V3
<i>Wahlenbergia stricta</i>	Bluebell	V3

Erodium crinitum was found during the survey and is considered to be a category REG V1 species in western Sydney (NPWS 1997). Records of this species within the subject site are of a number of specimens at lower elevations in the Grassland with Scattered trees vegetation community. This species is widespread in New South Wales, occurring in all botanical subdivisions except North Coast and occurs in all states. As such it is not considered to be in danger of regional extinction in the near future. As all of the specimens were observed well below the 1:100 year flood level and all are growing in a highly disturbed environment, it is considered that any future development of the site will have no impact on this species.

Eucalyptus baueriana was found during the survey and is considered to be a category REG V1 species in western Sydney (NPWS 1997). Records of this species within the subject site are of a number of specimens in close proximity to the Nepean River. This species occurs on alluvial soils in the botanical subdivisions of Central Coast and South Coast and extends into Victoria. With the increasing restrictions to development in the environment in which it occurs, it is not considered to be in danger of regional extinction in the near future. As all of the specimens were observed well below the 1:100 year flood level and all are growing in an effective vegetation corridor, it is considered that any future development of the site will have no impact on this species.

Pomaderris discolor was found during the survey and is considered to be a category V2 species in western Sydney (NPWS 1997). Records of this species within the subject site are of a single specimen in the Grey Box Woodland vegetation community. This species is widespread in open forest south of Bulahdelah and extends into Victoria. As such it is not considered to be in danger of regional extinction in the near future.

Sida corrugata was found during the survey and is considered to be a category V2 species in western Sydney (NPWS 1997). Records of this species within the subject site are of a small number of specimens in the Grassland with Scattered Trees vegetation community and numerous specimens in the Grey Box Woodland vegetation community. This species is widespread in New South Wales, occurring in all botanical subdivisions except South Coast, Southern Tablelands and Far Western Plains and occurs in all states except Tasmania. As such it is not considered to be in danger of regional extinction in the near future.

The remaining species are graded V3, indicating that they are common and widespread with no immediate threat, but are considered to be inadequately conserved in secure conservation reserves within the Cumberland Plain.

Four (4) fauna species listed as regionally significant by the UBBS (NPWS, 1997) were recorded within the subject site. These include, Great Egret (*Ardea alba*), Common Wombat (*Vombatus ursinus*), Swamp Wallaby (*Wallabia bicolor*), and Lace Monitor (*Varanus varius*).

These four species are common and widespread in suitable habitats throughout the Sydney Basin Bio-region and most of eastern Australia. It is considered these species are unlikely to become regionally extinct in the near future.

4.6 Threatened Flora

Two threatened flora species protected by State and National legislation have been identified as having the potential to occur within the subject site. These species are identified in the subsection below.

4.6.1 State Legislative Matters

TSC Act (1995) – A search of the Atlas of NSW Wildlife (NPWS 2004) database indicated that five (5) species have been recorded within a 10 km radius of the subject site. Those species are listed in Table A1.3 (Appendix 1).

Of those five threatened flora species, two have the potential to occur within the subject site. Those species are *Eucalyptus benthamii* and *Pimelea spicata*.

Eucalyptus benthamii – A tall, smooth-barked tree which is white, shedding in short ribbons or flakes. It occurs on flood plains, chiefly along the Nepean River between Camden and Bents Basin. A disjunct population occurs along the Grose River. It was targeted during the survey, the result being that no specimens were observed.

Pimelea spicata – A slender, erect to decumbent shrub to 50 cm high. It is restricted to the central coast of NSW where it occurs on the Cumberland Plain and coastal headlands of the Illawarra region. Suitable habitat was observed in many areas of the Cumberland Plain Woodland vegetation community. It was targeted during the survey, the result being that no specimens were observed. However, as the plant is often relatively small, a more intensive survey during its flowering period of late summer to early autumn would be required to establish that it does not occur within the subject site

Remnants of one threatened ecological community, Cumberland Plain Woodland was observed during the survey and are discussed in Section 4.7 below.

4.6.2 National Legislative Matters

Environment Protection and Biodiversity Conservation Act (1999)

A review of the schedules of the *EPBC Act* (1999) indicated the potential of eight (8) threatened species and two (2) endangered ecological communities to occur within a 10km radius of the site. These include *Acacia flocktoniae*, *Caladenia tessellata*, *Cynanchum elegans*, *Eucalyptus benthamii*, *Lepidium hyssopifolium*, *Persoonia bargoensis*, *Pimelea spicata*, *Pomaderris brunnea*, Cumberland Plain Woodland and Shale / Sandstone Transition Forest. None of those species were observed during the survey and only *Pimelea spicata* is considered likely to occur. A more intensive survey will be required during the species' flowering period to determine whether or not it occurs within the subject site. The presence of Cumberland Plain Woodland indicates that a referral to Department of the Environment & Heritage should be required.

At this stage a proposed development has not been finalised and further surveys will be required to determine whether *Pimelea spicata* occurs within the site. Until then, it is not possible to determine the potential impact of the proposal on that species or ecological community and so an assessment as to whether a referral is required cannot be carried out at this stage.

4.7 Endangered Ecological Communities

The following endangered ecological communities have been observed within the general locality of the subject site: Cumberland Plain Woodland, Elderslie Banksia Scrub Forest, Sydney Coastal River-Flat Forest, Western Sydney Dry Rainforest.

No rainforest vegetation communities were observed within the subject site, while Elderslie Banksia Scrub Forest is confined to a small area on the opposite side of Camden.

Residual trees in Vegetation Community 2 indicate that Sydney Coastal River-Flat Forest once occurred within the subject site, but the results of the survey indicate that the vegetation of Vegetation Community 2 is no longer representative of that vegetation community.

CUMBERLAND PLAIN WOODLAND (CPW)

General Description

Woodland which occurs on clay soils derived from Wianamatta Shales on the Cumberland Plain of western Sydney.

Habitat Requirements

- Geology / Soils: Clay soils derived from Wianamatta Shales.
- Topography: Hills and plains in the above geology on the Cumberland Plain.
- Characteristic Canopy Species: *Eucalyptus moluccana*, *Eucalyptus tereticornis*, *Eucalyptus crebra*, *Eucalyptus eugenioides*, *Eucalyptus fibrosa* and *Corymbia maculata*.

Conservation Status and Distribution

Occurs on the Cumberland Plain in western Sydney. It is estimated by UBBS (1997) that only 7% of the original Cumberland Plain Woodland remains and that 90% of those remnants are in small patches which are subject to ongoing threatening processes. Small areas are known to be reserved in the Cattai NP, Mulgoa NR and Scheyville NP.

Key Threatening Processes

Clearing associated with agriculture, grazing, hobby and poultry farms, housing and other developments, invasion by exotic plants, increased nutrient loads due to fertiliser runoff from gardens and farmland, dumped refuse and sewer discharge.

Vegetation Community 1, within the eastern lot of the subject site, consists of three sections, each considered to be a remnant of a former extensive area of Cumberland Plain Woodland. Each of the remnants contains varying degrees of disturbance and each has sections varying from very poor to reasonably good representations of Cumberland Plain Woodland.

It is considered that with appropriate management, Cumberland Plain Woodland could be restored in all of the remnants.

Vegetation Community 2, within the western lot of the subject site, consists of two sections, each considered to be a remnant of a former extensive area of Cumberland Plain Woodland. Each of the remnants appears to be regrowth from previous clearing and is developing into a reasonably good representation of Cumberland Plain Woodland.

Within the remnants, 64 native species and 46 exotics were observed indicating the extent to which incursions of exotic species have occurred, although of the exotic species, only *Olea europea* ssp. *africana* and *Eragrostis curvula* are considered to have made serious incursions. The Scientific Committee has provided a list of 54 species which it classes as characterising Cumberland Plain Woodland. 20 of those species (31% of species observed) were observed during the survey indicating that while there is significant disturbance, principally in the eastern lot, a reasonable seedbank of Cumberland Plain Woodland species is retained in the soil.

A separate list of diagnostic species has been prepared by the Tozer (2003) and of the 112 species listed as positive indicators of either of the components of Cumberland Plain Woodland, 36 (56% of species observed) were observed in the remnants.

The high percentage of indicator species observed within the subject site indicates a potential for regeneration of Cumberland Plain Woodland. However, the number of exotic species observed indicates the potential pressure on the woodland remnants and the need for an intensive plan of management to enable regeneration to occur.

4.8 Fauna Species

A total of ninety-nine (99) species were recorded within or in close proximity to the subject site. This number comprised 72 bird, 12 mammal, 6 reptile, 7 amphibian and 2 mollusc species. Three (3) threatened species, Large-footed Myotis (*Myotis adversus*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Cumberland Plain Land Snail (*Meridolum corneovirens*) were detected within the subject site. Species recorded during the duration of the survey are listed within Table 1.4 of Appendix 1.

Seventy-two (72) birds were recorded within or in close proximity to the subject site. All of these species are considered to be common within the local area. Nineteen (19) threatened bird species are considered to have potential to utilise the subject site.

Twelve (12) species of mammals were recorded to be utilising the subject site. This included two (2) threatened species Grey-headed Flying-fox (*Pteropus poliocephalus*) and Large-footed Myotis (*Myotis adversus*). Grey-headed Flying-fox (*Pteropus poliocephalus*) was spotlighted flying south over the subject site on September 29th 2004. Large-footed Myotis (*Myotis adversus*) was recorded foraging above the large dam on the September 30th 2004. Eight (8) threatened mammal species, not including Grey-headed Flying-fox and Large-footed Myotis are considered to have potential to utilise the subject site.

Six (6) species of reptile were recorded to be utilising the subject site. No threatened species of reptile are considered to have potential to utilise the subject site.

Seven (7) common species of amphibian were heard calling within the two dams and along the ephemeral drainage lines. One (1) threatened species of amphibian, Green and Golden Bell Frog is considered to have potential to utilise the subject site.

Two (2) Mollusc species were recorded within the woodland remnants of the subject site. This included the threatened species Cumberland Plain Land Snail (*Meridolum corneovirens*).

No fish species were recorded during the duration of the fauna survey. One threatened fish species Macquarie Perch is considered to have potential to inhabit the Nepean River on the northern edge of the subject site.

4.9 Habitat Types

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

- Vegetated areas of Woodland dominated by flowering Eucalyptus trees;
- Sparse to Dense shrublayer;
- Dense ground cover of herbs and grasses;
- Nectar producing plants, principally *Acacia*;
- Sap flows;
- Small (<10cm) to Large sized (>30cm) Tree hollows;
- Fallen timber and hollow logs;
- Loose soil suitable for burrowing;
- Sparse to moderate litter layer;

- Aquatic Habitats characterised by dams and ephemeral drainage lines, also the Nepean river adjoining the northern boundary of the subject site; and
- Occasional rubbish debris.

4.10 Habitat

The five (5) vegetation communities present within the subject site provide a diverse array of habitat. The habitat attributes of each vegetation community are described below.

Vegetation Community 1 – Mixed Species Woodland (EEC) occurs in three sections of the subject site. This community is dominated by the May to January flowering *Eucalyptus crebra* (Narrow-leaved Ironbark) the January to April flowering *Eucalyptus moluccana* (Grey Box) and the June to November flowering *Eucalyptus tereticornis* (Forest Red Gum). This provides foraging habitat for birds, bats and arboreal mammals. Also this winter foraging source provides potential foraging habitat for threatened migratory bird species, Swift Parrot and Regent Honeyeater. Hollow bearing trees containing small (<10cm) to large (>30cm) sized hollows were observed throughout this community. These provide potential roosting and nesting habitat hollow dependent fauna including small birds, micro-chiropteran bats, arboreal mammals and some arboreal reptile species. A sparse shrublayer provides protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. A dense groundcover of herbs and grasses as well as leaf litter provides suitable habitat for small terrestrial mammals, reptiles, amphibians and mollusc species.

Vegetation Community 2 – Grey Box Woodland (EEC) occurs in three sections of the subject site. This community is dominated by the January to April flowering *Eucalyptus moluccana* (Grey Box) and the June to November flowering *Eucalyptus tereticornis* (Forest Red Gum). This provides foraging habitat for birds, bats and arboreal mammals. Also this winter foraging source provides potential foraging habitat for threatened migratory bird species, Swift Parrot and Regent Honeyeater. Hollow bearing trees containing small (<10cm) to large (>30cm) sized hollows were observed throughout this community. These provide potential roosting and nesting habitat hollow dependent fauna including small birds, micro-chiropteran bats, arboreal mammals and some arboreal reptile species. A sparse to moderate shrublayer provides protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. A sparse to dense groundcover of herbs and grasses as well as leaf litter provides suitable habitat for small terrestrial mammals, reptiles, amphibians and mollusc species.

Vegetation Community 3 – Riparian vegetation occurs as a narrow strip along the Nepean River. This community is dominated by emergent flowering trees in which provides foraging habitat for birds, bats and arboreal mammals. Hollow bearing trees containing small (<10cm) to medium (10 - 30cm) sized hollows were observed throughout this vegetation community. These provide potential roosting and nesting habitat for hollow-dependent fauna including small birds, micro-chiropteran bats, small arboreal mammals and some arboreal reptile species. A dense shrublayer provides protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. A sparse groundcover of herbs and grasses including soft soil for burrowing provides suitable habitat for terrestrial mammals, reptiles and amphibians.

Vegetation Community 4 – Grassland with Scattered Trees occurs in the northern and eastern sections of the subject site. This community is dominated by the January to April flowering *Eucalyptus moluccana* (Grey Box) and the June to November flowering *Eucalyptus tereticornis* (Forest Red Gum). These provide foraging habitat for birds, bats and arboreal mammals. A scattered shrublayer provides suitable protective and foraging habitat for birds, arboreal mammals and terrestrial mammal species. A dense groundcover of herbs and grasses provides suitable habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation Community 5 – Parkland occurs within the vicinity of the buildings. Flowering exotic and native trees and shrubs provide foraging habitat for birds, bats and arboreal mammals. A dense groundcover of gardens and lawns provides suitable habitat for small terrestrial mammals, reptiles and amphibians.

Vegetation Community 6 – Aquatic Herbfield occurs in the areas normally inundated by the dam, or frequently inundated by the drainage lines. This community provides suitable foraging habitat for birds and reptile species. This habitat also provides protective, foraging and breeding habitat for amphibian species.

4.11 Threatened Fauna

4.11.1 State Legislative Matters

TSC Act (1995) - A search of the Atlas of NSW Wildlife (NPWS, 2004) database for threatened species resulted in records of twelve (12) threatened species within a 10 km radius of the subject site. Threatened species considered to have potential to occur within the subject site but not recorded within 10km by the Atlas of NSW Wildlife (NPWS 2004) have been including in the list of threatened species to be considered in the eight-part test. Table A1.5 of Appendix 1 identifies whether the subject site provides potential habitat for these species.

One (1) Koala food tree species (*Eucalyptus tereticornis*) listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection, was observed within the subject site. This species made up approximately 25% of trees within the eastern section and approximately 10% of trees on the western side of the subject site. This is greater than the 15% threshold as indicated by SEPP 44 for classification as Potential Koala Habitat. Therefore the subject site is considered to contain 'Potential Koala Habitat' as defined by SEPP 44.

No Koalas were observed during the fauna survey. No scats or other evidence suggests the presence of koalas within the local area. A search of the Atlas of NSW Wildlife (NPWS, 2004) database resulted in no records of Koala habitation within a 10 km radius from the subject site. Therefore the subject site is not considered to be 'Core Koala Habitat' as defined by SEPP 44.

Professor Robert Close, a koala expert from the University of Western Sydney was contacted in relation to potential Koala usage of the area in particular the riparian vegetation along the Nepean River. It is considered that there will potentially be occasional dispersers following the Nepean River from other areas (pers. com. Professor Robert Close)

A habitat assessment of the vegetation communities present within the subject site, combined with knowledge of the location of local threatened species populations, yielded the identification of potential habitat for the following threatened species within the subject site.

Species	Nesting	Foraging	Roosting	Breeding
Green and Golden Bell Frog	✓	✓		✓
Square-tailed Kite	✓	✓	✓	✓
Australasian Bittern		✓		
Black Bittern	✓	✓	✓	✓
Painted Snipe		✓		
Blue-billed Duck	✓	✓	✓	✓
Freckled Duck	✓	✓	✓	✓
Bush-stone Curlew	✓	✓	✓	✓

Species	Nesting	Foraging	Roosting	Breeding
Swift Parrot		✓		
Turquoise Parrot	✓	✓	✓	✓
Painted Honeyeater	✓	✓	✓	✓
Black-chinned Honeyeater	✓	✓	✓	✓
Regent Honeyeater	✓	✓	✓	✓
Barking Owl		✓		
Powerful Owl		✓		
Masked Owl	✓	✓	✓	✓
Speckled Warbler	✓	✓	✓	✓
Hooded Robin	✓	✓	✓	✓
Diamond Firetail	✓	✓	✓	✓
Brown Treecreeper	✓	✓	✓	✓
Koala		✓		✓
Squirrel Glider	✓	✓		✓
Grey-headed Flying-fox		✓		
Yellow-bellied Sheath-tail-bat		✓	✓	✓
Large-footed Myotis		✓	✓	✓
Eastern Bentwing-bat		✓		
Greater Broad-nosed Bat		✓	✓	✓
Eastern Freetail-bat		✓	✓	✓
Eastern False Pipistrelle		✓	✓	✓
Large-eared Pied Bat		✓	✓	✓
Cumberland Plain Land Snail		✓		✓
Macquarie Perch		✓		✓

A detailed assessment in accordance with Section 5A of the *EP&A Act* (1979) will be completed for these species in Section 5 of this report.

Fisheries Management Act (1994) – A review of the *Fisheries Management Act* (1994) identified the potential for one (1) threatened aquatic species (Macquarie Perch) to inhabit the Nepean River adjoining the subject site.

4.11.2 National Legislative Matters

EPBC Act (1999) – A review of the schedules of the *EPBC Act* (1999) identified the presence of fourteen (14) threatened fauna species within a 10km radius of the subject site. These species have been listed in Table A1.5 (Appendix 1) and those with potential to utilise the subject site will be considered in the eight-part test within Section 5.

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

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

The following 8 part test of significance relies on the ecological assessment provided in Sections 3 & 4 above and should be read as such. It is considered that the subject site provides potential habitat for the following threatened species and will be assessed accordingly in the following eight-part test:

- *Eucalyptus benthamii*
- Cumberland Plain Woodland
- Green and Golden Bell Frog
- Square-tailed Kite
- Australasian Bittern
- Black Bittern
- Painted Snipe
- Blue-billed Duck
- Freckled Duck
- Bush-stone Curlew
- Swift Parrot
- Turquoise Parrot
- Painted Honeyeater
- Black-chinned Honeyeater
- Regent Honeyeater
- Barking Owl
- Powerful Owl
- Masked Owl
- *Pimelea spicata*
- Speckled Warbler
- Hooded Robin
- Diamond Firetail
- Brown Treecreeper
- Koala
- Squirrel Glider
- Grey-headed Flying-fox
- Yellow-bellied Sheath-tail-bat
- Large-footed Myotis
- Eastern Bentwing-bat
- Greater Broad-nosed Bat
- Eastern Freetail-bat
- Eastern False Pipistrelle
- Large-eared Pied Bat
- Cumberland Plain Land Snail
- Macquarie Perch

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

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

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

Eucalyptus benthamii

Eucalyptus benthamii is a tall, smooth barked eucalypt which has localised occurrence on alluvial soils along a small section of the Nepean River, with a disjunct population on the Grose River. Throughout the duration of the flora survey of the subject site it was identified that Vegetation Community 2, within the subject site, provides potential habitat for this species. During the survey of the subject site, no specimens of *Eucalyptus benthamii* were observed. Despite the presence of potential habitat for *Eucalyptus benthamii* within the subject site, it is considered that future development of the subject site is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Pimelea spicata

A small subshrub which is confined to the Central Coast botanical division of NSW, principally on the western section of the Cumberland Plain. Throughout the duration of the flora survey of the subject site it was identified that the remnants of Cumberland Plain Woodland within the subject site provide potential habitat for this species. During the survey of the subject site, no specimens of *Pimelea spicata* were observed, however, a more intensive survey during the flowering period of the species will be required before it can be ascertained whether the species occurs within the subject site. As a proposed development has not been finalised, it is not possible to determine the impact of the proposal on this species, subject to determining whether the species actually occurs within the subject site.

Green and Golden Bell Frog

The Green and Golden Bell Frog prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds where it is often located under debris including corrugated iron, timber and rock. It is considered that vegetation community 6 – Aquatic Herbfield provides potential foraging and breeding habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Square-tailed Kite

The Square-tailed Kite moves low over the canopy of woodland, exploiting ecotones while hunting. It is known to favour *Angophora floribunda* and *Angophora subvelutina* woodland in association with box / ironbark eucalypt species along moist valleys on the coast of NSW. There is usually profuse blossom associated with this type of vegetation, which provides an abundance of nesting birds on which the kite typically preys. It is considered that the subject site provides potential nesting, foraging and roosting habitat for this species throughout the subject site. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Australasian Bittern

The Australasian Bittern inhabits shallow freshwater or brackish wetlands with tall dense beds of reeds, sedges or rush species and swamp edges. It is considered that the large dam and Vegetation community 3 – Riparian vegetation provides potential foraging habitat for the Australasian Bittern. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Black Bittern

The Black Bittern inhabits freshwater and brackish wetlands, ponds and streams with tall dense reed beds (Lindsey 1992). It is considered that the large dam and Vegetation community 3 – Riparian vegetation provides potential foraging nesting and breeding habitat for the Black Bittern. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Painted Snipe

The Painted Snipe is most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. It is considered that the large dam and Vegetation community 3 – Riparian vegetation provides potential foraging habitat for the Painted Snipe. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Blue-billed Duck

The Blue-billed Duck is a completely aquatic species occurring mainly throughout the Murray-Darling basin in cool to warm temperate deep permanent freshwater lakes, lagoons and swamps with extensive reed-beds. It is considered that the large dam and Vegetation community 3 – Riparian vegetation provides potential foraging nesting and breeding habitat for the Blue-billed Duck. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the

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

Freckled Duck

The Freckled Duck occurs mainly within the Murray-Darling basin and the channel country within large cool temperate to sub-tropical swamps, lakes and floodwaters with cumbungi, lignum or melaleucas. It is considered that the large dam and Vegetation community 3 – Riparian vegetation provides potential foraging nesting and breeding habitat for the Freckled Duck. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Bush Stone Curlew

The Bush Stone Curlew occurs in open woodland with fallen branches, leaf-litter, sparse grass; timber along dry watercourses, sand plains with spinifex and mallee, sandy scrub near beaches; mangrove-fringes; country golf courses, timber remnants on roadsides, plantations and urban areas. It is considered that the subject site provides potential foraging nesting and breeding habitat for the Bush Stone-curlew. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Swift Parrot

The Swift Parrot inhabits eucalypt forests and woodlands foraging mainly on nectar from winter flowering eucalypts and also psyllids and lerp, and seeds and fruits (Higgins, 1999). This migratory species breeds in Tasmania and its offshore islands in summer and in late March, almost the entire population migrates to mainland Australia. It is considered that the subject site provides potential foraging habitat for this species predominantly within the winter flowering tree species in vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), but also in all other trees throughout the subject site. Despite the presence of potential foraging habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Turquoise Parrot

The Turquoise Parrot inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. It is considered that the subject site provides potential nesting and breeding habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Painted Honeyeater

The Painted Honeyeater inhabits open forest, woodland and scrubland feeding on mistletoe fruits. It is considered that the subject site provides potential nesting and foraging habitat for this species within vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland). Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Black-chinned Honeyeater

Throughout its range over much of eastern Australia, the Black-chinned Honeyeater inhabits forest and woodlands. This species show a special preference for areas having rough-barked eucalypts such as ironbark and ash. In drier areas it is found within timber along watercourses, often with little understorey. On the western slopes of New South Wales it is found within ironbark forests (Simpson and Day, 1993). In New South Wales this species is mainly found in woodlands containing box-ironbark associations and River Red Gum. It is considered that the subject site provides potential nesting and foraging habitat for this species within the vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland) and 3 - Riparian Vegetation. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Regent Honeyeater

The Regent Honeyeater inhabits mostly dry eucalypt woodlands and forests dominated by box and ironbark eucalypts. In areas on western slopes of the Great Divide, this species is associated with moister more fertile soils, along creeks, broad river valleys and on lower slopes of foothills. This species is known to forage mainly among foliage or flowers in the upper canopy of trees, sometimes in the lower strata on trunks of trees, in shrubs, and occasionally on the ground. This species feeds on nectar, invertebrates (mostly insects) and their exudates, such as lerp and honeydew and occasionally on fruit. This species usually nests in canopy of forest or woodland. This species is often observed foraging on winter flowering eucalypts throughout western Sydney. It is considered that the subject site provides potential foraging and nesting habitat for the Regent Honeyeater within vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland). Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Barking Owl

The Barking Owl utilises eucalypt forests, woodlands and adjacent cleared areas for foraging and large hollows for nesting and breeding (Schodde & Tiedemann, 1986). This species usually roosts in large densely foliated trees, either among foliage or on bare branch below foliage, sometime quite low (Higgins, 1999). It is considered that the subject site provides potential foraging habitat for this species. Despite the presence of potential foraging habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Powerful Owl

The Powerful Owl inhabits dense mountain gullies, coastal forests and woodlands, coastal scrubs, and pine plantations over a large range (approx. 400-1400 ha). The Powerful Owl occurs in a range of vegetation types from woodland and open forest to rainforest. In NSW this species most commonly occurs in tall, wet or dry sclerophyll forests. This species nests in large hollows within large old trees, usually in living *Eucalypts* (Higgins, 1999; Conacher Travers, 2004). This species mostly roosts in closed forest, including rainforest or wet sclerophyll forest within densely foliated trees (Higgins, 1999). It is considered that the subject site provides potential foraging habitat for the Powerful Owl. Despite the presence of potential foraging habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Masked Owl

The Masked Owl utilises eucalypt forests, woodlands and adjacent cleared areas for foraging and large hollows for roosting, nesting and breeding. It is considered that the

subject site provides potential roosting, nesting and foraging habitat for the Masked Owl within the vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland). Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Speckled Warbler

The Speckled Warbler inhabits woodlands with a grassy understorey. They are sedentary, living in pairs or trios and nest on the ground in grass tussocks, dense litter and fallen branches. This species preferred foraging habitat is areas with a combination of open grassy patches, leaf litter and shrub cover (Pizzey and Knight, 1997). It is considered that the subject site provides potential nesting and foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Hooded Robin

The Hooded Robin is found in drier Eucalypt woodlands and scrubland. It has been found to occur in areas with fallen logs, cleared paddocks with stumps. It is considered that the subject site provides potential nesting and foraging for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Diamond Firetail

The Diamond Firetail inhabits open forests, mallee and savanna grassland preferring the vicinity of watercourses. The Diamond Firetail is sedentary often nesting in the same tree year after year (Pizzey and Knight, 1997). It is considered that suitable nesting and foraging habitat for this species exists throughout the subject site. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Brown Treecreeper

The Brown Treecreeper can be found in eucalypt woodland over much of eastern Australia. They prefer drier forests/woodlands with fallen branches and its distribution is known to coincide with that of River Red Gums and other eucalypts bordering river courses but it prefers rough-barked trees, especially the boxies and peppermints (Pizzey and Knight, 1997). Hollows in trees are known to be important for Brown Treecreepers. They provide nesting chambers, roosting sites, refuges from predators and sources of food. It may occur in the same patches as the White Throated Treecreeper but apparently defend territories against each other (Schodde and Tidemann, 1986). It is considered that vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), provides potential foraging and nesting habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Koala

The Koala inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees. It is considered that the subject site provides potential foraging habitat for this species primarily within northern section of vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland). Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Squirrel Glider

The Squirrel Glider inhabits mixed aged stands of eucalypt forest & woodlands including gum barked and high nectar producing species with hollow bearing trees. According to Quin (1995) the home-ranges of Squirrel Gliders have been estimated at between 0.65 and 8.55 ha, the movement of males being greater than that of females. Nightly movements are estimated at between 300 and 500 m. Quin (1995) found that the home-range of a family group is likely to vary according to habitat quality and availability of resources. The Squirrel Glider is a hollow-dependant species. It is considered that the subject site provides potential denning and foraging habitat within vegetation community 1 - Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), and 3 - Riparian vegetation. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Grey-headed Flying-fox

The Grey-headed Flying-fox is a canopy feeding frugivore and nectarivore species inhabiting rainforests, open forests, woodlands, *Melaleuca* swamps and *Banksia* woodlands. This species provides a means of seed dispersal and pollination for many native plants. Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, *Melaleuca* stands, mangroves, riparian woodland or modified vegetation in urban areas. The Grey-headed Flying-fox was observed flying South across the subject site above the large Dam on September 29th 2004. It is considered that the subject site provides potential foraging habitat for this species. It is considered that areas of similar and better quality foraging habitat exist within the local area. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Yellow-bellied Sheath-tail-bat

The Yellow-bellied Sheath-tail-bat inhabits rainforests, sclerophyll forests and woodlands. This species has been noted to forage and breed throughout these habitats where suitable tree hollows are available for roosting. It is considered that the subject site provides potential roosting and foraging habitat for this species within vegetation community 1 Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), and 3 - Riparian vegetation. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Large-footed Myotis

The Large-footed Myotis inhabits rainforests and sclerophyll forests near creeks and lakes over which it forages for aquatic insects and small fish. This species is known to roost in tree hollows, caves, mines and tunnels. The Large-footed Myotis (*Myotis adversus*) was recorded foraging above the large dam on the September 30th 2004. It is considered that the subject site provides potential foraging habitat for this species. Potential roosting habitat exists within tree hollows in vegetation community 1 - Cumberland Plain Woodland (Mixed

Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), and 3 - Riparian vegetation. As a proposed development has not been finalised, it is not possible to determine the impact of the proposal on this species.

Eastern Bentwing-bat

The Eastern Bentwing-bat inhabits areas where there are caves, old mines, old buildings, stormwater drains for shelter and well-timbered areas for foraging. It is considered that the subject site provides potential foraging habitat for this species. Despite the presence of potential foraging habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat

The Greater Broad-nosed Bat inhabits areas containing moist river & creek systems especially tree-lined creeks for foraging and breeding. It is considered that the subject site provides potential roosting and foraging habitat for this species. In particular along the Nepean River and drainage lines passing through the subject site. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Eastern Freetail-bat

The Eastern Freetail-bat inhabits open forests and woodlands foraging above the canopy and along the edge of forests. This species is known to roost in tree hollows, under bark and buildings. It is considered that the subject site provides potential roosting and foraging habitat for this species within vegetation community 1 - Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), and 3 - Riparian vegetation. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Eastern False Pipistrelle

The Eastern False Pipistrelle has been recorded roosting in caves, old buildings and tree hollows. This species forages throughout woodlands and open forest. It is considered that the subject site provides potential roosting and foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Large-eared Pied Bat

The Large-eared Pied Bat has a restricted distribution from south central Queensland to central and northern NSW and is localised and uncommon throughout its range occurring in Rainforest, wet sclerophyll forest to dry sclerophyll forest and woodland habitats. It is considered that the subject site provides potential roosting and foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

Cumberland Plain Land Snail

The Cumberland Plain Land Snail inhabits remnant eucalypt woodland of the Cumberland Plain, generally in areas characterised by moist soils together with growths of various species of lichen. This species is known to shelter under logs, debris, clumps of grass, around the base of trees and burrowing into loose soil.

The Cumberland Plain Land Snail was recorded throughout all areas of Vegetation community 1 – Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland). The Cumberland Plain Snail was not found in the disturbed Vegetation communities 3 – Riparian Vegetation, 4 – Grassland with Scattered Trees or 5 – Parkland.

A total of forty-four (44) live and forty-two (42) dead specimens of Cumberland Plain Land Snail were found. It is considered that Cumberland Plain Snails within the natural vegetation remnants of vegetation community 1 - Cumberland Plain Woodland (Mixed Woodland) and 2 – Cumberland Plain Woodland (Grey Box Woodland), are likely to form a viable population of this species. As a proposed development has not been finalised, it is not possible to determine the impact of the proposal on this species.

Macquarie Perch

Occurs in south east Australia at moderate to high altitudes in rivers and reservoirs. Historical records show the species was widespread and abundant in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers and their tributaries. Allen (1989) states that introduced populations are present in Nepean River and water supply dams in the Sydney area. Occurs in lakes and flowing streams, usually in deep holes. It is considered that the Nepean River to the north of the subject site provides suitable habitat for this species. Despite the presence of potential habitat, it is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population of this species is likely to be placed at risk of extinction.

(b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

No endangered populations listed within the TSC Act (1995) have been identified within the subject site. This matter does not require any further consideration.

Marsdenia viridiflora ssp. *viridiflora* has been listed as an endangered population within the Camden LGA. Only very marginal habitat was observed during the survey and only one native vine species (*Glycine tabacina*) was observed. It is considered that the life cycle of the species that constitutes the endangered population is not likely to be disrupted such that the viability of the population is likely to be significantly compromised.

(c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

Several habitat attributes were identified within the subject site including:

- Vegetated areas of Woodland dominated by flowering Eucalyptus trees;
- Sparse to Dense shrublayer;
- Dense ground cover of herbs and grasses;
- Nectar producing plants, principally *Acacia*;
- Sap flows;
- Small (<10cm) to Large sized (>30cm) Tree hollows;
- Fallen timber and hollow logs;
- Loose soil suitable for burrowing;
- Sparse to moderate litter layer;
- Aquatic Habitats characterised by dams and ephemeral drainage lines, also the Nepean river adjoining the northern boundary of the subject site; and

- Occasional rubbish debris.

Habitats within the subject site, which contain potential habitat for threatened species, populations and ecological communities, are likely to be widespread in disturbed vegetation communities on Wianamatta Shale geology, within the Sydney Basin Bioregion.

It is considered that the proposal will not remove or modify a significant area of habitat for *Eucalyptus benthamii*, *Pimelea spicata*, Cumberland Plain Woodland, Green and Golden Bell Frog, Square-tailed Kite, Australasian Bittern, Black Bittern, Painted Snipe, Blue-billed Duck, Freckled Duck, Bush-stone Curlew, Swift Parrot, Turquoise Parrot, Painted Honeyeater, Black-chinned Honeyeater, Regent Honeyeater, Barking Owl, Powerful Owl, Masked Owl, Speckled Warbler, Hooded Robin, Diamond Firetail, Brown Treecreeper, Koala, Squirrel Glider, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Large-footed Myotis, Eastern Bentwing-bat, Greater Broad-nosed Bat, Eastern Freetail-bat, Eastern False Pipistrelle, Large-eared Pied Bat, Cumberland Plain Land Snail or Macquarie Perch within the local area or region.

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

It is considered that the habitat attributes of the subject site provide known or potential habitat for *Eucalyptus benthamii*, *Pimelea spicata*, Cumberland Plain Woodland, Green and Golden Bell Frog, Square-tailed Kite, Australasian Bittern, Black Bittern, Painted Snipe, Blue-billed Duck, Freckled Duck, Bush-stone Curlew, Swift Parrot, Turquoise Parrot, Painted Honeyeater, Black-chinned Honeyeater, Regent Honeyeater, Barking Owl, Powerful Owl, Masked Owl, Speckled Warbler, Hooded Robin, Diamond Firetail, Brown Treecreeper, Koala, Squirrel Glider, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Large-footed Myotis, Eastern Bentwing-bat, Greater Broad-nosed Bat, Eastern Freetail-bat, Eastern False Pipistrelle, Large-eared Pied Bat, Cumberland Plain Land Snail and Macquarie Perch.

Until such time as a final proposal is determined, it is not possible to ascertain as to whether known habitat for a threatened species, population or ecological community within the local area and region is likely to become isolated from currently interconnecting or proximate areas of habitat as a result of the proposal.

(e) Whether critical habitat will be affected.

The site has not been identified as critical habitat within the provisions of the TSC Act (1995).

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

The subject site provides potential habitat for *Eucalyptus benthamii*, *Pimelea spicata*, Cumberland Plain Woodland, Green and Golden Bell Frog, Square-tailed Kite, Australasian Bittern, Black Bittern, Painted Snipe, Blue-billed Duck, Freckled Duck, Bush-stone Curlew, Swift Parrot, Turquoise Parrot, Painted Honeyeater, Black-chinned Honeyeater, Regent Honeyeater, Barking Owl, Powerful Owl, Masked Owl, Speckled Warbler, Hooded Robin, Diamond Firetail, Brown Treecreeper, Koala, Squirrel Glider, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Large-footed Myotis, Eastern Bentwing-bat, Greater Broad-nosed Bat, Eastern Freetail-bat, Eastern False Pipistrelle, Large-eared Pied Bat, Cumberland Plain Land Snail and Macquarie Perch.

Eucalyptus benthamii is known to occur within two (2) conservation reserves throughout the Sydney Basin Bio-region including: Bents Basin SRA and Blue Mountains NP (NPWS, 1997; NPWS, 2004).

Pimelea spicata is known to occur within one (1) conservation reserve throughout the Sydney Basin Bio-region including: Killalea SRA (ROTAP, NPWS, 1997; NPWS, 2004).

Grey-headed Flying-fox is known to occur within seven (7) conservation reserves throughout the Sydney Basin Bio-region. These include: Blue Mountains NP, Brisbane Water NP, Dharug NP, Ku-ring-gai Chase NP, Munmorah SRA, Royal NP and Wyrribalong NP (NPWS, 2004).

Large-footed Myotis is known to occur within four (4) conservation reserves throughout the Sydney Basin Bio-region including: Blue Mountains NP, Dharug NP, Royal NP and Wyrribalong NP (NPWS, 1997; NPWS, 2004).

Cumberland Plain Land Snail is known to occur within five (5) conservation reserves throughout the Sydney Basin Bio-region including: Scheyville NP, Cattai NP, Mulgoa NR, Windsor Downs NR and Castlereagh NR (*pers. com.* Clarke, 1999).

Cumberland Plain Woodland is represented within a number of reserves including Mulgoa NR, Scheyville NP and Cattai NP (Benson, 1992).

While many of the threatened species and endangered ecological communities are represented in secure conservation reserves as indicated above. On the basis of available information, it is considered that none of the above are adequately represented within secure conservation reserves.

(g) Whether the development or activity proposed is a class of development or activity that is recognised as a threatening process

The proposal is likely to include clearing of native vegetation and removal of dead wood. "Clearing of native vegetation" and "Removal of dead wood and dead trees" are listed as Key Threatening Processes and as such the proposal is of a class of development recognised as a threatening process.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

None of the species that have been identified as potentially occurring within the subject site are approaching their natural limits of distribution within the Camden local area.

SECTION 6.0 - CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

Conacher Travers has undertaken an ecological survey and assessment of The Carrington Hospital site Werombi Road, Camden. This section also identifies ecological constraints for further development within the site.

In respect of matters required to be considered in the *Environment Protection and Biodiversity Conservation Act* (1999) one endangered ecological community, Cumberland Plain Woodland and one (1) threatened fauna species, Grey-headed Flying-fox (*Pteropus poliocephalus*) was recorded. Until such time as a final proposal is determined, it is not possible to determine whether the proposal is likely to have a significant impact on those

species or communities and therefore whether a referral to Department of the Environment & Heritage is required.

In respect of matters required to be considered in the *Environmental Planning & Assessment Act* (1979) and relating to the species / provisions of the *Threatened Species Conservation Act* (1995), one endangered ecological community and three (3) threatened fauna species were recorded within or in close proximity to the subject site. These included, Cumberland Plain Woodland, Grey-headed Flying-fox (*Pteropus poliocephalus*), Large-footed Myotis (*Myotis adversus*) and Cumberland Plain Land Snail (*Meridolum corneovirens*). Until a final proposal is determined, it is not possible to determine whether the proposed development will not cause a significant impact upon threatened species, populations and endangered ecological communities and whether a Species Impact Statement should not be required for the proposed development.

Potential ecological constraints exist for the development of the Carrington Hospital site Werombi Road, Camden. These constraints are mapped within Figure 2 and include the following:

- Endangered Ecological Community - Cumberland Plain Woodland consisting of vegetation Community 1 – Mixed Species Woodland & Vegetation Community 2 – Grey Box Woodland.
- Vegetation Community 3 – Riparian Vegetation providing a buffer for the Nepean River, also riparian areas buffering ephemeral drainage lines.
- Cumberland Plain Land Snail (*Meridolum corneovirens*) – populations present throughout areas of Vegetation Communities 1 and 2.
- Hollow bearing trees containing potential roosting habitat for Large-footed Myotis (*Myotis adversus*).

6.2 Recommendations

The following recommendations are made in accordance with the principles of Ecologically Sustainable Development.

- The site contains the Endangered Ecological Community - Cumberland Plain Woodland (Vegetation Communities 1 and 2). Any proposed works that require removal or modification to these communities may require referral to the Department of Environment and Heritage (Commonwealth) for assessment under the Environmental Protection and Biodiversity Conservation Act. A Species Impact Statement may need to be prepared subject to the extent of the proposed development.
- High densities of Cumberland Plain Snail was sighted throughout remnant Cumberland Plain Woodland and will require additional survey and assessment to estimate the population size and distribution.
- The potential roosting habitat for Large Footed Myotis needs to be identified and retained according to its ecological value and condition.
- The current vegetation is considered to be suitable habitat for *Pimelea spicata* which could not be surveyed as part of this report. Target survey for *Pimelea spicata* is recommended during its flowering season in late Summer to Autumn.
- That construction of dwellings and associated infrastructure be limited to cleared areas to minimise impacts on the Endangered Ecological Community – Cumberland Plain Woodland, (Vegetation Communities 1 and 2).

- Where possible, habitat trees should be retained. If a habitat tree is to be removed it should be inspected by a suitably qualified person for fauna occupation and if it is occupied by breeding native fauna, the removal of the tree be postponed until the young have matured.
- In respect to dams within the subject site, the dams should be retained if possible. If a dam is to be filled or altered it should first be inspected by a suitably qualified person for fauna occupation, so that any significant species can be relocated to suitable habitat in the local area.
- In respect to the creek-line, any fauna found to be utilising the creek for burrowing, nesting and/or breeding purposes, which are likely to be disturbed during rehabilitation works should be collected and relocated or passed to an appropriate wildlife care organisation such as Wildlife Information and Rescue Service (WIRES).

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