

Flora and fauna assessment, proposed rezoning.



**Nowra Park,
Corner of Scenic Drive
and North Street,
Nowra,
New South Wales.**



August 2010

Cover photographs: Dominant character of the study area.

Report prepared for:

Urban Planning Outcomes

at the request of,

Health Infrastructure

by

LesryK Environmental Consultants
c/o PO BOX 3001
BUNDEENA NSW 2230

Telephone: (02) 9523 2016

Mobile: 0408 25 8129

Facsimile: (02) 9544 1835

Email: admin@lesryk.com.au

www.lesryk.com.au

Please note that, given the dynamic nature of the relevant pieces of environmental legislation considered in this report, the authors consider that this report only has a 'shelf life' of six months. If a development application, review of environmental factors or statement of environmental effect is not submitted to a determining authority for consideration within this time frame, it is recommended that this report be reviewed and revised where required in light of any relevant legislative listings or changes.

Table of Contents

1.	Introduction.....	3
2.	Literature review and field guides.....	4
3.	Results of the literature review.....	6
3.1.	Flora.....	6
3.1.1.	Threatened flora.....	6
3.1.2.	Vegetation mapping.....	6
3.2.	Fauna.....	7
3.3.	Priorities action statement, recovery and threat abatement plans.....	7
4.	Field survey methods.....	9
5.	Results.....	10
5.1.	Vegetation and habitat types present within the study area.....	10
5.2.	Species recorded.....	11
5.2.1.	Flora.....	11
5.2.2.	Fauna.....	11
5.2.2. (a)	Yellow-bellied Sheath-tailbat (<i>Saccolaimus flaviventris</i>).....	13
5.2.2. (b)	East-coast Freetail Bat (<i>Mormopterus norfolkensis</i>).....	13
5.2.2. (c)	Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>).....	13
5.2.2. (d)	Eastern Falsistrelle (<i>Falsistrellus tasmaniensis</i>).....	14
5.3.	Wildlife corridors and vegetation links.....	14
6.	Ecological assessments.....	14
6.1.	Commonwealth - <i>Environment Protection and Biodiversity Conservation Act 1999</i>	14
6.2.	State - <i>Environmental Planning and Assessment Act 1979</i>	14
6.2. (a)	Hollow-dependent microchiropterans – Seven part test.....	15
6.2. (b)	Expected impact on hollow dependent microchiropterans.....	17
6.3.	State - <i>State Environmental Planning Policy No. 44 (SEPP 44) – Koala Habitat Protection</i>	17
7.	Conclusions.....	17
8.	Recommendations.....	18
9.	Bibliography.....	20

List of Figures

Figure 1: Study location and area.

Figure 2: Proposed development layout.

List of Tables

Table 1: Plant species of conservation significance previously recorded in the study region.

Table 2: Threatened fauna species potentially occurring within the study area.

Table 3: Fauna species recorded during the field survey.

List of Appendices

Appendix 1: Photographic record of the study area.

Appendix 2: Flora species recorded within the study area.

Appendix 3: Fauna species previously recorded in the study area.

I. Introduction.

At the request of Urban Planning Outcomes, a flora and fauna investigation has been carried out at Nowra Park, Nowra, New South Wales (NSW) (Figure 1). The area surveyed is approximately 1.4 hectares (ha) in size and is located immediately south of the Shoalhaven Hospital car park. The site is bound to the west by Scenic Drive, south by North Street, east by Nowra Park and north by Shoalhaven Hospital (Figure 1). This investigation has been undertaken as Health Infrastructure wishes to rezone the land to permit the development of a Cancer Care Centre in accordance with a funding agreement with the Commonwealth.



Figure 1: Study location and area. (Study area boundaries are approximate only). Not to scale. Source: Google Maps (2010).

For reference, a photographic record of the area investigated has been provided (Appendix 1).

The proposed hospital expansion is to include a number of buildings, car parks, driveways, footpaths and landscaped areas. With reference to those plans provided at the commencement of the project (refer to Figure 2) it is assumed that all vegetation within the study area would require removal. Whilst this is the case, as landscape areas are proposed to be included into the development's layout, it may be possible to retain some of the remnant native vegetation recorded on site, subject to design feasibility. For the purposes of this investigation it has been assumed all vegetation would be removed, and recommendations have been provided to negate this impact.

With reference to the definitions provided by the Department of Environment and Climate Change (DECC) (DECC 2007) it is noted that the:

- Subject site is defined as: the area directly affected by the proposal;
- Study area is defined as: the subject site and any additional areas that are likely to be affected by the Proposal, either directly or indirectly; and

- A local population is defined as: the population that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated.

For the purposes of this investigation, the study region is considered to include the surrounding lands for a distance of up to 5 kilometres. When referring to the proposal, this is considered to include all works associated with the project's construction, operation and occupation.

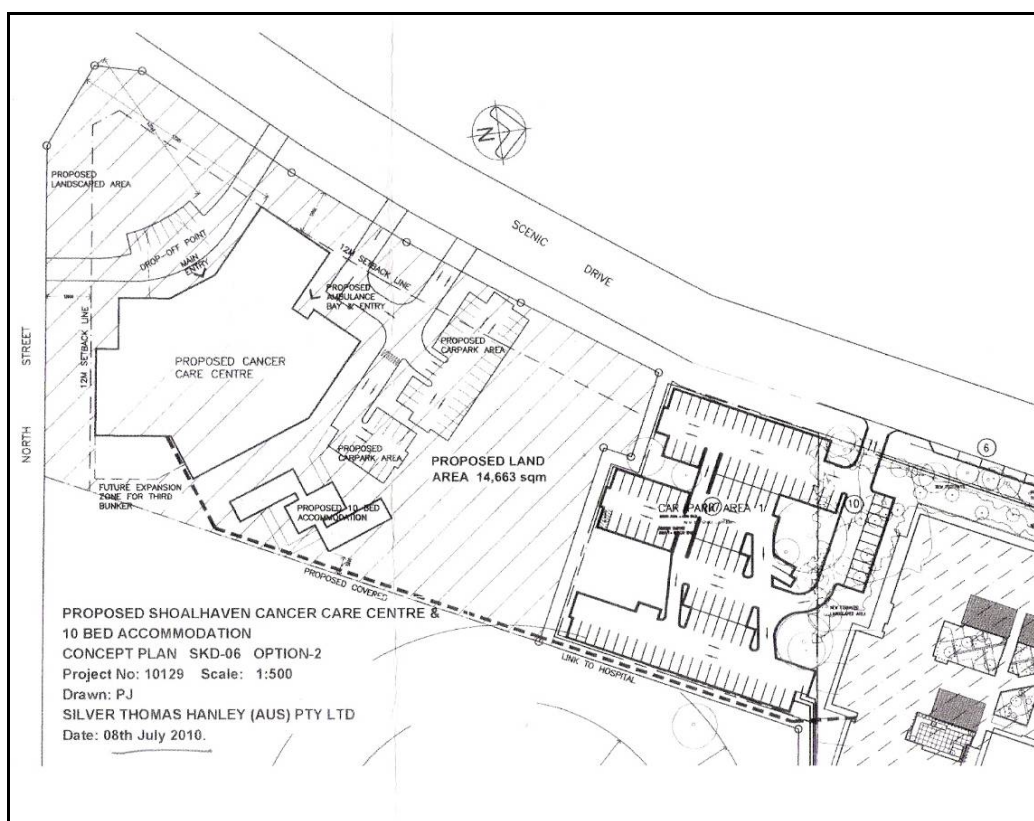


Figure 2: Proposed development layout.

Not to scale.

Source: Silver Thomas Handley (2010).

The assessment of possible impacts associated with the proposed Cancer Care Clinic is based on a field survey of the likely development area, a literature review of previous studies undertaken in both the region and this portion of the Shoalhaven City Council Local Government Area (LGA), the consultation of standard databases and the consideration of the objectives of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the New South Wales *Environmental Planning and Assessment Act 1979*, NSW *National Parks and Wildlife Act 1974* and NSW *Threatened Species Conservation Act 1995* (TSC Act), and any relevant State Environmental Planning Policies (SEPP).

2. Literature review and field guides.

Prior to undertaking any fieldwork, previous studies conducted in the region and known databases were consulted to identify the diversity of flora and fauna species known for, or potentially occurring in, the study region. The identification of known or potentially occurring native flora and fauna within this portion of the Shoalhaven LGA, particularly those listed under the Schedules to the EPBC and/or TSC Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants and animals, their vegetation communities and necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, the most appropriate species-specific survey

techniques may be selected should their associated vegetation communities / habitat requirements be present. The undertaking of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impacts on, all known and likely native species, particularly any plants and animals that are of regional, state and/or national conservation concern. This approach also avoids issues inherent with a one off “snap shot” study.

The studies, reports and databases referred to include:

- A flora and fauna assessment of Lot 2, 189 Old Southern Road, South Nowra (LesryK Environmental Consultants 1998);
- A fauna survey and targeted microchiropteran (insectivorous bat) study, Links Road, South Nowra (LesryK Environmental Consultants 2007);
- A fauna survey conducted at the intersection of BTU Road and the Princes Highway, South Nowra (LesryK Environmental Consultants 2008);
- A flora and fauna assessment for water and wastewater upgrading throughout the Shoalhaven (LesryK Environmental Consultants 2009a);
- A fauna investigation of three bushland area that are present within the Shoalhaven LGA (LesryK Environmental Consultants 2009b);
- The Department of Environment, Water, Heritage and the Arts (DEWHA) Online Database (DEWHA 2010);
- The Department of Environment, Climate Change and Water’s (DECCW) Atlas of NSW Wildlife (DECCW 2010a);
- Shoalhaven City Council’s State of the Environment Report (Shoalhaven City Council 2008/09).

Other reports and documents referred to are provided within the bibliography section of this report.

When accessing the DEWHA and DECCW databases, the search area specified was 10km² centred on the study area. All data base searches were undertaken on the 6th August 2010.

All these databases and reports were reviewed and drawn upon where relevant. Whilst reviewing these documents, particular attention was paid to identifying records of species listed under the Schedules of the *EPBC* and/or *TSC* Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the study area.

Field guides and standard texts used include:

- Harden (1992, 1993, 2000 and 2002) and Robinson (2003) (used for the identification of plants);
- Cogger (2000) (reptiles and frogs);
- Churchill (2008) (microchiropterans);
- Simpson and Day (2004) (birds);
- Van Dyck and Strahan (2008) (non-flying mammals); and
- Triggs (1996) (identification of scats, tracks and markings).

The naming of those species recorded or known for the region follows the nomenclature presented in these texts, or within the *EPBC* and *TSC* Acts.

The conservation significance of those ecological communities, plants and animals recorded is made with reference to:

- A publication on Australia’s Rare or Threatened Plants (ROTAP) (Briggs and Leigh 1996);
- The *EPBC* and/or *TSC* Acts;
- Vegetation mapping of the study region (Shoalhaven City Council 2010); and/or
- Shoalhaven City Council’s State of the Environment Report (Shoalhaven City Council 2008/09).

3. Results of the literature review.

3.1. Flora.

3.1.1. Threatened flora.

Consultation of the DECCW and DEWHA databases (DECC 2010a, DEWHA 2010) identified 10 threatened plants that have been previously recorded in the study region (Table 1). Based on the consultation of standard botanical texts, the study locality could provide potential habitat for some of these species. Therefore, if during the field survey suitable habitat for these threatened plants was identified, targeted searches for these species were undertaken.

Table 1. Plant species of conservation significance previously recorded in the study region.

Key

S1 = Schedule 1 (Endangered).

S2 = Schedule 2 (Vulnerable).

	EPBC Act	TSC Act	Habitat*
<i>Acacia pubescens</i>	S2	S2	Open sclerophyll forest and woodland on clay soils.
<i>Cryptostylis hunteriana</i>	S2	S2	Scrubby swamp fringes to steep bare hillsides in tall eucalypt forest.
<i>Eucalyptus langleyi</i>	S2	S2	Found in mallee shrubland on poorly-drained, shallow, sandy soils on sandstone.
<i>Genoplesium baueri</i>	Not listed	S2	Shady places in woodland.
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	S2	S1	Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Grows in sandy or light clay soils usually over thin shales.
<i>Pterostylis gibbosa</i>	S1	S1	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum <i>Eucalyptus tereticornis</i> , Wollybutt <i>Eucalyptus longifolia</i> and White Feather Honey-myrtle <i>Melaleuca decora</i> . Near Nowra, the species grows in an open forest of Spotted Gum <i>Corymbia maculata</i> , Forest Red Gum and Grey Ironbark <i>Eucalyptus paniculata</i> . In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark <i>Eucalyptus crebra</i> , Forest Red Gum and Black Cypress Pine <i>Callitris endlicheri</i> .
<i>Solanum celatum</i>	S1	S1	Occurs in a restricted area from Wollongong to just south of Nowra, and west to Bungonia. Grows in rainforest clearings, or in wet sclerophyll forests.
<i>Syzygium paniculatum</i>	S2	S2	Subtropical and littoral rainforest on sandy soils or stabilised dunes near the sea.
<i>Triplarina nowraensis</i>	S1	S1	Nowra Heath Myrtle occurs on poorly drained, gently sloping sandstone shelves or along creek lines underlain by Nowra Sandstone. The sites are often either treeless or have a very open tree canopy due to the impeded drainage.
<i>Zieria baeuerlenii</i>	S1	S1	Bomaderry Zieria The species occurs in only one location north-west of Nowra, on both sides of Bomaderry Creek. This species occurs on skeletal sandy loam overlaying sandstone, on a rocky plateau amongst sandstone boulders in either shrubby open forest, shrubby woodland or closed scrub.

* based on DECCW (2010b), Harden (1992-2002), NSW Scientific Committee (various dates), Robinson (2003) and Bishop (1996).

3.1.2. Vegetation mapping.

Upon review of the mapping prepared for the vegetation of the Shoalhaven LGA it is noted that the study area has been mapped as cleared and containing no vegetation (Shoalhaven City Council 2010). Whilst this is the case, with reference to aerial mapping of the study area (Google Maps 2010), it is

noted that vegetation is present (refer to Figure 1). Shoalhaven City Council (2010) has identified four (4) vegetation communities as occurring within the surrounding area, these being:

- Spotted Gum Forest;
- Scribbly Gum-Silvertop Ash Forest Woodland;
- Blackbutt Forest Woodland; and
- Grey Gum Forest Woodland.

It is noted that none of these are listed, or currently being considered for listing, as Endangered Ecological Communities (EEC) under either the *EPBC* or *TSC* Acts.

Through reference to the listings provided under the *TSC* Act, it is noted that no gazetted areas of critical habitat for any species, populations or ecological communities occur within the study area. Critical habitats are areas of land that are crucial to the survival of a particular threatened species, population and ecological community, none being present within, or in close proximity to, the proposed hospital expansion area.

3.2. Fauna.

Consultation of the DECCW and DEWHA databases (DECCW 2010a, DEWHA 2010) identified 42 threatened animals¹ that have been previously recorded in the study region (Table 2, Appendix 3). Based on the structure of the habitats present within the study area it is considered that four (4) of these species could potentially utilise and reside within the subject site (these being highlighted in **bold** on Table 2). In regards to the remainder of the species listed in Table 2, whilst it is acknowledged that these species have been previously recorded within the surrounding region, given the lack of any significant stands of their necessary habitat requirements within the study area (e.g. rainforests, wetlands, estuarine and pelagic environments and caves) none of these animals are considered to occur as a resident population within or near the study area. As these species would not be present as resident populations, and would therefore not be affected by the Cancer Care Centre proposal, no further assessment or consideration of the impacts of the works on these species is considered necessary.

It is acknowledged that some of the species listed in Table 2 may fly over or use the project site on occasion [e.g. Grey-headed Flying Fox (*Pteropus poliocephalus*), Cattle Egret (*Ardea ibis*), Great Egret (*Ardea alba*) and White-bellied Sea-eagle (*Haliaeetus leucogaster*)]. Whilst this is the case none of these animals would be considered to solely rely upon the resources provided by the subject site, such that the disturbance or further modification of these would have a significant impact on the local or regional viability (and presence) of these species, their populations or habitats. As with the threatened animals that would not occur on site, it is not considered necessary that any further assessment into the impact of the proposal on the occurrence of these species is required.

3.3. Priorities action statement, recovery and threat abatement plans.

Of those threatened species listed in Tables 1 and 2, DECCW has prepared, or is in the process of preparing, recovery plans for:

- the Koala (*Phascolarctos cinereus*);
- Yellow-bellied Glider (*Petaurus australis*);
- Grey-headed Flying Fox (*Pteropus poliocephalus*);
- Bush-stone Curlew (*Burhinus grallarius*);
- Large Forest Owls; and
- Green and Golden Bell Frog (*Litoria aurea*).

¹ This includes four animals that are currently being considered for listing [i.e. "Preliminary Determinations"] under both the *EPBC* and *TSC* Acts.

Table 2. Threatened fauna species potentially occurring within the study area.

Key

M – Listed as migratory under the EPBC Act.

N - Nominated for listing under the EPBC Act.

P – Preliminary determination made for listing under the TSC Act.

Common Name	Scientific Name	Legislation	Likelihood of Occurrence
MAMMALS			
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	EPBC and TSC Acts	Low – no suitable habitat present
Koala	<i>Phascolarctos cinereus</i>	TSC Act	As above
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	TSC Act	As above
Yellow-bellied Glider	<i>Petaurus australis</i>	TSC Act	As above
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	EPBC and TSC Acts	Moderate – may fly over
Yellow-bellied Sheath-tailbat	<i>Saccolaimus flaviventris</i>	TSC Act	Assumed to be present
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	EPBC and TSC Acts	No caves present
Eastern Falsistrelle	<i>Falsistrellus tasmaniensis</i>	TSC Act	Assumed to be present
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	TSC Act	Assumed to be present
Eastern Bentwing Bat	<i>Miniopterus (schreibersii) orianae oceanensis</i>	TSC Act	No caves present
East-coast Freetail Bat	<i>Mormopterus norfolkensis</i>	TSC Act	Assumed to be present
BIRDS			
Wedge-tailed Shearwater	<i>Puffinus pacificus</i>	EPBC Act M	Low – no suitable habitat present
Freckled Duck	<i>Stictonetta naevosa</i>	TSC Act	As above
Cattle Egret	<i>Ardea ibis</i>	EPBC Act M	Moderate – may fly over
Great Egret	<i>Ardea alba</i>	EPBC Act M	As above
Black Bittern	<i>Ixobrychus flavicollis</i>	TSC Act	As above
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EPBC N and TSC Act	As above
Glossy Ibis	<i>Plegadis falcinellus</i>	EPBC Act M	Low – no suitable habitat present
Pectoral Sandpiper	<i>Calidris melanotos</i>	EPBC Act M	As above
Bush-stone Curlew	<i>Burhinus grallarius</i>	TSC Act	As above
Hooded Plover	<i>Thinornis rubricollis</i>	TSC Act	As above
Square-tailed Kite	<i>Lophoictinia isura</i>	TSC Act	Moderate – may fly over
White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>	EPBC Act M	As above
Little Eagle	<i>Hieraetus morphnoides</i>	TSC Act P	As above
Spotted Harrier	<i>Circus assimilis</i>	TSC Act	As above
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	TSC Act	As above
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	TSC Act	As above
Little Lorikeet	<i>Glossopsitta pusilla</i>	TSC Act	As above
Powerful Owl	<i>Ninox strenua</i>	TSC Act	As above
Sooty Owl	<i>Tyto tenebricosa</i>	TSC Act	As above
Masked Owl	<i>Tyto novaehollandiae</i>	TSC Act	As above
White-throated Needletail	<i>Hirundapus caudacutus</i>	EPBC Act M	As above
Rainbow Bee-eater	<i>Merops ornatus</i>	EPBC Act M	As above
Varied Sittella	<i>Daphoenositta chrysoptera</i>	TSC Act	As above
Regent Honeyeater	<i>Xanthomyza phrygia</i>	EPBC M and TSC Acts	As above
White-fronted Chat	<i>Epthianura albifrons</i>	TSC Act P	As above
Scarlet Robin	<i>Petroica multicolor</i>	TSC Act	As above
Rufous Fantail	<i>Rhipidura rufifrons</i>	EPBC Act M	As above
Satin Flycatcher	<i>Myiagra cyaneoleuca</i>	EPBC Act M	As above
Black-faced Monarch	<i>Monarcha melanopsis</i>	EPBC Act M	As above
AMPHIBIANS			
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	EPBC and TSC Acts	Low – no suitable habitat present
Green and Golden Bell Frog	<i>Litoria aurea</i>	EPBC and TSC Acts	As above

Similarly, the Australian Government has adopted these plans, or is in the process of preparing recovery plans for:

- the Grey-headed Flying-fox; and
- Green and Golden Bell Frog.

As part of these recovery plans, certain objectives have been established. Given the poor quality and limited extent of the habitat present within the subject site, it is considered that the rezoning of the proposed development area, and the development of the Cancer Care Centre in this area, would not breach any of these objectives such that there would be a significant impact on these species or their necessary habitat.

For all listed threatened species with no recovery plan prepared, DECCW has prepared a Priorities Action Statement to promote the recovery of threatened species and the abatement of key threatening processes in NSW. The Priorities Action Statement identifies 25 broad recovery strategies, of which habitat management, protection and restoration would be applicable to the current proposal.

It is noted that the habitats likely to be affected by the rezoning and subsequent development of the subject site are not considered *significant* for the occurrence of any of the threatened species listed in Tables 1 and 2.

4. Field survey methods.

A survey of the study area was undertaken by Stephen Bloomfield (B.App.Sc) and Jennifer Edwards (B.A) on the 5th of August 2010. For reference, the weather conditions experienced during the site investigation were clear skies (10% cloud cover), cool temperatures (around 12°C) and moderate to strong south-westerly winds.

The purpose of the field investigation was to locate within the areas surveyed any plants, animals or vegetation communities that are of regional, State and/or National conservation significance. When conducting the field investigation, the 'Random Meander Method' (as per Cropper 1993) (or a modification of this that is applicable to fauna surveys) was employed. This method is suitable for covering large areas and for locating any rare species (and their associated vegetation communities / habitat types) that may occur within a survey site.

In relation to the fauna survey, in addition to the direct observation of those species present, other field survey methods employed were:

- Diurnal call identifications;
- The identification of indirect evidence, such as tracks, scats, diggings and scratchings; and
- Litter and ground debris searches for reptiles and amphibians.

Whilst conducting the fauna survey, efforts were made to document the diversity, structure and value of those habitats present within the areas surveyed for those protected, as defined under the NPW Act, and threatened, species potentially occurring. This involved assessing the structure of the flora and fauna habitats present and determining their significance for native species, particularly any that are of National and/or State conservation concern. Whilst conducting the habitat assessments, efforts were made to identify features such as known feed trees, hollow-bearing trees, connectivity of fauna corridors, aquatic environments and other habitat features important to the life cycle needs of those threatened species known or likely to occur in the study region.

By the completion of the field investigations, approximately three (3) person-hours of active searches had been accumulated. During the field surveys, no limitations to the overall outcomes of the site investigation, such as adverse climatic conditions, limited site access or reduced site visibility, were encountered. Whilst this is the case it is noted that the survey was undertaken during the winter months, a time when migratory birds would have dispersed to northern hemisphere breeding grounds, and species such as reptiles, frogs and insectivorous bats would be hibernating.

In regards to the possible presence of hollow dependant microchiropterans it is acknowledged that four hollow bearing trees were observed within the subject site. As the investigation was undertaken during a winter month and as no nocturnal work was conducted it was considered appropriate to adopt a precautionary approach in regards to the possible presence of these animals.

Within the subject site, no habitat areas suitable for any resident populations of threatened reptiles, frogs or migratory birds were present.

5. Results.

5.1. Vegetation and habitat types present within the study area.

The study area is comprised of a tall open eucalypt woodland which supports clumps of regenerating eucalypt saplings and native shrubs. Where no regenerating stands occur, the site has been slashed, presumably by Council, thereby resulting in a maintained grassland.

The canopy trees of the woodland are predominantly Blackbutt (*Eucalyptus pilularis*) and Red Bloodwood (*Corymbia gummifera*), as well as Radiata Pine (*Pinus radiata*) and some isolated Spotted Gum (*Corymbia maculata*). Those trees present reach a height of 20m to 25m, whilst the mid-storey consists of similar sapling species that reach a height of 10m. The understorey occurs in clumps that are of a medium to high density and are approximately 4m to 6m tall. Common understorey species include Blackthorn (*Bursaria spinosa*), Sweet Pittosporum (*Pittosporum undulatum*) and Fern-leaved Wattle (*Acacia filicifolia*). The groundcover associated with the woodland is of a high density, approximately 0.5m in height and consists of native grasses, herbs and forbs. Common species present within this layer include Three-awn Speargrass (*Aristida vagans*), Kangaroo Grass (*Themeda australis*), Paddock Lovegrass (*Eragrostis leptostachya*), Tufted Hedgehog Grass (*Echinopogon caespitosus*) and *Lomandra multiflora*. The groundcover around the edges of the subject site, and those areas which are regularly maintained, consist of exotic grasses, herbs and forbs that are approximately 15 centimetres in height and of a sparse to medium density. Common ground cover species include Panic Veldt Grass (*Ehrharta erecta*), Carpet Grass (*Axonopus fissifolius*), Couch (*Cynodon dactylon*), White Clover (*Trifolium repens*) and Catsear (*Hypochaeris radicata*). Gravel and exposed dirt patches are also present.

Accumulations of leaf litter and ground debris are common within the woodland areas. Within the area surveyed, no water bodies are present.

It is noted that three of the mature trees present within the proposed rezoning/hospital expansion area contain hollows suitable for the life cycle needs of hollow dependant species. An indication of the location of these plants is provided on Figure 1, the Global Positioning System (GPS)² coordinates of these being:

- Easting [E]: 279992; Northing [N]: 6138422;
- E: 279941; N: 6138441; and
- E: 279977; N: 6138522.

It is noted that a fourth hollow bearing tree was observed to the east of the proposed rezoning area, within Nowra Park (at E: 280034; N: 6138410) (Figure 1). This hollow bearing tree occurs beyond the projects limits and would therefore be unaffected by the proposed rezoning and subsequent development of the subject site.

As it was beyond the scope of the investigation, it is not known whether any hollow bearing trees are present along the banks of the Shoalhaven River, or in association with "Bens Walk"/Nowra Creek (this bushland area being located around 500m south of the subject site). A review of aerial photography that encompasses this portion of the study locality suggests that hollow bearing trees are present.

² GPS system used is GDA94. Accuracy ranged from 3m to 6m.

5.2. Species recorded.

5.2.1. Flora.

By the completion of the field survey sixty (60) plants had been recorded within the area investigated (Appendix 2). It is noted this is not intended to be a comprehensive list of all species present within the area surveyed, and only represents those plants that were recorded whilst undertaking searches for those native species of national or state conservation concern that are known, or expected to occur, in this locality.

In regards to those species identified it is noted that none are listed, or currently being considered for listing [i.e. Preliminary Determinations], on the Schedules to the *EPBC* or *TSC* Acts, or identified as a ROTAP. Similarly, none of the plants detected are of regional conservation significance.

Of those exotic species recorded, three are declared to be noxious weeds in the Shoalhaven LGA (as per the *Noxious Weeds Act 1993*), these being:

- Large-leaved Privett (*Ligustrum lucidum*) (C4³);
- Small-leaved Privett (*Ligustrum sinense*) (C4); and
- Lantana (*Lantana camara*) (C4).

Where any of these weeds occur on site, any biological control or other control program directed by the Local Control Authority must be implemented to result in the suppression of these plants.

5.2.2. Fauna.

As would be expected for a site that is essentially an urban parkland surrounded by residential and open space areas, few native species were recorded. Those that were observed or indicated as being present within, or beyond the subject site, were 17 native, and one introduced, animals (Table 3).

None of the native species observed or indicated are listed (or currently considered for listing i.e. Preliminary Determinations) under the Schedules to the *EPBC* or *TSC* Acts. Similarly none are of regional conservation concern within the Shoalhaven City LGA (Shoalhaven Shire Council 2008/09).

The native species recorded are all protected, as defined by the NSW *National Parks and Wildlife Act 1974*, but considered to be common to abundant throughout the surrounding region. These animals are all commonly recorded in association with residential areas and suburban properties. All of the recorded would be considered either generalist and/or suburban animals (Catterall *et al.* 1991). These species would not be solely reliant upon those habitats present within the subject site such that the removal or further disturbance of these would threaten the local or regional occurrence of these animals. Post-development, the native species identified are all expected to be present within either the study area or surrounding locality.

Whilst no species of conservation concern were recorded during the field survey, given the presence of hollow-bearing trees there is the potential that hollow-dependant microchiropterans could be present. With reference to the DECCW Atlas, it is noted that the following state listed hollow-dependant microchiropterans that have been previously recorded in this locality (DECCW 2010a):

- Yellow-bellied Sheath-tailbat (*Saccolaimus flaviventris*);
- East-coast Freetail Bat (*Mormopterus norfolkensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*); and
- Eastern Falsistrelle (*Falsistrellus tasmaniensis*).

For reference, a profile description of each of these microchiropterans has been provided.

³ The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

As no field work was undertaken to target the presence or absence of these bats, a precautionary approach has been adopted.

The development of the subject site would require the clearing of three hollow bearing trees. Given the structure of the hollows present these plants could be utilised by hollow-dependant microchiropterans as roosting, breeding and over-wintering sites. Though the removal of the three trees from the proposed development area is not considered to have a significant effect on the viability of any local populations of microchiropteran, an assessment drawing on the criteria provided under Section 5A of the *Environmental Planning and Assessment Act 1979* has been undertaken in Section 7.2.2 of this report.

Table 3. Fauna species recorded during the field survey.

* - introduced species.

COMMON NAME	FAMILY and SCIENTIFIC NAME	Detection Method
MAMMALS		
Sugar Glider	<i>Petaurus breviceps</i>	Characteristic feeding marks on a Red Bloodwood
BIRDS		
	Cacatuidae	
Galah	<i>Eolophus roseicapilla</i>	Observed / Heard
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	Heard
	Columbidae	
*Spotted Turtledove	<i>Streptopelia chinensis</i>	Heard
	Psittacidae	
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	Observed / Heard
Musk Lorikeet	<i>Glossopsitta concinna</i>	Observed / Heard
Australian King Parrot	<i>Alisterus scapularis</i>	Observed / Heard
Crimson Rosella	<i>Platycercus</i>	Observed / Heard
	Halcyonidae	
Laughing Kookaburra	<i>Dacelo naxaeguineae</i>	Observed / Heard
	Pardalotidae	
Spotted Pardalote	<i>Pardalotus punctatus</i>	Heard
	Acanthizidae	
Striated Thornbill	<i>Acanthiza lineata</i>	Observed / Heard
	Meliphagidae	
Red Wattlebird	<i>Anthochaera carunculata</i>	Observed / Heard
	Pachycephalidae	
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	Observed / Heard
	Dicruridae	
Magpie Lark	<i>Grallina cyanoleuca</i>	Observed / Heard
	Ptilonorhynchidae	
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>	Observed in nest
	Campephagidae	
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	Heard
	Artamidae	
Australian Magpie	<i>Gymnorhina tibicen</i>	Observed / Heard
Pied Currawong	<i>Strepera graculina</i>	Heard
	Corvidae	
Australian Raven	<i>Corvus coronoides</i>	Heard

A local population of a fauna species is defined as “comprising those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area (DECC 2007)”. As previously mentioned, the study area is defined as “the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly”. Drawing on these definitions, in combination with a review of the life cycle requirements and habitat needs of microchiropterans, the local insectivorous bat population is considered to include those individuals that occupy the subject site and are present within the study region.

5.2.2. (a) Yellow-bellied Sheathtailbat (*Saccolaimus flaviventris*).

Widespread in Australia, except in the very arid inland areas, the Yellow-bellied Sheathtail Bat roosts in large hollow trees or tree sprouts (Churchill 2008, Reardon and Flavel 1987, Van Dyck and Strahan 2008). The Yellow-bellied Sheathtail Bat is normally a solitary rooster, although groups of two to six individuals have been found, particularly in late winter-early spring (Churchill 2008, Lumsden and Menkhorst 1996). Although considered a forest dweller, collections of this species have come from a variety of habitats (Reardon and Flavel 1987, Van Dyck and Strahan 2008). Preying on insects, the Yellow-bellied Sheathtail Bat searches well above the forest canopy for suitable food resources (Reardon and Flavel 1987, Parnaby 1992). This species habit of flying high above the forest canopy results in few captures or detection's and this appears to account for the species' apparent rarity (Parnaby 1992). Populations in the southern part of the Yellow-bellied Sheathtail Bat's distribution do not appear to hibernate but seem to migrate to warmer areas during winter, though there is some controversy in regards to this issue (Reardon and Flavel 1987, Parnaby 1992, Van Dyck and Strahan 2008).

5.2.2. (b) East-coast Freetail Bat (*Mormopterus norfolkensis*).

The East-coast Freetail Bat (*Mormopterus norfolkensis*) is distributed along the east coast of Australia from Sydney to Brisbane, this species being confined to the east of the Great Dividing Range (Churchill 2008, Van Dyck and Strahan 2008). This species is known to predominantly roost during the day in tree hollows, either alone or in small colonies (Van Dyck and Strahan 2008). Emerging after dusk, the East-coast Freetail Bat feeds on flying insects, this species either hawking through the forest canopy, or clearings at its edge. Terrestrial insects may also be gleaned from the ground (Van Dyck and Strahan 2008). The East-coast Freetail Bat is known to prefer dry eucalypt forests and woodlands (Van Dyck and Strahan 2008).

5.2.2. (c) Greater Broad-nosed Bat (*Scoteanax rueppellii*).

This species is distributed from southern coastal Queensland through to south eastern NSW, though its strong hold appears to be the gullies and river systems draining the Great Dividing Range (Churchill 2008, Van Dyck and Strahan 2008). This species does not occur above 500m, except perhaps, in the very north of its range (Van Dyck and Strahan 2008). Generally occupies open eucalypt woodlands, though will also utilise rainforests, foraging and moving along natural and human made openings that have been created in the forest (Van Dyck and Strahan 2008). The Greater Broad-nosed Bat is known to fly slowly and directly (having poor manoeuvrability) along creek and river corridors at an altitude of 3m - 6m (these being a favoured movement/foraging corridor) (Van Dyck and Strahan 2008). This species usually roosts in tree hollows, though some individuals have been found in the roof spaces of old buildings (Strahan 2008). The Greater Broad-nosed Bat feeds on large insects such as beetles, and is also known to take small vertebrates such as mice and other small bats (Van Dyck and Strahan 2008). Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young (Van Dyck and Strahan 2008).

6.2.2. (d) Eastern Falsistrelle (*Falsistrellus tasmaniensis*).

The Eastern Falsistrelle is distributed southwards from south-eastern Queensland, along both the coast and Great Dividing Range through to western Victoria and Tasmania (Churchill 2008). This species commonly occurs at high, cool elevations, and, in Victoria, shows a clear preference for wet habitats with trees taller than 20m (Van Dyck and Strahan 2008, Menkhorst and Lumsden 1996). This species has also been recorded within eucalypt woodlands (Menkhorst and Lumsden 1996). Usually roosting in tree hollows, this species has also been recorded within caves in the Jenolan area (NSW) and cave substitutes (e.g. buildings) (Churchill 2008, Van Dyck and Strahan 2008). In Victoria, two roosting hollows were inspected by a researcher and these were found to be around 10m above the ground with entrances 40mm to 50mm in size (Menkhorst and Lumsden 1996). Known home ranges are in the order of 12km, though this may be a maximum size (Menkhorst and Lumsden 1996). The Eastern Falsistrelle feeds on a variety of insects usually collected from around, or just below, the tree canopy (Menkhorst and Lumsden 1996, Churchill 2008). In relation to this species winter activities, there appears to be some conflict within the literature with some reporters suggesting that the Eastern Falsistrelle migrates coastward, while others comment that it is a sedentary hibernator (Menkhorst and Lumsden 1996, Churchill 2008).

5.3. Wildlife corridors and vegetation links.

Based on a review of topographic maps and aerial photography, combined with a visual assessment of the subject site undertaken at the time of the field investigation, it is noted that the vegetation that is present within the study area is part of a local north-south vegetation corridor that extends along the Shoalhaven River. This vegetation connects with a much larger east-west vegetation corridor that encompasses a number of large conservation reserves.

Given the scope of works proposed, the presence of existing infrastructure and movement barriers and the extent of open space areas, any animals currently traversing along, through and over this corridor are also expected to do so post-development. The main group of animals expected to be traversing along those corridors identified would be the flying animals, the movement patterns of these species not being adversely affected by the scope of works proposed.

Therefore the proposed development of the study area is not considered to present a barrier to the movement patterns of any native fauna, thereby isolating or further fragmenting their habitat areas. Similarly it would not isolate any interbreeding populations.

6. Ecological assessments.

6.1. Commonwealth - *Environment Protection and Biodiversity Conservation Act 1999*.

The Proposal would not have a detrimental impact on any ecological communities, flora or fauna species of national conservation significance. Therefore it is not considered that the matter requires referral to the Federal Minister for the Environment Protection, Heritage and the Arts for further consideration or approval.

6.2. State - *Environmental Planning and Assessment Act 1979*.

By the completion of the field investigation no ecological communities, flora or fauna species listed under the *TSC Act* had been detected.

As three hollow bearing trees were observed within the proposed development area, and as these are all likely to be removed, based on the adoption of the precautionary approach, there is the potential that the following threatened microchiropterans could potentially occur within the subject site:

-
- Yellow-bellied Sheath-tailbat (*Saccolaimus flaviventris*);
 - East-coast Freetail Bat (*Mormopterus norfolkensis*);
 - Greater Broad-nosed Bat (*Scoteanax rueppellii*); and
 - Eastern Falsistrelle (*Falsistrellus tasmaniensis*).

These microbats have all been previously recorded in the study region and all are hollow-dependant animals.

To consider the potential for the proposed rezoning and future development of the site to have a detrimental impact on these microchiroptera, their populations and communities, the assessment criteria provided under Section 5A of the *Environmental Planning and Assessment Act 1979*, has been referred to.

When undertaking the following assessment it was assumed that the proposed future development of the study site would require the removal of all hollow-bearing trees within the subject site. Whilst this is the case, should the rezoning of the land occur, and should the development of the Shoalhaven Cancer Care Centre be carried out, it is recommended that, where possible, the hollow-bearing trees within the study site be retained, as set out in the recommendations section of this report.

In line with the guidelines provided on the seven-part test (DECC 2007), an assessment has been undertaken on “hollow dependant microchiropterans” due to the similarity of the animals habitat requirements.

6.2. (a) Hollow-dependent microchiropterans – Seven part test.

(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..."

As noted a local population of a fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area (DECC 2007).

From the perspective of those hollow-dependant microchiropterans potentially occurring, *adjoining areas* are expected to include those bushland stands that are present either side of the Shoalhaven River and in association with both “Bens Walk”/Nowra Creek and the vegetated Crown lands that occur to the south (i.e. around Mundamia 3km south of the project site) and north (i.e. Cambewarra 3km north).

In line with the above, and with reference to the species profile provided, the local populations of those hollow-dependant microchiropterans is considered to include those individuals present within the study area and nearby bushland stands. It is also assumed that, within this area, these bats would be roosting, foraging and breeding.

It is noted that, during the course of a previous ecological study, the authors have recorded the Greater Broad-nosed Bat, East-coast Freetail Bat and Eastern Falsistrelle to the north of the proposed hospital expansion site (LesryK Environmental Consultants 2009b).

The development of the study area would result in the removal of 1.4ha of bushland, this including three hollow bearing trees.

The impact of this disturbance on the viability of the local microchiropteran populations is considered to be minimal, particularly given the extent of similar bushland in the surrounding region. The development of the subject site would not affect the viability of this group of animals, such that they are placed at risk of extinction. Individuals, and therefore populations of this animal, would remain within both the study area and locality post-development, thereby ensuring the long term presence of these species.

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

An 'endangered population' is defined as a "population specified in Part 2 of Schedule 1" of the TSC Act. No hollow dependant microchiropterans are listed under Part 2, Schedule 1 of the TSC Act.

(c) *"...in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."*

No hollow-dependant microchiropterans are listed as an endangered ecological community.

(d) *"...in relation to the habitat of a threatened species, population or ecological community:*

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

The proposal is likely to require the removal of three hollow bearing trees. In addition, some insect attracting plants would also be removed.

- (ii) *"... whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action..."*, and

Hollow-dependent microchiropterans can easily negotiate urban areas and have been recorded flying over open spaces and infrastructure (author's field notes). Given the tolerance and ability of microbats to fly over urban areas, the development of the subject site is not considered to fragment or isolate any areas of microchiropteran habitat.

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

The resources present within the subject site are not considered to be unique to this locality. Within the surrounding bushland areas, including the reserve fringing the Shoalhaven River, similar resources are known/expected to be present. The importance of the subject site is therefore considered to be limited. The vegetation and habitat to be removed is therefore not considered important for the long-term survival of any threatened hollow-dependent microchiropterans in this locality.

(e) *"...whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)..."*

No critical habitat would be adversely affected by the proposal. The subject site is not listed as critical habitat under Part 3 Division 1 of the TSC Act.

(f) *"...whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan..."*

No recovery plans have been prepared for any species of microchiropteran.

A number of priority actions have been identified to assist the recovery of this group of species. Of these the following is relevant: "prepare [environmental impact assessment] guidelines which address

the retention of hollow-bearing trees maintaining diversity of age groups, species diversity, and structural diversity. Give priority to largest hollow bearing trees."

Recommendations have been present within this report to retain as many hollow bearing trees on site as possible.

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

Currently 31 Key Threatening Processes for mainland NSW are listed under Schedule 3 of the TSC Act. Of these, the "clearing of native vegetation", "loss of hollow-bearing trees" and "removal of dead wood and dead trees" would be applicable to the proposal.

Though the development of the subject site would involve both the removal of three hollow bearing trees and the clearing of an area of remnant vegetation, the overall impact of this on the local viability of those hollow dependant microchiropterans previously recorded is considered to be limited.

6.2. (b) Expected impact on hollow dependent microchiropterans.

The rezoning of the subject site and subsequent undertaking of the proposed Cancer Care Centre would not disturb, remove, modify or fragment any habitats critical to the life cycle requirements of any hollow dependent threatened microchiropterans. The works would not result in the significant loss of any hollow bearing trees, or any major occurrences of any insect attracting plants from the study locality. Therefore, it is not considered that the proposal would have a significant impact on any hollow dependent threatened microchiropterans, their populations, ecological communities or habitats.

The preparation of a Species Impact Statement that further considers the impact of the development on those hollow-dependant threatened microchiropterans previously recorded in the study region is not required.

6.3. State - State Environmental Planning Policy No. 44 (SEPP 44) – Koala Habitat Protection.

The Shoalhaven LGA is identified under Schedule 1 – Local Government Areas of SEPP 44. This Policy seeks to encourage the proper conservation and management of areas that provide habitat for Koalas.

Within the study area, two eucalypts were recorded, neither of which are listed under Schedule 2 of SEPP 44 as a Koala Feed Tree. Therefore, in accordance with the definitions provided under SEPP 44, the subject site is not considered to constitute Potential (or Core) Koala habitat. As such, the proposed works can proceed as planned without requiring the preparation of a Plan of Management for the conservation and management of areas of Koala habitat.

7. Conclusions.

By the completion of the field investigations, no ecological communities, flora or fauna species that are of National conservation significance or their populations were identified within the study area. As such, referral to the Federal Minister for Environment Protection, Heritage and the Arts for further consideration or approval in relation to the proposal would not be necessary.

By the completion of the field investigations, no ecological communities, flora or fauna species that are of State conservation significance or their populations were identified within the study area. Given the presence of hollow bearing trees a precautionary approach was adopted in regards to the possible occurrence of four state listed hollow-dependant microchiropterans that are known to have been recorded within the study region, these being the:

-
- East-coast Freetail Bat;
 - Yellow-bellied Sheath-tailbat;
 - Greater Broad-nosed Bat; and
 - Eastern Falsistrelle.

Drawing on the assessment criteria provided under Section 5A of the *Environmental Planning and Assessment Act 1979*, it was not considered that the loss of three hollow-bearing trees and some insect attracting plants would have a significant impact on the animals, their local populations or habitat. As such, the preparation of a Species Impact Statement was not recommended.

It is not considered that any of the species listed under the Schedules to the *EPBC* and/or *TSC* Acts that have been previously recorded in the study region would be significantly affected by the undertaking of the Proposal. The Proposal would not result in any threatened animals, plants, their populations, or habitats being significantly impacted upon such that a locally viable population of that species would be placed at risk of extinction. Similarly, the Proposal would not fragment, disturb or alter any plant propagation or dispersal vectors, or isolate any proximate areas of their suitable habitat. No fauna corridors will be fragmented such that those species recorded will be adversely affected.

Through reference to the assessment criteria provided under SEPP 44, the subject site is not considered to constitute Potential or Core Koala habitat. Therefore, in relation to Clause 9 of SEPP 44, it is considered that the proposal would not require the preparation of a Plan of Management for Koalas, nor is the adoption of any other mitigative measures required.

8. Recommendations.

If the future development of the subject site is to occur, the following recommendations are presented to ensure that the works are undertaken in an ecologically sustainable manner:

- In accordance with the regulations set out under *The Noxious Weeds Act 1993*, those weeds identified as noxious on site, should be subject to any biological control or other control program directed by the Local Control Authority to result in the suppression of these species.
- If feasible (and giving consideration to site operation/occupation safety), a layout for the development should be prepared that results in the retention/inclusion of those hollow-bearing trees present into the site's open space areas (e.g. gardens, landscape areas and parklands).
- Similarly, a layout for the development should be prepared that includes a percentage of the remnant vegetation into the site's landscape works.
- Any areas of remnant vegetation proposed to be retained within the developments layout should be temporarily fenced prior to the undertaking of any clearing works. Vehicles and machinery should not be permitted to enter these areas. These areas should be highlighted as "no-go zones" on those construction plans provided to the work's contractor and should be included in any monitoring work.
- If the hollow-bearing trees are to be removed as part of the works, an ecologist should be on site during their clearing. The ecologist should:
 - provide information on the most suitable removal method; and
 - be on site during the removal process to check any hollows (once the tree has been felled) for sheltering animals.

-
- The loss of the hollow bearing trees should be offset through the erection of suitably designed nesting boxes. The nesting boxes should be erected in the adjacent bushland area prior to the clearing works being commenced. The nesting boxes should be monitored for a period of two years with any damage boxes, or boxes occupied by exotic species, being replaced.
 - A Landscape Plan of Management should be developed as part of the site's landscape works. This plan should include features such as the use of locally occurring native species within any revegetation/landscaping works, the inclusion of mulch and the provision of ground habitat resources such as logs and boulders.
 - Vehicles and machinery should not be stored or parked in those portions of the site that are to be retained.
 - The location of all bushland stands that occur beyond the limits of the works should be provided to the construction contractor, these areas being identified on the development plans and on site through the erection of temporary fencing.
 - Exclusion fencing should be erected between the project area and adjacent habitats prior to the commencement of the Proposal's construction.
 - Construction huts, parking lots, stockpiles, access routes and the like should be located in those portions of the site that have been previously cleared or degraded.
 - During construction activities, construction vehicles should be restricted in their movements to the delineated construction zone.
 - Newly exposed surfaces should be stabilised as soon as possible in order to reduce the potential for soil erosion. This should be done through the planting of native species endemic to the study area.

9. Bibliography.

- Bishop, T. (1996) *Field guide to the orchids of New South Wales and Victoria*. UNSW Press, Sydney, NSW.
- Briggs, J. and Leigh, J. (1996) *Rare or Threatened Australian Plants*. CSIRO Publishing, Collingwood, Victoria.
- Catterall, C.P, Green, P.J. and Jones, N. I (1991) *Nature Conservation 2: The Role of Corridors*. D.A. Saunders and R.J. Hahs (Eds). Surrey Beatty & Sons.
- Churchill, S. (2008) *Australian bats - 2nd Edition*. Allen and Unwin, Crows Nest, NSW.
- Cogger, H. (2000) *Reptiles and amphibians of Australia*. Reed Books, Chatswood, NSW.
- Costermans, L. (1996) *Native trees and shrubs of South-eastern Australia*. Landsdowne Publishing, Sydney, NSW.
- Cropper, S. (1993) *Management of Endangered Plants*. CSIRO, Melbourne, Victoria.
- Department of Environment and Climate Change (2007) *Threatened species assessment guidelines: The assessment of significance*. Department of Environment and Climate Change, Hurstville, NSW.
- Department of Environment and Climate Change (2010a) *Atlas of NSW Wildlife Database*. <http://wildlifeatlas.npws.gov.au> [Accessed August 2010].
- Department of Environment and Climate Change (2010b) *Threatened species, populations and ecological communities*. http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx [Accessed August 2010].
- Department of Environment, Heritage, Water and the Arts (2010) *Environment Protection and Biodiversity Conservation Act Online Database*. <http://www.environment.gov.au/epbc/db/index.html> [Accessed August 2010].
- Frith, H.J. (Ed) (2007) *Complete book of Australian birds*. Readers Digest, Surry Hills, NSW.
- Google Maps (2010) *Maps*. <http://maps.google.com.au/maps?hl=en&tab=wl> [Accessed August 2010].
- Harden, G. (Ed) (1992-2002) *Flora of New South Wales Vols 1,2,3 and 4*. NSW University Press, Kensington, NSW.
- Keith D.A. (2004) *Ocean shores to desert dunes. The native vegetation of New South Wales and the ACT*. Department of Environment and Conservation, Hurstville, NSW.
- Lamp, C. and Collet, F. (1990) *A field guide to weeds in Australia*. Inkata Press, Melbourne, Victoria.
- Leonard, G. (2007) *Eucalypts: A bushwalkers guide*. New South Wales University Press, Kensington, NSW.
- LesryK Environmental Consultants (1998) *Flora and fauna assessment of Lot 2, 189 Old Southern Road, South Nowra*. Report prepared for Flower and Samios by LesryK Environmental Consultants, Bundeena, NSW.
- LesryK Environmental Consultants (2007) *Fauna survey and targeted microchiropteran study, Links Road, South Nowra*. Survey undertaken at the request of Kevin Mills and Associates [KMA] by LesryK Environmental Consultants, Bundeena, NSW.

-
- LesryK Environmental Consultants (2008) *Fauna survey conducted at the intersection of BTU Road and the Princes Highway, South Nowra*. Survey undertaken at the request of Hayes Environmental by LesryK Environmental Consultants, Bundeena, NSW.
- LesryK Environmental Consultants (2009a) *Flora and fauna assessment of proposed watermain and sewer upgrading works, Shoalhaven, NSW*. Report prepared at the request of the Department of Commerce by LesryK Environmental Consultants, Bundeena, NSW.
- LesryK Environmental Consultants (2009b) A fauna investigation of three bushland area that are present within the Shoalhaven LGA. Survey undertaken at the request of Alison Hunt and Associates Pty Ltd, Arncliffe, NSW, on behalf of Shoalhaven City Council by LesryK Environmental Consultants, Bundeena, NSW.
- Menkhorst, P.W. and Lumsden, L.F. (1996) *Eastern False Pipistrelle*, (ed) Menkhorst, P.W. *Mammals of Victoria: distribution, ecology and conservation*. Oxford University Press, Melbourne.
- NSW National Parks and Wildlife Service (1999) *Threatened species management – Species information*. NSW National Parks and Wildlife Service, Hurstville, NSW.
- NSW Scientific Committee (2010) *Threatened Species Final and Preliminary Determinations*. <http://www.npws.nsw.gov.au/news/tscdets/index.html> [Accessed August 2010].
- Parnaby, H. (1992) An Interim Guide to Identification of Insectivorous Bats of South-eastern Australia, Technical Reports of the Australian Museum No. 8.
- Reardon, T.B. and Flavel, S.C. (1987) A guide to the Bats of South Australia. South Australian Museum, SA.
- Robinson, L. (2003) *Field guide to the native plants of Sydney*. Second edition. Kangaroo Press, Sydney, NSW.
- Shoalhaven City Council (2009) *State of the Environment Report 2008-2009*. Shoalhaven City Council, Nowra, NSW.
- Shoalhaven City Council (2010) *Vegetation mapping of the Shoalhaven Local Governemnt Area*. Shoalhaven City Council, Nowra, NSW.
- Simpson, K. and Day, N. (2004) *Field guide to the birds of Australia*. 7th Edition. Penguin Books Australia, Victoria.
- Triggs, B. (1996) *Tracks, scats and other traces: a field guide to Australian mammals*. Oxford University Press, Melbourne, Victoria.
- Van Dyck, S. and Strahan, R. (Eds) (2008) *The mammals of Australia* (3rd edition). Reed New Holland, Sydney, NSW.

Appendix I: Photographic record of the study area.



Plate 1: The typical character of the eucalypt woodland.



Plate 2: The typical nature of those cleared areas within the eucalypt woodland.



Plate 3: The typical structure of the eucalypt woodland. The cleared grassland area is visible in the foreground.



Plate 4: The typical character of the understorey present within the eucalypt woodland.

Appendix 2: Flora species recorded within the study area.

Key

* - indicates introduced species.

^N - indicates species listed under the Noxious Weeds Act 1993.

	GENUS	Species	Common Name
FILICOPSIDA			
Dennstaedtiaceae	<i>Pteridium</i>	<i>esculentum</i>	Bracken Fern
MAGNOLIOPSIDA - DICOTYLEDONS			
Asteraceae	<i>Bidens</i>	<i>pilosa</i> *	Farmers Friend
	<i>Coreopsis</i>	<i>lanceolata</i> *	Coreopsis
	<i>Hypochaeris</i>	<i>radicata</i> *	Catsear
Casuarinaceae	<i>Allocasuarina</i>	<i>littoralis</i>	Black She-Oak
Convolvulaceae	<i>Dichondra</i>	<i>repens</i>	Kidney Weed
Cupressaceae	<i>Callitris</i>	<i>rhomboidea</i>	Port Jackson Cypress
Epacridaceae	<i>Leucopogon</i>	<i>ericoides</i>	Bearded Heath
Euphorbiaceae	<i>Breynia</i>	<i>oblongifolia</i>	Breynia
	<i>Glochidion</i>	<i>ferdinandi</i>	Cheese Tree
Fabaceae: Faboideae	<i>Daviesia</i>	<i>ulicifolia</i>	
	<i>Glycine</i>	<i>microphylla</i>	
	<i>Trifolium</i>	<i>repens</i> *	White Clover
Fabaceae: Mimosoideae	<i>Acacia</i>	<i>filicifolia</i>	Fern-leaved Wattle
	<i>Acacia</i>	<i>floribunda</i>	White Sallow Wattle
	<i>Acacia</i>	<i>mearnsii</i>	Black Wattle
	<i>Acacia</i>	<i>suaveolens</i>	Sweet-scented Wattle
	<i>Acacia</i>	<i>ulicifolia</i>	Prickly Moses
Lauraceae	<i>Cinnamomum</i>	<i>camphora</i> *	Camphor Laurel
Malvaceae	<i>Sida</i>	<i>rhombifolia</i> *	Paddy's Lucerne
Moraceae	<i>Ficus</i>	<i>sp.</i>	
Myrtaceae	<i>Callistemon</i>	<i>sp.</i>	Bottlebrush
	<i>Corymbia</i>	<i>gummifera</i>	Red Bloodwood
	<i>Corymbia</i>	<i>maculata</i>	Spotted Gum
	<i>Eucalyptus</i>	<i>sp.</i>	A Stringybark
	<i>Eucalyptus</i>	<i>pilularis</i>	Blackbutt
	<i>Kunzea</i>	<i>ambigua</i>	Tick Bush
	<i>Melaleuca</i>	<i>armillaris</i> subsp. <i>armillaris</i>	Bracelet Honeymyrtle
	<i>Melaleuca</i>	<i>stypheliodes</i>	Prickly-leaved Paperbark
Oleaceae	<i>Ligustrum</i>	<i>lucidum</i> * ^N	Large-leaved Privett
	<i>Ligustrum</i>	<i>sinense</i> * ^N	Small-leaved Privett
Pinaceae	<i>Pinus</i>	<i>radiata</i> *	Radiata Pine
Pittosporaceae	<i>Bursaria</i>	<i>spinosa</i>	Blackthorn
	<i>Pittosporum</i>	<i>undulatum</i>	Sweet Pittosporum
Plantaginaceae	<i>Plantago</i>	<i>lanceolata</i> *	Lamb's Tongue
Proteaceae	<i>Grevillea</i>	<i>robusta</i> *	Silky Oak
	<i>Hakea</i>	<i>salicifolia</i> subsp. <i>salicifolia</i>	Willow-leaved Hakea
Sapindaceae	<i>Dodonaea</i>	<i>triquetra</i>	Common Hop Bush
Thymelaeaceae	<i>Pimelea</i>	<i>linifolia</i> subsp. <i>linifolia</i>	Rice Flower
Verbenaceae	<i>Lantana</i>	<i>camara</i> * ^N	Lantana
MAGNOLIOPSIDA - MONOCOTYLEDONS			
Asparagaceae	<i>Protasparagus</i>	<i>aethiopicus</i> *	Asparagus Fern
Lomandraceae	<i>Lomandra</i>	<i>longifolia</i>	Mat Rush
	<i>Lomandra</i>	<i>multiflora</i>	
	<i>Lomandra</i>	<i>obliqua</i>	Fish Bones

	GENUS	Species	Common Name
Phormiaceae		<i>Dianella caerulea</i> var. <i>caerulea</i>	Blue Flax Lily
Poaceae		<i>Aristida vagans</i>	Three-awn Speargrass
		<i>Austrodanthonia</i> sp.	A Wallaby Grass
		<i>Axonopus fissifolius</i> *	Carpet Grass
		<i>Cynodon dactylon</i> *	Couch
		<i>Cymbopogon refractus</i>	Barbed-wire Grass
		<i>Echinopogon caespitosus</i>	Tufted Hedgehog Grass
		<i>Entolasia stricta</i>	Wiry Panic
		<i>Ehrharta erecta</i> *	Panic Veldt Grass
		<i>Eragrostis curvula</i> *	African Love Grass
		<i>Eragrostis leptostachya</i>	Paddock Lovegrass
		<i>Imperata cylindrical</i> var. <i>major</i>	Blady Grass
		<i>Panicum simile</i>	Two Colour Panic
		<i>Pennisetum clandestinum</i> *	Kikuyu Grass
		<i>Sporobolus</i> sp. *	Parramatta Grass
		<i>Themeda australis</i>	Kangaroo Grass

Appendix 3: Fauna species previously recorded in the study area.

Source of Records

1 = Species recorded during present study.

2 = DECCW (2010a).

3 = LesryK Environmental Consultants (2008).

Key

A - indicates species listed under the EPBC Act.

F - migratory Family listed under the EPBC Act.

M - Species listed as migratory listed under the EPBC Act.

B - indicates species listed under the TSC Act.

C - Species is Critically Endangered.

E - Species is Endangered.

V - Species is Vulnerable.

P - preliminary determinations to the TSC Act.

N - nominations for listing under the EPBC Act.

* - indicates introduced species.

A	B	Common Name	Family and Scientific Name	1	2	3
		MAMMALS				
			Ornithorhynchidae			
		Platypus	<i>Ornithorhynchus anatinus</i>		x	
			Tachyglossidae			
		Short-beaked Echidna	<i>Tachyglossus aculeatus</i>		x	
			Dasyuridae			
V	V	Spotted-tailed Quoll	<i>Dasyurus maculatus</i>		x	
		Brown Antechinus	<i>Antechinus stuartii</i>		x	
			Peramelidae			
		Long-nosed Bandicoot	<i>Perameles nasuta</i>		x	
			Phascolarctidae			
N	V	Koala	<i>Phascolarctos cinereus</i>		x	
			Vombatidae			
		Common Wombat	<i>Vombatus ursinus</i>		x	
			Burramyidae			
	V	Eastern Pygmy Possum	<i>Cercartetus nanus</i>		x	
			Petauridae			
	V	Yellow-bellied Glider	<i>Petaurus australis</i>		x	
		Sugar Glider	<i>Petaurus breviceps</i>		x	x
			Pseudocheiridae			
		Greater Glider	<i>Petauroides volans</i>		x	
		Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>		x	
			Acrobatidae			
		Feathertail Glider	<i>Acrobates pygmaeus</i>		x	
			Phalangeridae			
		Common Brushtail Possum	<i>Trichosurus vulpecula</i>		x	x
			Macropodidae			
		Eastern Grey Kangaroo	<i>Macropus giganteus</i>		x	x
		Red-necked Wallaby	<i>Macropus rufogriseus</i>		x	
		Swamp Wallaby	<i>Wallabia bicolor</i>		x	
			Pteropodidae			

A	B	Common Name	Family and Scientific Name	1	2	3
V	V	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>		x	
			Emballonuridae			
	V	Yellow-bellied Sheath-tailbat	<i>Saccolaimus flaviventris</i>		x	
			Rhinolophidae			
		Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>		x	
			Vespertiliidae			
V	V	Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>		x	
		Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		x	x
		Chocolate Wattled Bat	<i>Chalinolobus morio</i>		x	x
	V	Eastern Falsistrelle	<i>Falsistrellus tasmaniensis</i>			x
		Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>		x	
		Gould's Long-eared Bat	<i>Nyctophilus gouldi</i>		x	
	V	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>		x	
		Eastern Broad-nosed Bat	<i>Scotorepens orion</i>		x	x
		Large Forest Bat	<i>Vespadelus darlingtoni</i>		x	x
		Southern Forest Bat	<i>Vespadelus regulus</i>		x	
		Little Forest Bat	<i>Vespadelus vulturnus</i>		x	x
			Miniopteridae			
	V	Eastern Bentwing Bat	<i>Miniopterus (schreibersii) orianae oceanensis</i>		x	x
			Molossidae			
		White-striped Freetail Bat	<i>Austronomus australis</i>		x	x
	V	East-coast Freetail Bat	<i>Micronomus norfolkensis</i>		x	x
		Eastern Freetail Bat	<i>Mormopterus ridei</i>			x
			Muridae			
		Water Rat	<i>Hydromys chrysogaster</i>		x	
		* House Mouse	<i>Mus musculus</i>		x	
		Bush Rat	<i>Rattus fuscipes</i>		x	
		Swamp Rat	<i>Rattus lutreolus</i>		x	
			Canidae			
		Dingo	<i>Canis lupus dingo</i>		x	
		* Fox	<i>Vulpes vulpes</i>		x	x
			Felidae			
		* Feral Cat	<i>Felis catus</i>		x	
			Leporidae			
		* Rabbit	<i>Oryctolagus cuniculus</i>		x	x
		* Brown Hare	<i>Lepus capensis</i>		x	
			Equidae			
		* Horse	<i>Equus caballus</i>		x	
			Bovidae			
		* European Cattle	<i>Bos taurus</i>		x	
		BIRDS				
			Phasianidae			
		Stubble Quail	<i>Coturnix pectoralis</i>		x	
		Brown Quail	<i>Coturnix ypsilophora</i>		x	
			Procellariidae			
M		Wedge-tailed Shearwater	<i>Puffinus pacificus</i>		x	
		Australian Pelican	<i>Pelecanus conspicillatus</i>		x	
			Anhingidae			

A	B	Common Name	Family and Scientific Name	I	2	3
		Darter	<i>Anhinga melanogaster</i>		x	
			Phalacrocoracidae			
		Pied Cormorant	<i>Phalacrocorax varius</i>		x	
		Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>		x	
		Great Cormorant	<i>Phalacrocorax carbo</i>		x	
		Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>		x	
			Podicipedidae			
		Hoary-headed Grebe	<i>Poliocephalus poliocephalus</i>		x	
		Australasian Grebe	<i>Tachybaptus novaehollandiae</i>		x	
F			Anatidae			
		Black Swan	<i>Cygnus atratus</i>		x	
		Australian Shelduck	<i>Tadorna tadornoides</i>		x	
		Pacific Black Duck	<i>Anas superciliosa</i>		x	
		* Mallard	<i>Anas platyrhynchos</i>		x	
		Grey Teal	<i>Anas gracilis</i>		x	
		Chestnut Teal	<i>Anas castanea</i>		x	
		Australasian Shoveler	<i>Anas rhynchotis</i>		x	
		Pink-eared Duck	<i>Malacorhynchus membranaceus</i>		x	
		Hardhead	<i>Aythya australis</i>		x	
		Australian Wood Duck	<i>Chenonetta jubata</i>		x	
	V	Freckled Duck	<i>Stictonetta naevosa</i>		x	
		Musk Duck	<i>Biziura lobata</i>		x	
			Rallidae			
		Buff-banded Rail	<i>Gallirallus phillippensis</i>		x	
		Australian Spotted Crake	<i>Porzana fluminea</i>		x	
		Dusky Moorhen	<i>Gallinula tenebrosa</i>		x	
		Purple Swamphen	<i>Porphyrio porphyrio</i>		x	x
		Eurasian Coot	<i>Fulica atra</i>		x	
			Ardeidae			
		White-necked Heron	<i>Ardea pacifica</i>		x	
		White-faced Heron	<i>Egretta novaehollandiae</i>		x	x
M		Cattle Egret	<i>Ardea ibis</i>		x	
M		Great Egret	<i>Ardea alba</i>		x	
		Little Egret	<i>Egretta garzetta</i>		x	
		Intermediate Egret	<i>Egretta intermedia</i>		x	
		Striated Heron	<i>Butorides striatus</i>		x	
		▽ Nankeen (Rufous) Night Heron	<i>Nycticorax caledonicus</i>		x	
	V	Black Bittern	<i>Ixobrychus flavicollis</i>		x	
N	V	Australasian Bittern	<i>Botaurus poiciloptilus</i>		x	
			Threskiornidae			
M		Glossy Ibis	<i>Plegadis falcinellus</i>		x	
		Australian White Ibis	<i>Threskiornis molluca</i>		x	
		Straw-necked Ibis	<i>Threskiornis spinicollis</i>		x	
		Royal Spoonbill	<i>Platalea regia</i>		x	
		Yellow-billed Spoonbill	<i>Platalea flavipes</i>		x	
F			Scolopacidae			
M		Pectoral Sandpiper	<i>Calidris melanotos</i>		x	
			Burhinidae			

A	B	Common Name	Family and Scientific Name	1	2	3
	E	Bush-stone Curlew	<i>Burhinus grallarius</i>		x	
F			Charadriidae			
		Masked Lapwing	<i>Vanellus miles</i>		x	x
	C	Hooded Plover	<i>Thinornis rubricollis</i>		x	
F			Recurvirostridae			
		Black-fronted Dotterel	<i>Elseya melanops</i>		x	
			Laridae			
		Silver Gull	<i>Larus novaehollandiae</i>		x	
		Whiskered Tern	<i>Chlidonias hybrida</i>		x	
		Crested Tern	<i>Sterna bergii</i>		x	
F			Accipitridae			
		Black-shouldered Kite	<i>Elanus axillaris</i>		x	
	V	Square-tailed Kite	<i>Lophoictinia isura</i>		x	
		Black Kite	<i>Milvus migrans</i>		x	
		Whistling Kite	<i>Haliastur sphenurus</i>		x	
M		White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>		x	
	V	Little Eagle	<i>Hieraaetus morphnoides</i>		x	
		Brown Goshawk	<i>Accipiter fasciatus</i>		x	
		Grey Goshawk	<i>Accipiter novaehollandiae</i>		x	
	V	Spotted Harrier	<i>Circus assimilis</i>		x	
		Swamp Harrier	<i>Circus approximans</i>		x	
F			Falconidae			
		Black Falcon	<i>Falco subniger</i>		x	
		Peregrine Falcon	<i>Falco peregrinus</i>		x	
		Australian Hobby	<i>Falco longipennis</i>		x	
		Brown Falcon	<i>Falco berigora</i>		x	
		Nankeen Kestrel	<i>Falco cenchroides</i>		x	
			Columbidae			
		White-headed Pigeon	<i>Columba leucomela</i>		x	
		* Rock Dove	<i>Columba livia</i>		x	
		* Spotted Turtle-dove	<i>Streptopelia chinensis</i>		x	
		Brown Cuckoo-dove	<i>Macropygia amboinensis</i>		x	
		Peaceful Dove	<i>Geopelia striata</i>		x	
		Common Bronzewing	<i>Phaps chalcoptera</i>		x	
		Crested Pigeon	<i>Ocyphaps lophotes</i>		x	x
		Wonga Pigeon	<i>Leucosarcia melanoleuca</i>		x	
			Cacatuidae			
	V	Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>		x	
		Yellow-tailed Black Cockatoo	<i>Calyptorhynchus funereus</i>		x	x
	V	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>		x	
		Galah	<i>Eolophus roseicapilla</i>		x	x
		Long-billed Corella	<i>tenuirostris</i>		x	
		Little Corella	<i>Cacatua sanguinea</i>		x	
		Sulphur-crested Cockatoo	<i>Cacatua galerita</i>		x	x
			Psittacidae			
		Rainbow Lorikeet	<i>Trichoglossus haematodus</i>		x	x
		Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>		x	
		Musk Lorikeet	<i>Glossopsitta concinna</i>		x	

A	B	Common Name	Family and Scientific Name	1	2	3
	V	Little Lorikeet	<i>Glossopsitta pusilla</i>		x	
		Australian King Parrot	<i>Alisterus scapularis</i>		x	
		Crimson Rosella	<i>Platycercus elegans</i>		x	x
		Eastern Rosella	<i>Platycercus eximius</i>		x	x
			Cuculidae			
		Pallid Cuckoo	<i>Cuculus pallidus</i>		x	
		Fan-tailed Cuckoo	<i>Cuculus flabelliformis</i>		x	
		Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>		x	
		# Common Koel	<i>Eudynamys scolopacea</i>		x	
		Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>		x	
			Strigidae			
	V	Powerful Owl	<i>Ninox strenua</i>		x	
		Southern Boobook	<i>Ninox novaeseelandiae</i>		x	x
			Tytonidae			
	V	Sooty Owl	<i>Tyto tenebricosa</i>		x	
	V	Masked Owl	<i>Tyto novaehollandiae</i>		x	
			Caprimulgidae			
		White-throated Nightjar	<i>Eurostopodus mysticalis</i>		x	
			Aegothelidae			
		Australian Owlet-nightjar	<i>Aegotheles cristatus</i>		x	
			Apodidae			
M		White-throated Needletail	<i>Hirundapus caudacutus</i>			x
			Alcedinidae			
		Azure Kingfisher	<i>Alcedo azurea</i>		x	
			Halcyonidae			
		Sacred Kingfisher	<i>Todiramphus sanctus</i>		x	
		Laughing Kookaburra	<i>Dacelo naxaeguineae</i>		x	x
			Meropidae			
M		Rainbow Bee-eater	<i>Merops ornatus</i>		x	
			Coraciidae			
		Dollarbird	<i>Eurystomus orientalis</i>		x	
			Menuridae			
		Superb Lyrebird	<i>Menura novaehollandiae</i>		x	
			Neosittidae			
	V	Varied Sittella	<i>Daphoenositta chrysoptera</i>		x	
			Climacteridae			
		White-throated Treecreeper	<i>Cormobates leucophaeus</i>		x	x
			Maluridae			
		Superb Fairy-wren	<i>Malurus cyaneus</i>		x	x
		Variegated Fairy-wren	<i>Malurus lamberti</i>		x	x
			Pardalotidae			
		Spotted Pardalote	<i>Pardalotus punctatus</i>		x	x
		Striated Pardalote	<i>Pardalotus striatus</i>		x	x
			Acanthizidae			
		Rockwarbler	<i>Origma solitaria</i>		x	
		White-browed Scrubwren	<i>Sericornis frontalis</i>		x	
		Yellow-throated Scrubwren	<i>Sericornis citreogularis</i>		x	
		White-throated Gerygone	<i>Gerygone olivacea</i>		x	

A	B	Common Name	Family and Scientific Name	1	2	3
		Brown Gerygone	<i>Gerygone mouki</i>		x	
		Brown Thornbill	<i>Acanthiza pusilla</i>		x	
		Yellow Thornbill	<i>Acanthiza nana</i>		x	
		Striated Thornbill	<i>Acanthiza lineata</i>		x	
		Buff-rumped Thornbill	<i>Acanthiza reguloides</i>		x	
		Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>		x	
			Meliphagidae			
		Red Wattlebird	<i>Anthochaera carunculata</i>		x	x
		Noisy Friarbird	<i>Philemon corniculatus</i>		x	
ME	E	Regent Honeyeater	<i>Anthochaera phrygia</i>		x	
		Noisy Miner	<i>Manorina melanocephala</i>		x	x
		Lewin's Honeyeater	<i>Meliphaga lewinii</i>		x	
		Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>		x	
		White-eared Honeyeater	<i>Lichenostomus leucotis</i>		x	
		Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>		x	
		▽ Fuscous Honeyeater	<i>Lichenostomus fuscus</i>		x	
		White-plumed Honeyeater	<i>Lichenostomus pencillatus</i>		x	
		Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>		x	
		White-naped Honeyeater	<i>Melithreptus lunatus</i>		x	
		Crescent Honeyeater	<i>Phylidonyris pyrrhoptera</i>		x	
		White-cheeked Honeyeater	<i>Phylidonyris nigra</i>		x	
		New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>		x	
		Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>		x	x
		Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>		x	
	P	White-fronted Chat	<i>Epthianura albifrons</i>		x	
			Orthonychidae			
		Eastern Whipbird	<i>Psophodes olivaceus</i>		x	
			Petroicidae			
		Rose Robin	<i>Petroica rosea</i>		x	
	V	Scarlet Robin	<i>Petroica multicolor</i>		x	
		Eastern Yellow Robin	<i>Eopsaltria australis</i>		x	
		Jacky Winter	<i>Microeca fascians</i>		x	
			Pachycephalidae			
		Grey Shrike-thrush	<i>Colluricincla harmonica</i>		x	
		Golden Whistler	<i>Pachycephala pectoralis</i>		x	
		Rufous Whistler	<i>Pachycephala rufiventris</i>		x	
			Dicruridae			
		Grey Fantail	<i>Rhipidura fuliginosa</i>		x	x
M		Rufous Fantail	<i>Rhipidura rufifrons</i>		x	
		Willie Wagtail	<i>Rhipidura leucophrys</i>		x	x
		Leaden Flycatcher	<i>Myiagra rubecula</i>		x	
M		Satin Flycatcher	<i>Myiagra cyanoleuca</i>		x	
M		Black-faced Monarch	<i>Monarcha melanopsis</i>		x	
		Magpie Lark	<i>Grallina cyanoleuca</i>		x	x
		Spangled Drongo	<i>Dicrurus bracteatus</i>		x	
			Oriolidae			
		Olive-backed Oriole	<i>Oriolus sagittatus</i>		x	
		Figbird	<i>Sphecotheres viridis</i>		x	

A	B	Common Name	Family and Scientific Name	1	2	3
			Ptilonorhynchidae			
		Green Catbird	<i>Ailuroedus crassirostris</i>		x	
		Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>		x	
			Campephagidae			
		Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>		x	x
		White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>		x	
		Cicadabird	<i>Coracina tenuirostris</i>		x	
		White-winged Triller	<i>Lalage sueurii</i>		x	
			Artamidae			
		Dusky Woodswallow	<i>Artamus cyanopterus</i>		x	
		Grey Butcherbird	<i>Cracticus torquatus</i>		x	x
		Australian Magpie	<i>Gymnorhina tibicen</i>		x	x
		Pied Currawong	<i>Strepera graculina</i>		x	
		Grey Currawong	<i>Strepera versicolor</i>		x	
			Corvidae			
		Australian Raven	<i>Corvus coronoides</i>		x	x
		Little Raven	<i>Corvus mellori</i>		x	
			Corcoracidae			
		White-winged Chough	<i>Corcorax melanorhamphos</i>		x	
			Hirundinidae			
		Welcome Swallow	<i>Hirundo neoxena</i>		x	x
		Tree Martin	<i>Hirundo nigricans</i>		x	
		Fairy Martin	<i>Hirundo ariel</i>		x	
			Motacillidae			
		Richard's Pipit	<i>Anthus naovaeseelandiae</i>		x	
			Alaudidae			
		* Eurasian Skylark	<i>Alauda arvensis</i>		x	
F			Sylviidae			
		Brown Songlark	<i>Cincloramphus cruralis</i>		x	
		Clamorous Reed-warbler	<i>Acrocephalus stentoreus</i>		x	
		Golden-headed Cisticola	<i>Cisticola exilis</i>		x	
		Little Grassbird	<i>Megalurus gramineus</i>		x	
			Passeridae			
		* House Sparrow	<i>Passer domesticus</i>		x	
			Fringillidae			
		* European Goldfinch	<i>Carduelis carduelis</i>		x	
			Ploceidae			
		Double-barred Finch	<i>Taeniopygia bichenovii</i>		x	
		Zebra Finch	<i>Taeniopygia guttata</i>		x	
		Red-browed Finch	<i>Neochmia temporalis</i>		x	
		Chestnut-breasted Mannikin	<i>Lonchura castaneothorax</i>		x	
			Dicaeidae			
		Mistletoebird	<i>Dicaeum hirundinaceum</i>		x	
			Zosteropidae			
		Silvereye	<i>Zosterops lateralis</i>		x	
			Pycnonotidae			
		* Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>		x	
F			Muscicapidae			

A	B	Common Name	Family and Scientific Name	1	2	3
		* Common Blackbird	<i>Turdus merula</i>		x	
			Sturnidae			
		* Common Starling	<i>Sturnus vulgaris</i>		x	x
		* Common Myna	<i>Acridotheres tristis</i>		x	x
		REPTILES				
			Chelidae			
		Eastern Snake-necked Turtle	<i>Chelodina longicollis</i>		x	
			Agamidae			
		Jacky Lizard	<i>Amphibolurus muricatus</i>		x	
			Varanidae			
		Lace Monitor	<i>Varanus varius</i>		x	
			Scincidae			
		Copper-tailed Skink	<i>Ctenotus taeniolatus</i>		x	
		Yellow-bellied Skink	<i>Eulamprus tenuis</i>		x	
		Eastern Water Skink	<i>Eulamprus quoyii</i>		x	
		Grass Skink	<i>Lampropholis delicata</i>		x	
		Garden Skink	<i>Lampropholis guichenoti</i>		x	
		Red-Throated Skink	<i>Pseudemoia platynota</i>		x	
		Weasel Skink	<i>Saproscincus mustelinus</i>		x	
		Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>		x	
			Elapidae			
		Golden Crowned Snake	<i>Cacophis squamulosus</i>		x	
		Yellow-faced Whip Snake	<i>Demansia psammophis</i>		x	
		Eastern Tiger Snake	<i>Notechis scutatus</i>		x	
		Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>		x	
		Eastern Brown Snake	<i>Pseudonaja textilis</i>		x	
		Eastern Small-eyed Snake	<i>Rhinoplocephalus nigrescens</i>		x	
		AMPHIBIANS				
			Myobatrachidae			
		Common Eastern Froglet	<i>Crinia signifera</i>		x	x
V	V	Giant Burrowing Frog	<i>Heleioporus australiacus</i>		x	
		Striped Marsh Frog	<i>Limnodynastes peronii</i>		x	x
		Barred Frog	<i>Mixophyes fasciolatus</i>		x	
		Haswell's Frog	<i>Paracrinia haswelli</i>		x	
		Brown Toadlet	<i>Pseudophryne bibronii</i>		x	
		Smooth Toadlet	<i>Uperoleia laevigata</i>		x	
		Tyler's Toadlet	<i>Uperoleia tyleri</i>		x	
			Hylidae			
V	E	Green and Golden Bell Frog	<i>Litoria aurea</i>		x	
		Green Tree Frog	<i>Litoria caerulea</i>		x	
		Bleating Tree Frog	<i>Litoria dentata</i>		x	
		Brown Tree Frog	<i>Litoria ewingii</i>			
		Eastern Dwarf Tree Frog	<i>Litoria fallax</i>		x	x
		Peron's Tree Frog	<i>Litoria peronii</i>		x	x
		Tyler's Tree Frog	<i>Litoria tyleri</i>		x	
		Verreaux's Tree Frog	<i>Litoria verreauxii</i>		x	
		Verreaux's Tree Frog (sub species)	<i>Litoria verreauxii verreauxii</i>		x	