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Flora & Fauna Assessment

SCECGS Redlands, Cremorne
Concept Proposal and Stage 1 Development Application

Total Earth Care Pty Ltd
May 2015



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1 INTRODUCTION

This Flora & Fauna Assessment Report has been prepared on behalf of SCECGS Redlands Ltd ("the Proponent"). It accompanies an environmental impact statement (EIS) prepared in support of State Significant Development Application SSD14_6454 for the staged development of the SCECGS Redlands Senior Campus ("Redlands").

This application seeks a staged development approval comprising a concept proposal for the school over five stages and consent for a detailed proposal for the first stage development referred to as "Stage 1". Details of the project are described below:

- (1) Concept Proposal:** A Concept Proposal has been prepared for the site to guide its future redevelopment and is intended to provide a statutory framework for the long term planning of the site.

The Concept Proposal will be delivered in five stages and will generally involve the following buildings and works:

Stage 1 – New Learning Hub:

- Demolition of existing buildings and structures
- Construction of a new multi-purpose education building with basement car park and associated vehicular entry off Gerard St
- Temporary fitout of a portion of the basement carpark shell for music and general education uses
- Construction of landscaped podium over new basement carpark and music facilities
- Creation of a new internal vehicular link between Waters Rd and Military Rd

Stage 2 - Sports and Performing Arts Centre:

- Demolition of existing buildings and structures
- Construction of a new sports and performing arts centre

Stage 3 - Redlands Hall, Roseby Building and Liggins Building Refurbishment:

- Internal alterations and additions of existing buildings

Stage 4 - Humphery Learning Hub and Resource Centre:

- Construction of a new multi-purpose education building with swimming pool and associated facilities at roof top level
- Decanting of temporary music facilities upon completion of the new Humphery Learning Hub providing additional carparking

Stage 5 - Adams Centre Extension:

- Alterations and additions to the Adams Centre at 219 Military Road

(2) Detailed Proposal for "Stage 1" development – New Learning Hub:

- Demolition of existing buildings and structures (Mowll Building, 1, 3, 7, 9 and 11 Gerard Street, 7 and 8 Monford Place, staff offices, multi-purpose building and Design and Technology buildings on the western boundary).
- Fit-out of 7 and 8 Monford Pl for temporary use as an educational facility
- Construction of a new purpose built education building generally comprising a four storey building with basement car park and outdoor learning area at roof level.
- Temporary fitout of a portion of the basement carpark shell for music and general education uses
- Construction of landscaped podium over new basement carpark and music facilities

- Creation of new vehicular access road off Gerard Street for the new basement car park.
- Creation of new internal vehicular access link facilitating ingress from Waters Rd and egress onto Military Rd
- Associated landscaping improvements.
- New services infrastructure.
- New servicing area including loading dock and waste enclosure
- Erection of temporary demountable classrooms.

The purpose of this Flora & Fauna Assessment Report is to provide an assessment of the ecological impacts of the proposal as described above and detailed within the EIS on the native flora and fauna biodiversity found onsite and within the wider locality.

2 AIMS

The aims of the fauna assessment are to:

- describe the existing fauna within the subject site based on current survey effort, database searches and review of existing reports of the subject site and surveys of the wider study area;
- determine the presence or likely occurrence of threatened species, populations and ecological communities (or their habitats), as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- assess the impacts of the current proposed development on the existing fauna of the subject site, and their habitats; and

The aims of the flora assessment were to:

- survey and describe the existing flora within the subject site based on field surveys, database searches and review of existing reports of the subject site and vegetation mapping surveys of the wider study area;
- determine the presence or likely occurrence of threatened species, populations and ecological communities (or their habitats), as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- assess the impacts of the current proposed development on the existing flora of the subject site and their habitats;

3 METHODS

3.1 Desktop Research

Prior to field surveys, records of all threatened species, populations and endangered ecological communities previously recorded within a 5 kilometre (km) radius of the subject site were obtained from the Office of Environment and Heritage (OEH) Wildlife Atlas database. In addition, an EPBC Act Protected Matters Report was generated using the Commonwealth Department of Environment Protected Matters Search Tool for the subject site. The report identifies matters of national environmental significance in the study area including threatened biodiversity and other matters protected by the EPBC Act.

Threatened fauna and flora species, populations, and endangered ecological communities, or their habitats, were targeted during the field surveys.

3.2 Flora

A botanical survey was conducted within Redlands campus (as shown in Map 1, Appendix A) on 12th December 2014 with reference to existing vegetation community descriptions and mapping by others for the locality (OEH, 2013). Surveys of the subject site were generally random meanders, but focused on identifying native vegetation and included;

- the identification of native and exotic plant species according to *Field Guide to the Native Plants of Sydney* (Robinson, 2003), *Weeds of the south-east: an identification guide for Australia* (Richardson *et al*, 2006) and *PlantNET* (Botanic Gardens Trust, 2008), with reference to recent taxonomic changes;
- the identification and mapping of plant communities based on previous broad-scale mapping as per *The Native Vegetation of the Sydney Metropolitan Area V2.0* (OEH, 2014), and accompanying descriptions and diagnostic tests by Tozer (2003), or the structural definitions of Specht & Specht (1999);
- targeted searches for plant species of conservation significance according to the “random meander” method (Cropper 1993).

The conservation significance of plant species and plant communities is determined according to:

- TSC Act for significance within NSW; and
- EPBC Act for significance within Australia.

The list of tree species recorded from the Arborist Impact Assessment (Bluegum, 2015) prepared for the subject site has been incorporated into the flora inventory of the current survey.

3.3 Fauna Surveys

A diurnal fauna habitat assessment was conducted over the Redlands campus on the 12th December 2014. Weather conditions were mild (to approximately 23°C), with moderate cloud cover and a light breeze.

The habitat assessment included;

- identifying fauna habitats, assessing their condition and assessing their value to threatened fauna species;
- targeted habitat assessment; active search for specific habitat requirements for threatened species, including microbat roosts.

- observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings). Survey for avifauna and amphibians will involved visual detection and aural recognition of bird and frog calls throughout the Redlands campus;
- targeted searches for threatened fauna species. The locations of threatened species, if recorded, will be taken using a hand-held GPS and mapped.

The conservation significance of fauna species and populations was determined at a State level according to the TSC Act and at a national level according to the EPBC Act.

All fauna sightings, as well as fauna habitat types and evidence of fauna activity, were recorded and an inventory of species was compiled (Appendix B).

It should be noted that no formal nocturnal surveying (spot-lighting, call-playback, ultrasonic call detection via ANABAT) was undertaken as part of this assessment.

3.4 Limitations

Field surveys were conducted over one day during summer 2014. Flora field survey was based on the recommendations of *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft* (DEC, 2004) with particular reference to the size of the subject site and a relatively homogeneous wider disturbed landscape. However, the relative brevity of the survey and its timing mean that the full spectrum of fauna species and ecological processes likely to occur on the site cannot be fully quantified or described in this report. These limitations have been partly addressed by identifying potential habitats for fauna species and assessing the potential for these species to occur on the site based on previous records, the type and condition of habitats present, the land use throughout the subject site, surrounds and the landscape context.

4 Results

4.1 Landscape

The subject site is located in the northern Sydney suburb of Cremorne, within North Sydney Local Government Area. Current land use is a mixture of SP2 Education Establishment and R4 High Density Residential, with urban residential with urban residential and commercial development characterising the wider study area. Sydney Harbour National Park is located approximately 2.5km to the south east of Redlands with numerous North Sydney Council bushland reserves located within a 1km radius of the school.

Chapman *et al* (1989) has mapped the GyMEA / Lambert Soil Landscape as occurring within Redlands. Chapman and Murphy (1989) described the GyMEA Soil Landscape and the Lambert Soil Landscape as the following:

- GyMEA: Undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief is between 20 – 80m, with slopes between 10-25% and rock outcrop to 25%. The soil landscape consists of broad convex crests, moderately inclined side slopes with wide benches, and localised rock outcrops on low broken scarps.
- Lambert: Undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief is between 20 – 120m, with slopes less than 20% and rock outcrop to 50%. The soil landscape consists of broad ridges, with gently to moderately inclined slopes, wide rock benches, low broken scarps, small hanging valleys, and areas of poor drainage.

4.2 Flora

4.2.1 Plant Species

A total of 38 plant species were recorded within the rear of the subject site, along Gerard Street, during the flora survey. The survey identified 2 locally occurring native species, 15 non-locally occurring native species (including planted natives), and 21 introduced species.

Of the 17 introduced species, one species, *Olea europaea ssp cuspidata* African Olive, is listed as noxious under Order 30 of the *NSW Noxious Weeds Act 1993* for the North Sydney LGA.

4.2.2 Plant Communities

Previous broad-scale mapping of the Sydney 1:100,000 map sheet by Benson and Howell (1994) has not identified any native plant communities either on, or immediately adjacent to, the subject site. Areas of Sydney Sandstone Gully Forest as described by Benson and Howell (1994) are mapped to the north and south east of the subject site, generally within Sydney Harbour National Park and aforementioned North Sydney Council reserves.

Mapping by the OEH (2013) *The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area V2.0* has identified Urban Exotic / Native vegetation occurring within the Redlands campus and the wider locality (Map 2, Appendix A). OEH (2013) maps a number of non-threatened sandstone vegetation communities occurring within Sydney Harbour National Park and North Sydney Council reserves, the most common being Coastal Sandstone Foreshores Forest.

The current survey found that the vegetation within the Redlands campus is a mixture of planted exotic species, planted natives including commonly cultivated species. Some natives occurring onsite are locally indigenous species, however many of these are planted or have come up from seed. The original vegetation that would have occurred on the site has been cleared and area developed. Development onsite, and within the locality in general, occurred pre 1943 (as per 1943 aerials) with soils have been substantially disturbed in the process. As such, the Redlands campus does not contain a fully or partially structured native vegetation community, nor possesses open areas with the potential for bushland regeneration.

The distribution of plant community identified on the subject site and in the study area of the current survey is shown in Maps 1, Appendix A.

4.2.3 Threatened Plant Species

One threatened plant species, *Eucalyptus nicholii* Narrow-leaved Black Peppermint, listed as Vulnerable on both the TSC Act and EPBC Act, was recorded in the current survey on the subject site. *Eucalyptus nicholii* is naturally rare and has a restricted distribution in the New England Table lands. It is not known to naturally occur in the Sydney Basin, although it is often found as a planted street tree. Given that the specimen onsite is planted, an Assessment of Significance for *Eucalyptus nicholii* is not considered necessary as part of this report.

A search of the OEH Wildlife Atlas and an EPBC Act Protected Matters Report identified 36 threatened plant species, and one threatened population, previously recorded as occurring within a 5km radius of the site, which are listed below (Table 1).

Table 1 Threatened flora species previously recorded within the locality

Family	Genus species	Common Name	TSC Act Status ¹	EPBC Act Status ²
Casuarinaceae	<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	E1	E
Dilleniaceae	<i>Hibbertia superans</i>		E1	V
Elaeocarpaceae	<i>Tetratheca glandulosa</i>		V	
Elaeocarpaceae	<i>Tetratheca juncea</i>	Black-eyed Susan	V	V
Ericaceae	<i>Epacris purpurascens</i> ssp. <i>purpurascens</i>		V	
Euphorbiaceae	<i>Chamaesyce psammogeton</i>	Sand spurge	E1	
Fabaceae	<i>Pultenaea parviflora</i>		E1	V
Fabaceae-Mimosoideae	<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V
Fabaceae-Mimosoideae	<i>Acacia pubescens</i>	Downy Wattle	V	V
Fabaceae-Mimosoideae	<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	E1	E
Grammitidaceae	<i>Grammitis stenophylla</i>	Narrow-lead Finger Fern	E1	
Lamiaceae	<i>Prostanthera junonis</i>	Somersby Mintbush	E1	E
Lamiaceae	<i>Prostanthera marifolia</i>	Seaforth Mintbush	CE	CE
Malvaceae	<i>Lasiopetalum joyceae</i>		V	V
Myrtaceae	<i>Darwinia biflora</i>		V	V
Myrtaceae	<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V
Myrtaceae	<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V
Myrtaceae	<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V
Myrtaceae	<i>Melaleuca deanei</i>	Deane's Paperbark	V	V
Myrtaceae	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V
Myrtaceae	<i>Triplarina imbricata</i>	Creek Triplarina	E1	E
Orchidaceae	<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1	V
Orchidaceae	<i>Microtis angusii</i>	Angus's Onion Orchid	E1	E
Orchidaceae	<i>Prasophyllum fuscum</i>	Slaty Leek Orchid	CE	V
Proteaceae	<i>Grevillea caleyi</i>	Caley's Grevillea	CE	E
Proteaceae	<i>Persoonia hirstuta</i>	Hairy Geebung	E1	E
Proteaceae	<i>Persoonia nutans</i>	Nodding Geebung	E	E
Santalaceae	<i>Thesium austral</i>	Austral Toadflax	V	V
Thymelaeaceae	<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	V
Thymelaeaceae	<i>Pimelea spicata</i>	Spiked Rice-flower	E1	E

Table 4 summarises the habitat potential of the subject site for the threatened plant species previously recorded as occurring within 5km radius of the site on the DECC Wildlife Atlas and listed in the EPBC Act matters of national environmental significance report for the locality.

¹ TSC Act Status: CE Critically Endangered (Schedule 1A); E1 – Endangered (Schedule 1); V – Vulnerable (Schedule 2).

² EPBC Act Status: CE – Critically Endangered; E – Endangered; V – Vulnerable.

4.2.4 Threatened Populations

No threatened flora populations listed under the TSC Act or EPBC Act were recorded on the subject site during the current investigation.

4.2.5 Threatened Ecological Communities

No Threatened Ecological Communities listed under the TSC Act or EPBC Act were recorded on the subject site during the current investigation.

4.3 Fauna

4.3.1 Fauna Species

A total of 6 vertebrate fauna species were recorded during the current field survey including 5 birds and 1 reptile. All fauna species recorded during the current survey are listed in Table B1 of Appendix B.

The majority of confirmed fauna species recorded on the subject site are generally typical of urban areas, urban fringes and adjoining natural areas within the Sydney Basin Bioregion and are widespread in distribution and common to abundant within their ranges. It is likely that additional common native and introduced fauna species utilise the subject site for nesting, sheltering and foraging activities.

4.3.2 Fauna Habitats

The survey investigated the Fauna habitats at two scales. The first locality scale addressed the fauna habitat features, contiguous land use, resources and connectivity which formed part of the broader landscape of the study area, while a narrower second scale of the subject site considered site specific fauna habitat features and resources provide the key elements required by native fauna for the maintenance of life cycles. Fauna habitats identified in the current survey and associated general fauna are summarised in Table 2. The subject site inventory of habitat resources included elements that may be utilised by common protected or threatened fauna for foraging, nesting, sheltering, and breeding purposes.

Table 2 Fauna habitat types and resources.

Area	Habitat Feature	Habitat Resources and Fauna
Locality	Tracts of remnant trees and associated lower vegetation and isolated canopy trees within surrounding rural areas.	Foraging, nesting, roosting and sheltering for birds, reptiles, amphibians, arboreal and terrestrial mammals and bat species.
	Landscape planted and street trees	Foraging, nesting, roosting and sheltering for birds, arboreal and terrestrial mammals and bat species.
	Drainage corridors	Foraging, nesting, roosting and sheltering for small, medium and large birds, arboreal mammals, reptiles and amphibians.
Subject Site	Canopy of native trees	Foraging, nesting, roosting and sheltering for small, medium and large birds, reptiles, arboreal mammals, megachiropteran and microchiropteran bat species.
	Planted midstorey and understorey strata	Foraging, nesting, roosting and sheltering for small and medium birds, reptiles, arboreal mammals and arboreal frogs.
	Planted groundcover	Foraging for small and medium birds, reptiles, amphibians and terrestrial mammals.
	Access roads and pathways	Foraging and flyways for microchiropteran bat species.

4.3.3 Threatened Fauna Species

No threatened fauna species are recorded in the current survey on the subject site. Using the subject site as the central point a 5km radius search of the OEH Wildlife Atlas identified 26 threatened fauna species either previously recorded in the search areas, known to occur within the bioregion, or predicted to occur within the bioregion.

Table 3 Threatened fauna species previously recorded within the locality.

Class	Family	Scientific Name	Common Name	TSC Act Status ²	EPBC Act Status ³
Amphibia	Myobatrachidae	<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	
Amphibia	Hylidae	<i>Litoria aurea</i>	Green & Golden Bell Frog	E1	V
Reptilia	Varanidae	<i>Varanus rosenbergi</i>	Heath Monitor	V	V
Aves	Ardeidae	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E
Aves	Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	V	
Aves	Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V	
Aves	Accipitridae	<i>Pandion cristatus</i>	Eastern Osprey	V	
Aves	Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	
Aves	Cacatuidae	<i>Calyptorhynchus latham</i>	Glossy Black Cockatoo	V	
Aves	Columbidae	<i>Ptilinopus superbus</i>	Superb Fruit Dove	V	
Aves	Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V	
Aves	Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E1	E

Class	Family	Scientific Name	Common Name	TSC Act Status ²	EPBC Act Status ³
Aves	Strigidae	<i>Ninox connivens</i>	Barking Owl	V	
Aves	Strigidae	<i>Ninox strenua</i>	Powerful Owl	V	
Aves	Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	
Aves	Meliphagida	<i>Anthochaera phrygia</i>	Regent Honeyeater	E	E
Aves	Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V	
Mammalia	Burramyidae	<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	
Mammalia	Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tail Quoll	V	E
Mammalia	Peramelidae	<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E1	E
Mammalia	Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V
Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V
Mammalia	Molossidae	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	
Mammalia	Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat		
Mammalia	Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	
Mammalia	Vespertilionidae	<i>Myotis macropus</i>	Southern Myotis	V	

²CE critically endangered (Schedule 1A of the TSC Act); E1 – endangered (Schedule 1 of the TSC Act); V – vulnerable (Schedule 2 of the TSC Act).

³ CE - critically endangered, E – endangered, V – vulnerable, M – migratory.

4.2.4 Threatened Populations

No threatened fauna populations listed under the TSC Act were recorded on the subject site in the current investigation.

4.3 Connectivity

Natural corridors provide connections within the landscape between larger areas of habitat. Corridors facilitate the movement and genetic exchange of flora and fauna, which allows the continuation of viable populations. The importance of wildlife corridors, such as drainage lines and fully or partially contiguous vegetation cover, is well documented (e.g. Recher *et al*, 1986).

The Redlands campus does not occur within, or form part of a tract of vegetation that could be considered a viable wildlife corridor. However, given the pattern of vegetation across the locality is highly fragmented, with remnant/regrowth native vegetation confined to isolated pockets, it is likely that common fauna species transitionally utilise the larger trees within the school as roosting or foraging habitat as they move across their home ranges

5 HABITAT POTENTIAL FOR THREATENED SPECIES

5.1 Flora

5.1.1 Threatened Plant Species

Table 4 summarises the habitat potential of the subject site for the threatened flora species previously recorded as occurring within 10km radius of the site on the NSW Wildlife Atlas and listed in the EPBC Act matters of national environmental significance report for the locality.

Table 4 Habitat potential and need for additional assessments for threatened flora and fungi species previously recorded within a 5km radius of the site on the OEH Wildlife Atlas and EPBC Act Protected Matters Search Tool.

Scientific Name	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Acacia bynoeana</i>	Bynoe's Wattle is a weeping shrub to an approximately 6 metres high. The species occurs along drainage lines, alluvial soils or protected land in sclerophyll forest. Generally prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Nil Subject site does not support preferred soil type or vegetation associations
<i>Acacia pubescens</i>	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. <i>Acacia pubescens</i> occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. It occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Nil Subject does not support preferred soil type or vegetation associations.
<i>Acacia terminalis</i> ssp. <i>terminalis</i>	Sunshine Wattle is an erect or spreading shrub, with a very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent records have been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watson Bay. Most sites are highly modified or disturbed due to surrounding urban development. Habitat for the species is coastal scrub and dry sclerophyll woodland on sandy soils. Small birds and bees are natural pollinators and seeds are dispersed by ants. Seed viability is high and recruitment occurs mainly after fire by germination or resprouting	Low. Subject site supports preferred soil type, and in the past it would have supported preferred vegetation associations. The original vegetation has long been removed, and it is unlikely the species is persisting in the soilbank.
<i>Allocasuarina portuensis</i>	A slender shrub, 3 - 5 m high with branchlets drooping to spreading and dark green in colour. The original known habitat of the Neilsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vacluse House.	Nil. The subject site is outside the species known former distribution, and no propagation material has been planted outside of Woollahra LGA.
<i>Caladenia tessellata</i>	The Tessellated Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Nil Subject does not support preferred soil type or vegetation associations.

Scientific Name	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Callistemon linearifolius</i>	This shrub is recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. There are currently only 5-6 populations in the Sydney area, of the 22 populations recorded in the past. Three of these are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve. Further north it has been recorded from Yengo National Park. Grows in dry sclerophyll forest	Low. Subject site supports very poor quality preferred habitat.
<i>Chamaesyce psammogeton</i>	Sand Spurge is a herb that forms mats to 1 m across. It grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (<i>Spinifex sericeus</i>) and Prickly Couch (<i>Zoysia macrantha</i>). Sand Spurge is found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park, Moonee Beach Nature Reserve and Bundjalung National Park.	Nil Subject site does not support preferred soil type or vegetation associations.
<i>Darwinia biflora</i>	An erect to spreading shrub to 80cm high. Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-ring-gai local government areas. The species occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath. Fire is an important factor in the life cycle of this species. Fire kills all plants, but also produces a flush of germination from seed stored in the soil. The number of individuals at a site declines with time since fire, as the surrounding vegetation develops.	Nil Subject site does not support preferred soil type or vegetation associations.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which are on sandstone but with a strong shale soil influence. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. Killed by fire and re-establishes from soil-stored seed. It is an erect shrub, 50 - 180 cm high; older stems with prominent short, broad leaf scars. Flowers are showy, white or sometimes pinkish.	Nil to low. Subject does not support preferred soil type or vegetation associations.
<i>Eucalyptus camfieldii</i>	Restricted distribution in a narrow band from Raymond Terrace in the north, south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of <i>E. oblonga</i> Narrow-leaved Stringybark, <i>E. capitellata</i> Brown Stringybark and <i>E. haemastoma</i> Scribbly Gum. Poor response to too frequent fires.	Low Subject site does not support preferred soil type or vegetation associations.

Scientific Name	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Eucalyptus nicholii</i>	This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property. Natural habitat for the species is dry grassy woodland, on shallow and infertile soils, mainly on granite.	Present on site as a planted specimen. Subject site is located outside of the species restricted distribution, and does not support preferred soil type or vegetation associations.
<i>Grevillea caleyi</i>	A medium to tall shrub, with long spreading branches, growing to a height of up to 4 m. Restricted to an 8km square area around Terry Hills. All natural remnant sites occur within a habitat that is both characteristic and consistent between sites. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by <i>Eucalyptus sieberi</i> and <i>Corymbia gummifera</i> and commonly found in the endangered Duffys Forest ecological community.	Nil Subject does not support preferred soil type or vegetation associations.
<i>Grammitis stenophylla</i>	Narrow Leaf Finger Fern grows lithophytically in rainforest and wet sclerophyll forest and has a wide distribution in eastern NSW. It prefers moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	Nil Subject does not support preferred vegetation associations.
<i>Hibbertia superans</i>	Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	Nil. Subject does not support preferred soil type or vegetation associations. Furthermore, the species has a highly restricted distribution.
<i>Lasiopetalum joyceae</i>	An erect shrub to 2 m that has a restricted range occurring on lateritic to shale ridge tops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. Preferred habitat is heath on sandstone.	Nil Subject does not support preferred soil type or vegetation associations.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Nil. Subject site does not support preferred habitat.
<i>Melaleuca deanei</i>	Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas with more isolated occurrences at Springwood Wollemi National Park, Yalwal and on the Central Coast. The species grows in heath on sandstone. The species is known from the following reserves, Berowra Valley Regional Park, Brisbane Water National Park, Ku-ring-gai Chase National Park, Garigal National Park, Lane Cove National Park, Royal National Park and Heathcote National Park.	Nil - low Subject site does not support preferred habitat.

Scientific Name	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Microtis angusii</i>	Currently known from only one site at Ingleside, north of Sydney. A collection previously thought to be this species was made from Sunny Corner 100 km west of Sydney, but has since been confirmed as being genetically distinct and may possibly be a subspecies. It is not easy to define the preferred natural habitat of this orchid as the Ingleside location is highly disturbed. The dominant species occurring on the site are introduced weeds <i>Hyparrhenia hirta</i> (Coolatai grass) and <i>Acacia saligna</i> . The Ingleside population occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. These soils support a specific and distinct vegetation type, the Duffys Forest Vegetation Community which is listed as an endangered ecological community under the TSC Act and ranges from open forest to low open forest and rarely woodland.	Nil – low. The habitat of the specie is poorly understood, and therefore it is difficult to define. The known occurrence is a highly disturbed site, similar to the subject site, however, the soil type between the two locations are different and support different vegetation types.
<i>Persoonia hirsuta</i>	The Hairy Geebung is best distinguished by its hairiness - long coarse hairs on flowers and branchlets and short stiff ones on the leaves. It is a spreading shrub with small leaves of variable shape. They are from 6 - 12 mm long, from oblong to narrow in shape and crowded along the stems; they are curled under at the edges. Groups of flowers grow into a leafy shoot. The tubular flowers are yellow or orange and about 1 cm long and also hairy. There are two subspecies - both are considered to be endangered. The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other Persoonia species are) but will regenerate from seed.	Low Potentially suitable habitat on the subject site in places.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	A much-branched shrub 20 to 120cm high with hairy stems and flowers are red to yellow. Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridge tops and upper slopes in woodlands amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing.	Nil Subject does not support preferred soil type or vegetation associations.
<i>Pimelea spicata</i>	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites.	Nil Subject does not support preferred soil type or vegetation associations.

Scientific Name	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Prasophyllum fuscum</i>	The type specimen is from "moist meadows towards the Georges River" in the Sydney area. The species is likely to be extinct from this area. Harden (1993) states that it is confined to the Blue Mountains area. However, some authorities believe <i>Prasophyllum</i> species from this area are not <i>P. fuscum</i> , but an undescribed species. In addition, some authorities believe it is identical to <i>P. uroglossum</i> which occurs in the Wingecarribee area. Grows in moist heath, often along seepage lines. The known population grows in moist sandy soil over sandstone amongst sedges and grasses in an area that appears to be regularly slashed by the local council.	Nil Subject does not support preferred soil type or vegetation associations.
<i>Prostanthera junonis</i>	Has a north-south range of approximately 19 km on the Somersby Plateau in the Gosford and Wyong local government areas. The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites.	Nil Subject site is located outside the species known distribution. The record on the Atlas is likely to be a misidentification.
<i>Prostanthera marifolia</i>	This species was previously recorded from the Sydney harbour region and was presumed extinct. All attempts to recollect this species were unsuccessful until 2001. Occurs in Woodland dominated by <i>Eucalyptus sieberi</i> and <i>Corymbia gummifera</i> on deeply weathered clay soil with ironstone nodules.	The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites.
<i>Pultenaea parviflora</i>	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. <i>Eucalyptus fibrosa</i> is usually the dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or co-dominant, with <i>Melaleuca decora</i> frequently forming a secondary canopy layer.	Nil Subject does not support preferred soil type or vegetation associations.
<i>Syzygium paniculatum</i>	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Nil Subject does not support preferred vegetation associations.

Scientific Name	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Tetratheca glandulosa</i>	A small spreading shrub which grows 20 - 50cm in height. Stems often become entwined among other small shrubs, sedges and grasses. Restricted to the Baulkham Hills, Gosford, Hawkesbury, Hornsby, Kuring-gai, Pittwater, Ryde, Warringah and Wyong LGA's the eastern limit is at Ingleside and the western limit is at East Kurrajong. In areas of shale-sandstone transition habitat such as shale-cappings over sandstone. Occupies ridgetops, upper-slopes and mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam with stony lateritic fragments common. Vegetation varies from heaths and scrub to woodlands, open woodlands and open forest with distribution broadly corresponding to Sydney Sandstone Ridgetop Woodland. Flowers July-November however residual flowers may persist until late December. Flowering influenced by seasonal weather conditions and/or the microclimate effects (eg. exposure) of each particular site.	Nil. Subject does not support preferred soil type or vegetation associations.
<i>Tetratheca juncea</i>	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral.	Nil. The subject site supports the preferred soil type, but not the vegetation associations. The subject site is located outside the species known distribution.
<i>Thesium australe</i>	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>).	Nil. Subject does not support preferred vegetation associations. This species has not been observed in Sydney for some time.
<i>Triplarina imbricata</i>	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. The species was previously recorded in Parramatta, near Sydney, however, the species is no longer thought to occur in this area. Occurs along watercourses in low open forest with Water Gum (<i>Tristaniopsis laurina</i>) or in montane bogs, often with <i>Baekea amissa</i>.	Nil. Subject does not support preferred soil type or vegetation associations. The subject site is located outside the species known distribution.

5.2 Fauna

5.2.1 Threatened Fauna Species

Table 5 summarises the habitat potential of the subject site for the threatened fauna species and populations previously recorded as occurring within a 5km radius of the subject site on the OEH Wildlife Atlas and using the EPBC Act Protected Matters Search Tool.

Migratory Wetland and Marine species listed on the EPBC Act have not been included below as there is no suitable habitat on the subject site and very limited habitat available in the wider locality, and therefore the potential for these species to be present or significantly impacted by the proposal has been discounted.

Table 5 Habitat potential for threatened fauna species previously recorded within 5km radius of the site on the OEH Wildlife Atlas and EPBC Act Protected Matters Search Tool.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Anthochaera phrygia</i>	The Regent Honeyeater inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years and its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining including one in north-east Victoria and two in NSW (excluding the Sydney Basin Bioregion). In NSW the distribution is very patchy and mainly confined to the two main breeding areas, however in some years non-breeding flocks converge on flowering coastal woodlands and forests. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. A generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Insects are important components of the diet of nestlings and a shrubby understorey is an important source of insects and nesting material. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks.	Nil. No suitable foraging or nesting habitat on the subject site
<i>Botaurus poiciloptilus</i>	The Australasian Bittern occurs from southern Queensland through south-eastern Australia to Tasmania and is recorded in south western, Western Australia. In NSW the species has been observed along the east coast and in wetlands of the Murrumbidgee and Lachlan Rivers and the Murray Darling Basin. Generally sedentary, inhabiting terrestrial and estuarine wetlands with permanent water, preferring dense fringing emergent vegetation of sedges and reeds. Nests are created from trampled reeds and rushes over shallow water with a clutch consisting of 4 – 5 eggs. Feeds at dusk foraging over shallow water for frogs, fish, invertebrates and vegetation or fruit (NPWS 1999).	Nil. No suitable foraging or nesting habitat on the subject site

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Burhinus grallarius</i>	Bush Stone-curlews are found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Bush Stone-curlews inhabit open forests and woodlands with a sparse grassy groundlayer and fallen timber feeding on insects and small vertebrates such as frogs, lizards, and snakes. They are largely nocturnal and are especially active on moonlit nights.	Nil-low. Subject site does not support preferred habitat.
<i>Calyptorhynchus lathamii</i>	Glossy Black Cockatoos are uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW. Inhabits open forest and woodlands of the coast and the Great Dividing Range. Feeds almost exclusively on the seeds of several species of She-oak particularly Black She-oak, Forest She-oak and Drooping She-oak. Is dependent on large hollow-bearing eucalypts for nest sites.	Low - Medium. Although marginal suitable foraging habitat occurs on the subject site this species is unlikely to regularly use or be dependent on the marginal habitats of the subject site. More preferential foraging and nesting habitat will be present in nearby conservation reserves and the species is unlikely to be adversely affected by the proposed development. For these reasons an assessment of significance has not been carried out for this species.
<i>Cercartetus nanus</i>	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW, it extends from the coast inland as far as the Pillaga and to Wagga Wagga on the western slopes. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes and insects. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation, (eg. grass-tree skirts) and are generally nocturnal.	Nil - Low. Subject site does not support preferred habitat.
<i>Daphoenositta chrysoptera</i>	The Varied Sittella inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticated bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	Nil - Low. Subject site does not support preferred habitat.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Dasyurus maculatus</i>	The range of the Spotted-tailed Quoll has contracted and is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Mostly nocturnal, it spends most of the time on the ground, but may also climb to raid possum and glider dens and prey on roosting birds. Prey includes gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects and also eats carrion and takes domestic fowl. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares and usually traverse their ranges along densely vegetated creeklines.	Nil - Low. Quolls require large tracks of habitat. Furthermore, subject site does not support preferred habitat.
<i>Glossopsitta pusilla</i>	The Little Lorikeet is the smallest of the Australian Lorikeets. The species is distributed from Cairns in QLD to Adelaide in SA. In New South Wales Little Lorikeets occur in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending west to Albury, Parkes, Dubbo and Narrabri. The species predominately forages for nectar and pollen in the tree canopy as well as melaleucas and mistletoes	Low. Although marginal suitable foraging habitat occurs on the subject site this species is highly unlikely to disperse to, regularly use or be dependent on the marginal habitats of the subject site. More preferential foraging and nesting habitat will be present in nearby conservation reserves and the species is unlikely to be adversely affected by the proposed development. For these reasons an assessment of significance has not been carried out for this species
<i>Hieraaetus morphnoides</i>	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment.	Low No suitable foraging or nesting habitat on the subject site. Species may fly over site on occasion.
<i>Isodon obesulus</i>	Southern Brown Bandicoots are found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, to coastal Victoria, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. Southern Brown Bandicoots are largely crepuscular and are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Nesting during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees <i>Xanthorrhoea</i> sp. and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest.	Nil - Low. Subject site does not support preferred habitat.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Ixobrychus flavicollis</i>	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region and in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks.	Nil. No suitable foraging or nesting habitat on the subject site.
<i>Lathamus discolor</i>	Migrating from breeding grounds in Tasmania to the Australian mainland in winter Swift Parrot ranges from south-eastern South Australia across inland and coastal areas to southeast Queensland. The preferred habitat on mainland Australia is woodlands and riparian vegetation where there are winter flowering eucalypts such as Swamp Mahogany <i>Eucalyptus robusta</i> in coastal areas. Breeding in Tasmania between September and February sometimes in small colonies the nest is an unlined tree hollow with three to five eggs laid. The species feeds mainly on nectar but also pollen and insects.	Low. No suitable foraging or nesting habitat on the subject site. However, preferential foraging is present in nearby conservation reserves, so the species may fly over the site on occasion.
<i>Litoria aurea</i>	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). Inhabits marshes, dams and stream-sides, particularly those containing 19ulrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs.	Nil. No suitable foraging, sheltering or breeding habitat on the subject site.
<i>Miniopterus australis</i>	Little Bentwing-bats occur through the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. They prefer moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, <i>Melaleuca</i> swamps, dense coastal forests and banksia scrub, and are generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Low. The subject site does not contain the preferred habitat. More preferential foraging and nesting habitat is present in nearby conservation reserves and the species is unlikely to be adversely affected by the proposed development.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Miniopterus schreibersii oceanensis</i>	The Eastern Bent-wing Bat occurs along the east and north-west coasts of Australia. Caves are the primary roosting habitat but also use man-made structures. Form discrete populations centered on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes and cold caves are used for hibernation in southern Australia. At other times of the year, populations disperse within about 300 km range of maternity caves. Forage in forested areas, catching moths and other flying insects above the tree tops.	Medium - High. Suitable foraging habitat on site. Maternity camp habitat absent. There are four records of this species occurring within 5km of the subject site. An assessment of significance has been carried out for this species in Appendix C.
<i>Mormopterus norfolkensis</i>	The Eastern Freetail-bat has dark brown to reddish brown fur on the back and is slightly paler below and is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest and woodland east of the Great Dividing Range and roost mainly in tree hollows but will also roost under bark or in man-made structures. Solitary and probably insectivorous.	Medium - High. Suitable foraging habitat on site. Maternity camp habitat absent. There are four records of this species occurring within 5km of the subject site. An assessment of significance has been carried out for this species in Appendix C.
<i>Myotis macropus</i>	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.	Nil. No suitable foraging or nesting habitat on the subject site
<i>Ninox connivens</i>	The Barking Owl is found throughout Australia except for the central arid regions and Tasmania. It is quite common in parts of northern Australia, but is generally considered uncommon in southern Australia. It has declined across much of its distribution across NSW and now occurs only sparsely. It is most frequently recorded on the western slopes and plains. It is rarely recorded in the far west or in coastal and escarpment forests. Inhabits eucalypt woodland, open forest, swamp woodlands and timber along watercourses. Dense vegetation is occasionally used for roosting. The species roosts during the day along creek lines, usually in tall understory trees with dense foliage. Feeds on a variety of prey including insects, birds and mammals such as smaller gliders, possums, rodents and rabbits becoming important during breeding. Territories range from 30 to 200 hectares and birds are present all year. Nests are made in hollows of large, old eucalypts.	Low. Barking owls are unlikely to utilise the subject site, or bushland reserves within close proximity.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Ninox strenua</i>	The Powerful Owl is the largest owl in Australasia and is endemic to eastern and south-eastern Australia. Distributed mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands but is now uncommon throughout its range where it occurs at low densities. The species Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine, Black She-oak, Blackwood, Rough-barked Apple, Cherry Ballart s and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. Birds comprise about 10% of the diet, with flying foxes important in some areas. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400-1450 ha. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Low – Medium. Very marginal foraging habitat on site. Roosting and nesting habitat absent. However, preferential foraging is present in nearby conservation reserves, so the species may fly over the site on occasion.
<i>Pandion cristatus</i>	The Eastern Osprey is a large, water-dependent bird of prey, distinctive in flight and when perched. Ospreys are found around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Low. Although suitable foraging habitat occurs within close proximity of the subject site, the subject site itself contains very little of habitat value. However, the species may fly over the site on occasion.
<i>Petroica boodang</i>	The Scarlet Robin is found in south-eastern Australia (extreme south-east Queensland to Tasmania, western Victoria and south-east South Australia) and south-west Western Australia. In NSW it occupies open forests and woodlands from the coast to the inland slopes. Some dispersing birds may appear in autumn or winter on the eastern fringe of the inland plains. The Scarlet Robin breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees.	Nil - Low. Subject site does not support preferred habitat.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Phascolarctos cinereus</i>	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the western region inhabiting eucalypt woodlands and forests. The species feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.	Nil - Low. Subject site does not support preferred habitat.
<i>Pseudophryne australis</i>	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones inhabiting periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter and breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter.	Nil. No ephemeral drainage lines onsite; therefore, there is suitable foraging or breeding habitat on the subject site.
<i>Pteropus poliocephalus</i>	The Grey-headed Flying-fox is the largest Australian bat. The species are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Site fidelity to camps is high with some caps being used for over a century and the species travel up to 50 km to forage. Grey-headed Flying-fox feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines and also forage in cultivated gardens and fruit crops.	High. There are 153 records of this species occurring within 5km of the subject site. Suitable foraging habitat is present on site. The closest maternity and roosting camp is located in Gordon.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
<i>Ptilinopus superbus</i>	The Superb Fruit-dove is a small rainforest pigeon, approximately 24cm in length. The male is brightly coloured, with golden-green upperparts, a brilliant orange-vermilion neck, and a rich purple crown. The tail is short and tipped with white. The throat and breast are grey with a lilac tinge, and a broad black band on the lower breast separates the grey breast from the creamy-white belly and green flanks. The female is light green on the back, has a small purple spot on the crown, and no dark breast band. The call is a distinctive cooing, rising in pitch and volume to a loud and clear 'whoop, whoop'. Also gives a low 'oom' in a steady sequence. The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. It inhabits rainforest and similar closed forests where it forages in the canopy eating the fruits of many trees species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit bearing trees. Part of the population is migratory or nomadic. At least part of the population, particularly young birds, moves through Sydney, especially in autumn.	Nil to low. No suitable foraging, sheltering or breeding habitat on the subject site.
<i>Varanus rosenbergi</i>	In NSW Rosenberg's Goanna mainly occurs on Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in Goulburn and ACT and is found in heath, open forest and woodland. Requiring large areas of habitat the species shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. The species nests in termite mounds which are a critical habitat component. Feeds on carrion, birds, eggs, reptiles and small mammals.	Nil. No ephemeral drainage lines onsite; therefore, there is suitable foraging or breeding habitat on the subject site.

6 LEGISLATION AND POLICY

6.1 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides for the conservation and protection of threatened species, populations and ecological communities of animals and plants through specific objectives relating to the conservation of biodiversity and promoting ecologically sustainable development. The Schedules of the TSC Act identify endangered or vulnerable species, populations, ecological communities, critically endangered species or ecological communities and key threatening processes affecting the listed species, populations and ecological communities. Provision is made for the preparation of recovery plans for listed threatened species, populations and ecological communities and threat abatement plans to manage key threatening processes. Further provision is made in the TSC Act for threatened species recovery and threat abatement through threatened species Priorities Action Statements (PAS). A PAS sets out the strategies to be adopted for promoting the recovery of each threatened species, population and ecological community to a position of viability in nature and for managing key threatening process. Other issues addressed in PAS are; the prioritisation of the implementation of recovery and threat abatement strategies; setting of performance indicators in implementing recovery and threat abatement strategies; and setting of timetables for recovery and threat abatement planning.

The TSC Act provides for the declaration and mapping of habitats that are critical to the survival of those identified threatened species, populations and ecological communities that are classified as endangered (critical habitats). Further, the TSC Act also sets out the methods of assessment, management and regulation of actions that may damage critical or other habitat or otherwise significantly affect threatened species, populations and ecological communities.

6.2 Environmental Planning and Assessment Act 1979

Under section 79C of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in determining a development application, a consent authority 'is to take into consideration such of the following matters', including 'the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality'. Further to this, approvals for development consent and determination of consent authorities are provided for State Significant Development under the EP&A Act.

Section 5A (s.5A) of the *Environmental Planning & Assessment Act 1979* (the so called '7-part test') lists seven factors that "must be taken into account" by a consent or determining authority in the administration of Sections 78A, 79C and 112 of the Act when considering a development proposal or DA. The aim of s.5A is to determine "whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats", as listed under Schedules 1, 1A and 2 of the TSC Act, and hence whether a *Species Impact Statement* (SIS) is required for the DA. Further the DECC (2007) has prepared the *Threatened species assessment guidelines – The assessment of significance* to technically inform the preparation of 7-part tests.

6.3 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) would only become relevant if it was considered that an impact on a 'matter of National Environmental Significance (NES)' were likely, thus providing a trigger for referral of the proposal to the Department of the Environment.

Matters of national environmental significance identified in the Act are:

- world heritage properties;
- national heritage places;
- Ramsar wetlands;
- nationally threatened species and communities;

- migratory species protected under international agreements;
- the Commonwealth marine environment; and
- nuclear actions.

The former Department of the Environment and Heritage (DEH) prepared the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines - Matters of National Environmental Significance* (DEH, 2006). The guidelines are a self assessment process that address detailed criteria to determine whether an 'action' (such as a development) 'has, will have, or is likely to have, a significant impact' on a matter of NES. The outcome the self assessment process determines whether or not the action or proposed action should be referred to the federal Environment Minister for a decision on whether approval is required under the EPBC Act as a 'controlled action'.

6.4 SEPP 44 – Koala Habitat Protection

State Environmental Planning Policy No.44 - Koala Habitat Protection (SEPP 44) aims to protect the Koala and its habitat by incorporating prescriptions for consent authorities to consider during the assessment of development applications. SEPP 44 contains prescriptions for the consideration of "potential koala habitat" and "core koala habitat" for developments within Local Government Areas listed on Schedule 1 of the Policy. North Sydney LGA is not listed on Schedule 1 as an area to which SEPP 44 applies.

6.5 SEPP 19 – Bushland in Urban Areas

State Environmental Planning Policy No.19 - Bushland in Urban Areas (SEPP 19) aims to, amongst other things, "protect and preserve bushland" within the urban areas of Sydney (Department of Planning 1986). North Sydney is listed under SEPP 19 as a Council area to which the Policy applies.

Clauses 6, 7 and 8 of the Policy outline requirements for development consent to be considered by a consent authority, when assessing development applications that involve disturbance to bushland "zoned or reserved for public open space". The subject site is not zoned "for public open space" pursuant to North Sydney Local Environment Plan 2013 and accompanying map; thus Clauses 6, 7 and 8 of SEPP 19 do not apply to the proposed development.

6.6 North Sydney Local Environment Plan

The North Sydney Local Environment Plan 2013 (NSLEP 2013) is an environmental planning instrument used to manage development and conservation in North Sydney LGA.

The NSLEP 2013 aims to guide the future development and conservation of North Sydney LEP. The LEP Map classifies land into a number of "zones" (such as residential, business, open space, etc) and "reservations" (such as roads). The LEP written instrument describes how land in these zones and reservations may be used, developed and conserved. The site is zoned 'SP2 Educational Establishment' under the LEP.

6.7 North Sydney Development Control Plan

NSDCP 2013 supports the implementation of the provisions to North Sydney Local Environmental Plan 2013 (NSLEP 2013). It contains detailed provisions on all aspects of development not covered under NSLEP 2013. The DCP provisions are not legally binding, however they are given weight in the assessment of all development applications.

7 IMPACT ASSESSMENT AND CONCLUSIONS

SCECGS Redlands is seeking a staged development approval comprising a concept proposal for the school over five stages and consent for a detailed proposal for the first stage development referred to as "Stage 1". "Stage 1" involves

- Demolition of existing buildings and structures (Mowll Building, 1, 3, 7, 9 and 11 Gerard Street, 7 and 8 Monford Place, staff offices, multi-purpose building and Design and Technology buildings on the western boundary).
- Fit-out of 7 and 8 Monford Pl for temporary use as an educational facility
- Construction of a new purpose built education building generally comprising a four storey building with basement car park and outdoor learning area at roof level.
- Temporary fitout of a portion of the basement carpark shell for music and general education uses
- Construction of landscaped podium over new basement carpark and music facilities
- Creation of new vehicular access road off Gerard Street for the new basement car park.
- Creation of new internal vehicular access link facilitating ingress from Waters Rd and egress onto Military Rd
- Associated landscaping improvements.
- New services infrastructure.
- New servicing area including loading dock and waste enclosure
- Erection of temporary demountable classrooms.

This flora and fauna assessment has considered the flora and fauna species, vegetation communities and habitat components occurring or previously recorded within the study area. The assessment identified one plant community consisting of a mixture of planted exotic and non-locally indigenous native species. No fully or partially structured native vegetation community exists on the subject site. One plant species, *Eucalyptus nicholii*, listed as a Vulnerable under both the NSW *Threatened Species Conservation Act 1995* and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* was found to occur onsite. However, given that this species is naturally rare, has a restricted distribution in the New England Tablelands, and it commonly planted around Sydney as a street tree, it has been assessed that the specimen onsite is planted thus an Assessment of Significance is not warranted.

The assessment found no fully or partially structured native vegetation onsite. There are a number of large, non-locally indigenous planted canopy trees onsite; some of these canopy trees will be removed as part of the proposal. The largest of these being a *Eucalyptus viminalis* (Tree 63, identified as *Eucalyptus maidenii* in Bluegum (2015)) which will be considered for removal as part of the proposal. No tree hollows were observed within any of the canopy trees being retained or removed onsite.

The site contains marginal and poor quality habitat for the majority of threatened species likely to occur within the locality; although it may be possible that some species periodically take refuge onsite as they transit between larger areas of good quality habitat. It is likely that various species of microchiropteran bats (microbats), including two threatened species Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*, Eastern Freetail Bat *Mormopterus norfolkensis* utilise the subject site as foraging habitat; the site contains no roosting or breeding habitat for microbats.

A 7-part Test has been undertaken for the two threatened microbats that may be foraging on the subject site (Appendix C), setting out the factors to consider when determining whether the proposed development will have a significant effect on this threatened entities. The Assessment of Significance (7-part test) has concluded that the proposal is unlikely to have a 'significant impact' on the entities assessed. Therefore a Species Impact Statement will not be required.

8 RECOMMENDATIONS

This assessment has concluded that the current proposal is unlikely to significantly impact on the native flora and fauna of the study area and wider locality, including threatened species. To minimise or control potential impacts of the current proposal on the native flora and fauna of the subject site and study area, this report recommends the following to guide the proposed development application.

- The current proposal is to be carried out in accordance with all policies, operational procedures and guidelines in place as part of a consent condition or EPI relating to environmental management or impact minimisation for construction projects of the scope for current proposal.
- Implementation of tree protection measures as recommended in the Arboricultural Impact Assessment (Bluegum, 2015).
- Installation, maintenance and decommissioning of sediment and erosion controls as required and as specified in any consent and soil and water management plan.
- A local wildlife rescue service is to be contacted if native or introduced fauna are injured or disturbed from nesting or sheltering habitat during construction works.
- Relevant recommendations above are to be incorporated into a construction environmental management plan or similar, prepared for the subject site.

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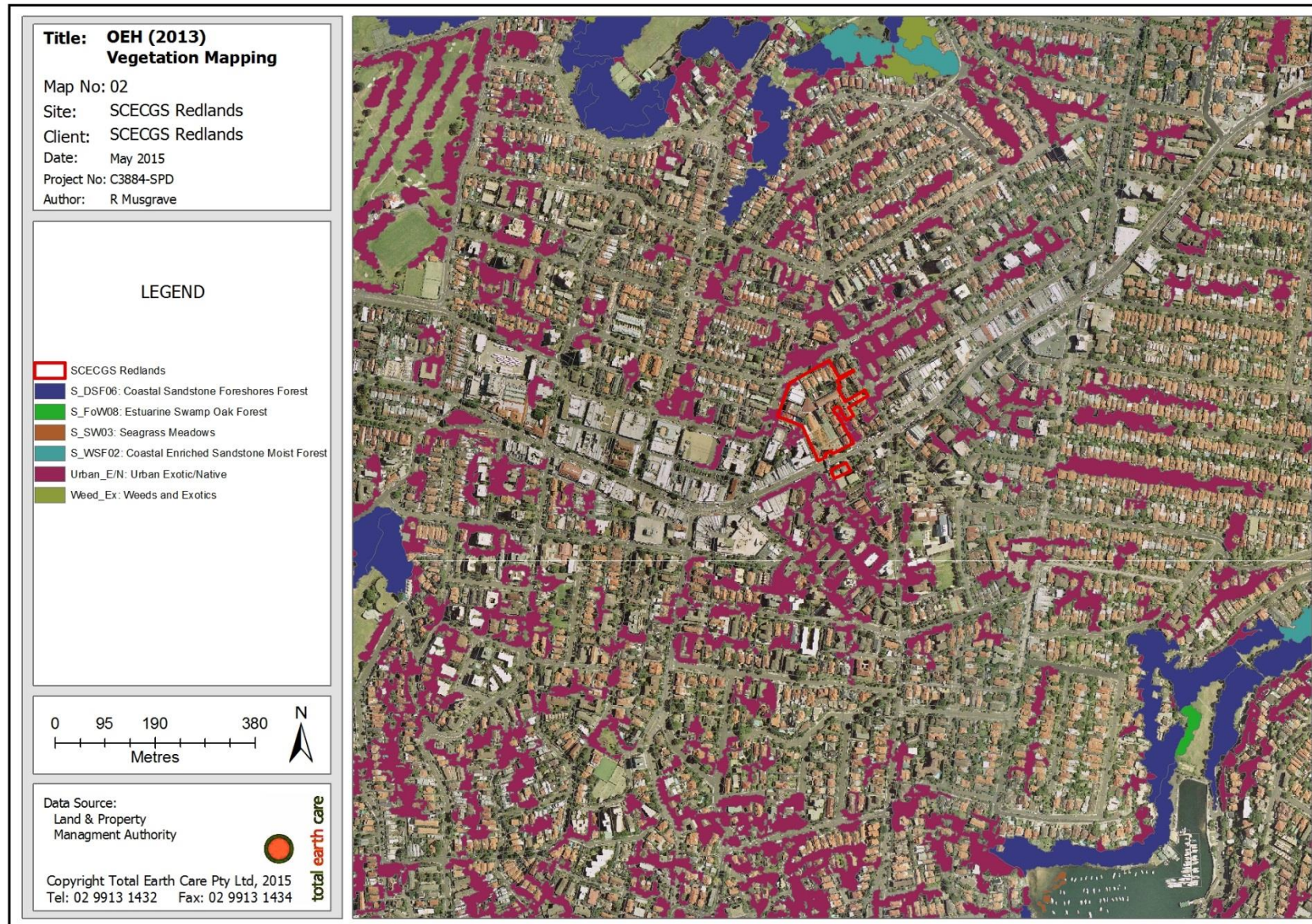
Appendix A

Figures

Flora & Fauna Assessment

SCECGS Redlands, Cremorne Concept Proposal & Stage 1 Development Application









Appendix B

Species Inventory

Flora & Fauna Assessment

SCECGS Redlands, Cremorne Concept Proposal & Stage 1 Development Application

Flora Species Inventory

General Status				
*	Exotic (not native to Australia)			
N()	Noxious weeds and 'Control Class' as listed on the NSW Noxious Weeds Act 1993 for the Campbelltown LGA			
ni	Non - indigenous native species (does not naturally occur at this locality)			
(?)	Uncertain identification			
Conservation Status				
CE	Critically Endangered - listed under Schedule 1A of the TSC Act			
E	Endangered - listed under Schedule 1 of the TSC Act			
V	Vulnerable - listed under Schedule 2 of the TSC Act			
Abundance				
c	Common, species occur all over the site			
o	Occasional, species occur over the survey area but not in large numbers at any occurrence			
uc	Uncommon, species occur only once or twice during the survey			
Status	Family	Genus species	Common Name	Abundance
*	Alliaceae	Agapanthus praecox ssp orientalis	African Lily	c
*	Anacardiaceae	Mangifera indica	Mango	uc
*	Apocynaceae	Plumeria alba	Frangipani	uc
*	Arecaceae	Archontophoenix alexandrae	Alexandria palm	c
*	Arecaceae	Phoenix canariensis	Canary Island Date Palm	uc
*	Asteraceae	Conyza bonariensis	Flaxleaf Fleabane	uc
*	Basellaceae	Anredera cordifolia	Madeira Vine	uc
*	Bignoniaceae	Jacaranda mimosifolia	Jacaranda	c
ni - Planted	Casuarinaceae	Casuarina cunninghamiana ssp	River Oak	x
	Casuarinaceae	Casuarina glauca	Swamp Oak	uc
*	Cupressaceae	Cupressus sp	Cypress	c
ni - Planted	Cyatheaceae	Cyathea cooperi	Straw Treefern	uc
ni - Planted	Elaeocarpaceae	Elaeocarpus eumundi	Eumundi Quandong	uc
*	Iridaceae	Dietes sp		c
*	Lythraceae	Lagerstroemia indica	Crepe Myrtle	c
*	Magnoliaceae	Magnolia sp	Magnolia	c
*	Malaceae	Cotoneaster sp		uc
*	Malaceae	Eriobotrya japonica	Loquat	uc
ni - Planted	Meliaceae	Toona ciliata	Red Cedar	uc
*	Moraceae	Ficus pumila	Creeping Fig	uc
ni - Planted	Myrtaceae	Callistemon salignus	Willow Bottlebrush	uc
ni - Planted	Myrtaceae	Corymbia maculata	Spotted Gum	uc
ni - Planted	Myrtaceae	Eucalyptus nicholii	Narrow-leaved Black Peppermint	uc
ni - Planted	Myrtaceae	Eucalyptus viminalis	Ribbon Gum	uc
ni - Planted	Myrtaceae	Lophostemon confertus	Brush Box	uc
ni - Planted	Myrtaceae	Melaleuca bracteata	Black Tea-tree	uc
ni - Planted	Myrtaceae	Syzygium - cultivar	Lilly Pilly	uc
*	Myrtaceae	Syzygium jambos	Jambos	uc
Planted	Myrtaceae	Tristaniopsis laurina	Mountain Water Gum	uc
*	Oleaceae	Jasminum sp		c
N(4)	Oleaceae	Olea europaea ssp cuspidata	African Olive	uc
Planted	Phormiaceae	Dianella caerulea	Blue Flax-lily	c
*	Pinaceae	Pinus halepensis		uc
	Pittosporaceae	Pittosporum undulatum	Sweet Pittosporum	uc
ni - Planted	Proteaceae	Grevillea robusta	Silky Oak	uc
ni - Planted	Proteaceae	Stenocarpus sinuatus	Firewheel Tree	uc
*	Rubiaceae	Gardenia florida	Gardenia	c
*	Rutaceae	Murraya paniculata		uc
*	Strelitziaceae	Strelitzia reginae	Bird of Paradise	uc
*	Ulmaceae	Ulmus parvifolia		uc

Fauna Species Inventory

General Status					
*	Exotic/introduced species				
(?)	Uncertain identification				
P	Protected				
U	Unprotected				
Conservation Status					
CE	Critically Endangered - listed under Schedule 1A of the TSC Act				
E	Endangered - listed under Schedule 1 of the TSC Act				
V	Vulnerable - listed under Schedule 2 of the TSC Act				
Record Type					
O Observed	B Burnt				
F Tracks/scratchings	T Trapped or netted				
H Hair, feathers, or skin	Y Bone or teeth				
R Road kill	P Scat				
D Dog kill	W Heard call				
C Cat kill	Z In raptor/owl pellet				
V Fox kill	E Nest/roost				
K Dead	M Miscellaneous				
S Shot	N Not located				
X In scat	A Stranding/Beached				
Sh Shell/carapace					
Certainty (anabat analysis only)					
D Definite					
Pr Probable					
Po Possible					
Status	Order	Family	Scientific Name	Common Name	Obs Type
P	Aves	Passeriformes	Gymnorhina tibicen	Australian Magpie	0
P	Aves	Passeriformes	Strepera graculina	Pied Currawong	0
P	Aves	Passeriformes	Hirundo neoxena	Welcome Swallow	0
P	Aves	Passeriformes	Manorina melanocephala	Noisy Miner	0
P	Aves	Psittaciformes	Trichoglossus haematodus	Rainbow Lorikeet	0
P	Reptilia	Squamata	Lampropholis delicata	Dark-flecked Garden Sunskink	0

Appendix C

Assessment of Significance

Flora & Fauna Assessment

SCECGS Redlands, Cremorne Concept Proposal & Stage 1 Development Application

7-part Test – *Microchiropteran Bat Species*

Microchiropteran bats (micro-bats) are small bats, with wingspans up to 30cm and with up to 170g. The majority of species in the suborder are insectivorous and feed upon moths and flying insects, although some catch fish and aquatic insects (Strahan 1995). All micro-bats hunt and navigate by echolocation. The Sydney Basin supports at least 19 species of micro-bats and of these four are predominantly cave-roosting; sheltering during the day in caves, mines, tunnels, culverts and stone basements. The remaining species roost during the day in tree hollows, under bark and in buildings (KBCS 2009). Preferred roost sites are species-specific (DIPNR 2004).

Two threatened fauna species, Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* and Eastern Freetail Bat *Mormopterus norfolkensis* assessed as having a 'medium to high' likelihood of occurring on the subject site and have been considered within the assessment.

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

The proposed action (in summary) includes the removal of several large trees, the demolition of existing buildings, and construction of new buildings. Seventeen trees are proposed to be removed as part of Stage 1, with another 30 trees being proposed for removal during the later stages of development. As such, a total of 43 trees are proposed to be removed as part of the development proposal (all stages).

Caves are the primary roosting habitat for Eastern Bent-wing Bats, however they also use derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations clustering within a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within a territorial range of about 300 km from the maternity cave (Churchill, 1998). Movement between territories is rare. Breeding or roosting colonies can number from 100 to 150,000 individuals. As such, they are prone to population damage if their roosting site is disturbed or modified. Eastern Freetail Bats generally roost under the bark or within small hollows which occur in large remnant eucalypts, however, they will also roost in manmade structures. No suitable roosting habitat is found within the large remnant trees onsite. Comparable roosting habitat may also be found within the smaller parks and reserves in the locality. Eastern Bentwing Bats and Greater Broad-nosed Bats hunt in forested areas, catching moths and other flying insects above the canopy.

Habitat features of the subject site which may support Eastern Bentwing Bats and Eastern Freetail Bats include some foraging habitat above the existing canopy and buildings. The subject site does not provide roosting habitat for individuals of these species and/or maternity camp habitat.

The proposal will not remove breeding or roosting habitat for either species. Foraging habitat within and around the 43 trees will be removed, and replaced with foraging flyways above and between buildings, and new plantings. As a result, the proposed actions are unlikely to have an adverse effect on the life cycle of the species of threatened micro-bats considered in this 7-part test such that viable local populations are likely to be placed at risk of extinction.

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

The TSC Act defines an 'endangered population' as 'a population specified in Part 2 of Schedule 1' of the Act. The aforementioned bat species are not listed as an 'endangered population', as defined under 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.**

The TSC Act defines an 'endangered ecological community' as an 'ecological community specified in Part 3 of Schedule 1' of the Act. The aforementioned species are not an 'endangered ecological community', as defined under the TSC Act.

- (d) In relation to a 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**
 - (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**
 - (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 proposed action (in summary) includes the removal of several large trees, the demolition of existing buildings, and construction of new buildings. Seventeen trees are proposed to be removed as part of Stage 1, with another 30 trees being proposed for removal during the later stages of development. As such, a total of 43 trees are proposed to be removed as part of the development proposal (all stages).

As noted, the subject site supports some foraging habitat above the existing canopy for species of micro-bat considered in this 7-part test. No breeding or roosting habitat is present on the subject site for either Eastern Bentwing Bats or Eastern Freetail Bats.

Preferred foraging habitat for these species is above the canopy of forested areas, where they hunt moths and other flying insects. In an urban landscape, this preferred habitat is highly fragmented across the locality. Tree canopy cover is highly fragmented and discontinuous in the locality as a result of roads, residential areas, rail lines and other urban infrastructure. Despite 43 trees being removed over the all stages of the proposal, the proposal is unlikely to further significantly fragment or isolate foraging habitat of species of micro-bat considered in this 7-part test.

The long-term survival of the relevant micro-bats in the locality is unlikely to be affected by the selective removal of native and exotic trees from the subject site.

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

No area has been designated as 'critical habitat' under Part 3 of the TSC Act 1995 for Eastern Bentwing Bats or Eastern Freetail Bats.

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

There is currently no Recovery Plan on Threat Abatement Plan in place for Eastern Bentwing-bats, or Eastern Freetail Bats. Recovery strategies include actions such as retaining stands of native vegetation, especially those with hollow-bearing trees (including dead trees), and retain other structures containing bats, retain a buffer of vegetation around roost sites in vegetated areas and protect hollow-bearing trees for breeding sites and younger mature trees should also be retained to provide replacements for the older trees.

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

The TSC Act defines a 'key threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'.

Schedule 3 of the TSC Act provides a list of the 'key threatening processes' (KTP). The proposed action will not result in the operation or increase the impact of any listed KTP on the microbats considered within this assessment.

Conclusion

In light of the consideration of the above seven factors (1 -7), the proposed activity on the subject site is not likely to have "a significant effect" on Eastern Bentwing Bats or Eastern Freetail Bats on the subject site or wider locality as a result of the current proposal, as:

- The proposal will not adversely affect the lifecycle of the species such that a viable local population is likely to be placed at risk of extinction;
- The proposal will not remove, modify or further fragment or isolate a significant area of habitat for the species; and
- The proposal does not significantly contribute to any KTP threatening the species.

Consequently, a Species Impact Statement is not required to be prepared.