7 Appendices

7.1 Flora & Fauna Assessment Report – Total Earth Care

Flora and Fauna Assessment

Cochlear Global Headquarters Project – Stage 1
Macquarie University

Total Earth Care Pty Ltd
June 2008

total earth care

Flora and Fauna Assessment

Cochlear Global Headquarters Project – Stage 1
Macquarie University

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Flora and Fauna Assessment

Cochlear Global Headquarters Project – Stage 1
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Flora and Fauna Assessment

Cochlear Global Headquarters Project – Stage 1
Macquarie University

1 INTRODUCTION

1.1 Background

Stage 1 of the proposed Cochlear Global Headquarters in the southern precinct of Macquarie University (subject site, Figure 1 Appendix B) involves the master planning, design and preparation of documentation for a major project to be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As part of the master planning process, Stage 1 of the current project will develop alternative concepts based on the desired outcome, and a range of constraints and opportunities for the staged construction of offices, other buildings and infrastructure over approximately 15 years (Figure 2, Appendix B).

As at publication of this Flora and Fauna Assessment Report the proposal will be determined under *Part 3A Major infrastructure and other projects* of the EP&A Act. Accordingly and in liaison with the NSW Department of Planning (DoP) the proponent has been issued with Director Generals Requirements (DGR's). The DGR's provide a scope for the preparation of an Environmental Assessment to accompany a Part 3A project application to the NSW Minister for Planning. An assessment of the environmental impacts of the proposed project has been specified in the DGR's. Additionally several key issues are identified from the DGR's for the investigation and management of biodiversity on the subject site and study area. In summary these are;

- provision of a riparian zone along the creek;
- preparation of a Vegetation Management Plan (VMP) for the designated riparian zone;
- assessment of the impact of the development on any existing native flora and fauna and their habitats, including threatened species having regard to *Threatened species assessment guidelines. The assessment of significance*. (DECC, 2007);
- assessment of the significance and condition of any trees on the subject site proposed to be removed and details of tree protection measures for any trees to be retained.

This Flora and Fauna Assessment and report will address or consider the key biodiversity issues highlighted above. Additionally this report will inform the overall Environmental Assessment to accompany the Part 3A project application.

1.2 Previous Studies and Reports

1.2.1 Urban Bushland in the Ryde LGA

Ryde City Council has undertaken surveys to map the extent and classify the remnant native vegetation of the local government area (Oculus, 2001). The survey involved reference to existing vegetation mapping schemes of the Sydney region and interpretation of aerial images. Some ground truthing was carried and limited to a few sites focusing on predicted or known areas supporting endangered ecological communities. The survey identified six native plant communities, with three identified as having national and state conservation significance. The report lists the largest and/or most significant bushland reserves in the local government area and this includes an area referred to as Macquarie University Nature Reserve.

The report suggests that the endangered ecological community Sydney Turpentine-Ironbark Forest (STIF) was probably the most common native plant community in the Ryde LGA prior to European

settlement. The report identifies a small and degraded remnant of STIF at Macquarie University amongst other areas.

1.2.2 Ryde Flora and Fauna Study 2006

The *Ryde Flora and Fauna Study 2006* (Biosphere Environmental Consultants, 2006) was commissioned by Ryde City Council to identify base-line biodiversity in four key reserves of the LGA. The survey focused on vertebrate and invertebrate fauna and native and exotic plant species assessing both species richness and relative abundance with surveys carried out in autumn and spring.

Although none of the reserves were free of urban impacts the report identified that several bushland reserves in the LGA retained representative native flora and fauna. Several rare and two threatened plant species were located during the survey effort as were threatened ecological communities. One threatened owl and one threatened microchiropteran bat species were detected during the surveys and the report suggests that both species were foraging preferentially along the Lane Cove River corridor (Biosphere Environmental Consultants, 2006).

In assessment of the fauna survey results, the report suggests that terrestrial mammals, large reptiles and frogs have been significantly affected by development in the Ryde LGA. Predation by foxes, dogs and cats and clearing of native vegetation are identified as resulting in the widespread loss of terrestrial mammals and larger reptiles. The significant decline of frog species in the LGA is attributed to substantial loss of foraging and breeding habitat, impacts on water quality and predation by introduced fish species (Biosphere Environmental Consultants, 2006).

The report states that forest and woodland birds are still well represented in the LGA due to the habitat provided by tree canopy including that of surveyed reserves. However due to an absence of mid storey vegetation cover the smaller passerines group of birds had declined markedly (Biosphere Environmental Consultants, 2006).

The major impacts that are affecting the biodiversity of the LGA are summarised and these include but are not limited to:

- weed invasion;
- contamination of creeks and ground water;
- changes in flow patterns of creeks through storm water control;
- increased erosion of creek banks;
- loss of ephemeral freshwater habitat;
- penetration of bushland by walking tracks, roads and easements;
- feral animals, such as foxes, cats, dogs, rats and mice;
- high density of native, predatory birds;
- night-light pollution from street lights and house lights;
- noise and movement disturbance; and
- edge effects.

1.2.3 Macquarie University Preliminary Ecological Assessment

The report *Macquarie University Preliminary Ecological Assessment* (EDAW, 2006) was prepared as part of a review of the overall master planing for Macquarie University and was primarily based on desktop methods. The specific scope of the assessment was to:

- review existing background information and comment on potential development constraints given legislative requirements;
- undertake additional investigations to confirm existing data as required; and

- identify and comment on any potential threatened species on the site and the constraints these would place on development.

Five areas of remnant native plant communities were identified over the University campus in the assessment (Figure 3, Appendix B) comprising three ecological communities (EDAW, 2006). One of the ecological communities, Sydney Turpentine-Ironbark Forest (STIF) is listed as endangered under the TSC Act and critically endangered under the EPBC Act. Several stands of STIF are recorded in the assessment including 'Remnant 3' that is adjacent to the subject site of the current survey (Figure 3, Appendix B). Remnant 3 is described by EDAW (2006) as supporting very little understorey and generally in poor condition due to landscape maintenance. Vegetation, other than the remnants of native plant communities, is described as mainly planted native endemic or non-locally endemic and exotic trees in mown areas.

A five kilometre radius search of the DECC Wildlife Atlas identified 13 threatened fauna species previously recorded from the locality. The potential habitat and likelihood for the threatened species, from the database records, to occur at the University campus is assessed and in summary EDAW (2006) suggest that:

- some threatened bird and bat species may potentially use the university site as foraging or roosting habitat. However the site was assessed as unlikely to provide important habitat for threatened bird and bat species given the limited extent of vegetation and the availability of alternative habitat in nearby Lane Cove National Park; and
- it is unlikely that there is adequate area of suitable habitat to support viable populations of threatened mammal species previously recorded from the locality.

The disjunct nature of the remnant native vegetation communities and lack of fauna habitats over the University Campus is noted. Habitats were assessed as generally more suited to fauna species adapted to urbanised environments (EDAW, 2006).

The report highlights the provisions of the *NSW Threatened Species Conservation Act 1995* (TSC Act) and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) particularly; the preparation of 7-part Tests (under Section 5A of the TSC Act) for any future development at the University that potentially impacts on threatened species, populations or communities; or where a proposed activity is located in an area identified to be of national environmental significance, the matter needs the approval of the Minister for Environment and Heritage.

1.2.4 Native Vegetation of the Cumberland Plain

At a regional scale *The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities* (Tozer, 2003), provides a survey of vegetation communities occurring on the Cumberland Plain and adjacent plateaus characterised by Wianamatta Shale soils. This study recognises that most of the native vegetation communities of the Cumberland Plain and neighbouring Wianamatta Shales are listed as endangered under the *Threatened Species Conservation Act 1995* and states that 'Due to the rate of urban development in western Sydney there is a large potential for development proposals to significantly impact on listed communities' (Tozer, 2003). As such, part of the rationale for the survey was to address the need for quantitative data to assist in the identification of native plant communities and provide an assessment of the conservation value of vegetation remnants.

The aim of the survey was to revise the existing plant community classification to take account of; recently described communities and other communities warranting recognition; provide quantitative data for characteristic species in each community (frequency of occurrence and relative abundance); identify species showing high fidelity to each community as a basis for diagnosing community type in the field; estimate the present cover of native vegetation; and derive a spatial model as a basis for predicting the vegetation type and conservation value of all remaining remnants (Tozer, 2003). In classifying communities interpreted in light of previous publications and endangered ecological communities listed under the TSC Act, Tozer (2003) recognises and describes more than one unit for four community types and these are as follows;

- Cumberland Plains Woodland incorporating Shale Plains Woodland and Shale Hills Woodland.
- Sydney Coastal River Flat Forest incorporating Riparian Woodland, Riparian Forest, and Alluvial Woodland.
- Shale/Sandstone Transition Forest incorporating Shale/Sandstone Transition Forest (low sandstone influence) and Shale/Sandstone Transition Forest (high sandstone influence).
- Sydney Turpentine-Ironbark Forest incorporating Turpentine-Ironbark Forest and Turpentine-Ironbark Margin Forest.

The survey incorporated systematic, stratified field sampling to record floristic structure and composition, a classification procedure based on hierarchical, agglomerative clustering analysis; spatial modelling of community distributions using geological, climatic and topographic variables; and the interpretation of patterns in canopy composition and remnant condition in aerial photographs. The resulting *Native Vegetation of the Cumberland Plain, Western Sydney − 1:25 000 Map Series* (NPWS, 2002) incorporates Ryde LGA in Map 10 of the series.

1.2.5 Tree Report - Cochlear Global Headquarters Macquarie Park

A tree survey and report has been prepared for the subject site (TUFM, 2008) and this is mainly restricted to the proposed construction footprint. The report has assessed that the former vegetation of the survey area has been entirely removed and that most of the tree species present are non-locally indigenous planted specimens with the possible exception of several individuals of three species.

Trees of the survey area are assessed as 'mainly well grown and semi-mature or approaching maturity.' The majority of trees were assessed to be in good or fair condition with all but a few specimens requiring removal as part of the current proposal (TUFM, 2008).

The survey has identified two tree species of conservation significance in the northern portion of the subject site. One planted specimen of *Eucalyptus nicholii* Narrow-leaved Black Peppermint (tree 9) that is in a 'poor' condition is located on the earth mound and the species is listed as Vulnerable under both the TSC and EPBC Acts. Tree number 16 is a specimen of *Eucalyptus scoparia* Wallangarra White Gum and the species is listed as Endangered under the TSC and Vulnerable under the EPBC Act. The specimen is the same general location as tree 9 and has been assessed as in a poor condition (TUFM, 2008).

2 AIMS

The aims of this flora and fauna assessment are to:

- survey and describe the existing flora and fauna within the subject site;
- determine the presence or likely occurrence of threatened species, populations and ecological communities (or their habitats), as listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *NSW Threatened Species Conservation Act 1995* (TSC Act);
- assess the impacts of the proposed development on the existing flora and fauna, and their habitats having regard to *Threatened species assessment guidelines. The assessment of significance*. (DECC, 2007); and
- determine areas that are of conservation significance and should be either excluded or constrain development as part of the current or future proposals.

3 METHODS

3.1 Desktop Research

Prior to field surveys, records of all threatened species, populations and endangered ecological communities previously recorded within a 10km radius of the subject site were obtained from the Department of Environment and Climate Change (DECC) Wildlife Atlas database. An EPBC Act Protected Matters Report was generated using the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Search Tool for a 10km radius of 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 species, threatened populations, threatened communities, or their habitats, were targeted during the field survey. Recent existing reports of the biodiversity of the locality were also reviewed prior to field surveys and these are summarised in earlier sections.

3.2 Flora

A botanical survey was conducted in the study area on 6th March 2008 to reference existing vegetation community descriptions and mapping by others (EDAW 2006 and NPWS 2002). More detailed survey including transects, quadrat sampling and random meanders was carried out within the subject site including:

- 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 of the Cumberland Plain by NPWS (2002), and accompanying descriptions by Tozer (2003), or the structural definitions of Specht & Specht (1999);
- targeted survey in predicted locations of endangered ecological communities previously mapped by EDAW (2006);
- 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 was determined according to:

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

3.3 Fauna

Fauna surveys, involving diurnal and nocturnal techniques, were conducted over the subject site during the afternoon and evening of 6th March 2008. Weather conditions were warm during the afternoon (to approximately 28^0C), and cooling into the evening under clear skies. Night light was high due to street and building lights surrounding the subject site.

The diurnal surveys involved observations of animal activity including turning logs, rocks and other debris, habitat identification and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings). Surveys for avifauna and amphibians involved visual detection and aural recognition of bird and frog calls.

The nocturnal surveys involved spotlighting on foot for direct visual observations of animal activity, turning logs and rocks and call playback for aural recognition of threatened owl species. No call playback was carried out for threatened frog species due to a distinct lack of suitable or marginal habitat for species identified in database searches. Similarly, due to the landscape and highly altered

nature of the subject site and immediate surrounds, no trapping or other fauna detection techniques such as ultrasonic bat call detection were carried out.

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 A).

3.4 Limitations

Field surveys were conducted over one afternoon and evening during autumn 2008. Flora and fauna 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 disturbed landscape. Accordingly, the brevity of the survey and its timing mean that the full spectrum of flora and 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 flora and 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 LANDSCAPE

The subject site is located at the southern extent of the Macquarie University Campus in the Sydney suburb of Macquarie Park, Ryde Local Government Area (LGA). Land use of the triangular shaped subject site incorporates two child care centres in the western area with the majority of the subject site characterised by a paved car park. Mown lawns with planted *Eucalyptus* spp form a perimeter of open space around the subject site. An open and eroded drainage line runs along the southeast boundary and this continues through the university campus in the direction of Lane Cove River to the north. Land use to the north of the subject site includes multi level carparks and university buildings. Open space incorporating a small area of native vegetation, planted native and exotic trees and mown lawns adjoins the southeast boundary whilst medium density housing development adjoins along the southwest boundary. Generally the study area and subject site are situated in a highly modified urban landscape with adjacent development including education facilities, medium density housing and commercial complexes. Lane Cove National Park forms a broad arc through the north and east of the study area.

Two soil landscapes are mapped by Chapman *et al* (1989) in the study area. The Glenorie Soil Landscape covers the majority of the study area with the Lucas Heights Soil Landscape mapped mainly toward Lane Cover River but with an intruding lobe occurring approximately through the university campus. In summary Chapman and Murphy (1989) described the Glenorie Soil Landscape as occurring over the Ashfield and Bringelly Shales of the Wianamatta Group Shales. Surface soils are friable loams, overlying clay loams with various clay sub soils deeper through the profile. This soil type has a generally low to moderate fertility and erodibility increases from low for surface soils through to moderate for subsoils. The geology of the Lucas Heights Soil Landscape is primarily the Mittagong Formation but may include minor intrusions of Hawkesbury Sandstone and Ashfield Shale. Soil composition includes sandy loams on the surface followed by stony sandy clay loams through to clays in the lower part of the profile. This soil landscape generally has a low fertility and overall moderate to high erodibility (Chapman and Murphy 1989).

Soils of the subject site are most likely to be entirely altered from a natural condition. Constructed batters and embankments surround the subject site and major earthworks will have been carried out during the construction of the buildings and carpark. The open channel of the drainage line is severely eroded in places due to stormwater runoff and it is likely that some sections have been realigned and banks have been graded down.

5 FLORA

5.1 Plant Species

A total of 103 plant species were recorded in the subject site and adjoining targeted area of native vegetation during the current flora survey. The survey identified 51 locally endemic native species, 4 non-locally endemic native species and 48 introduced species. Of the 48 introduced species 9 are listed as noxious under Order 20 of the *NSW Noxious Weeds Act 1993* for the Ryde LGA. An additional 8 native tree species were identified tree survey of the arborists report (TUFM, 2008) that were not recorded in the general flora surveys. Theses additional species have been incorporated into the flora species inventory of this report. The flora species inventory is provided in Table A1 of Appendix A.

5.2 Plant Communities

Two plant communities, Planted Woodland and Exotic Grassland were identified within the subject site. One plant community Sydney Turpentine-Ironbark Forest is identified immediately adjacent to the subject site in the study area.

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. Similarly, mapping of the native vegetation of the Cumberland Plain and adjacent areas by NPWS (2002) has not identified any native plant communities either on, or immediately adjacent to the subject site. However, the mapping project by NPWS (2002) has identified several stands of Sydney Turpentine-Ironbark Forest and Turpentine Ironbark Margin Forest within one kilometre and to the north of the subject site. As noted in earlier sections, preliminary biodiversity assessments of the University campus by EDAW (2006) has mapped Sydney Turpentine-Ironbark Forest adjoining the south east boundary of the subject site and elsewhere on the University campus (Figure 3, Appendix B).

The distribution of plant communities identified in the current survey is shown in Figure 4, Appendix B. Floristic composition, structure and distribution of the plant communities are described in the following sub sections.

5.2.1 Planted Woodland

Planted Woodland covers much of the subject site (Figure 4, Appendix B) generally as linear rows or in landscape islands of the carpark. Non-locally endemic species from the Myrtaceae family dominate and exotic tree species are also present. Canopy is from 15 to 20m and common native and exotic species that are generally planted in clusters of the one species are *Acer* sp Maple, *Eucalyptus cinerea* ssp *cinerea* Argyle Apple, *Eucalyptus elata* River Peppermint, *Eucalyptus grandis* Flooded Gum, *Eucalyptus microcorys* Tallowwood and *Lophostemon confertus* Brush Box. There is a patchy mid storey of the common planted tree species described above. Apart from landscaped areas of the two child care centres, understorey is absent. Common planted native and exotic shrubs of the landscaped areas in the community are *Callistemon rigidus* Stiff Bottlebrush, *Kunzea ambigua* Tick Bush, *Leptospermum laevigatum* Coast Teatree, *Leptospermum polygalifolium* Yellow Tea-tree, *Westringia fruticosa* Coastal Rosemary, *Abelia x grandiflora* Abelia, *Murraya paniculata* and *Strelitzia reginae* Bird of Paradise. The mown groundcover stratum is dominated by exotic grasses and herbaceous annual and perennial weeds including *Digitaria sanguinalis* Summer Grass, *Ehrharta erecta* Panic Veldtgrass, *Modiola caroliniana* Red-flowered Mallow, *Pennisetum clandestinum* Kikuyu Grass and *Stellaria media* Common Chickweed. Native grasses and herbs are also present in the groundcover stratum occurring either as minor and widely scattered patches of mixed species or evenly distributed through areas of the exotic groundcovers. Common native species are *Asperula conferta* Common Woodruff, *Cyperus gracilis* Slender Flat-sedge, *Dichondra repens* Kidney Weed and *Eragrostis brownii* Brown's Lovegrass.

Due to the highly altered nature of the surface soils and previous and current land use, natural resilience of this plant community is very low at best. Significant resources sustained over a long

period of time would be required to reconstruct a fully structured native plant community that would have previously occurred in this area.

5.2.2 Exotic Grassland

Exotic Grassland of the subject mainly occurs over the road verges and constructed embankment parallel to the south-eastern boundary (Figure 4, Appendix B). This community is predominately mown lawns and an extension of the groundcover stratum described above for the Planted Woodland with a similar floristic composition. Scattered planted native and exotic trees include *Eucalyptus cinerea* ssp *cinerea* Argyle Apple, *Eucalyptus saligna* Sydney Blue Gum, *Syncarpia glomulifera* ssp *glomulifera* Turpentine and *Morus alba* White Mulberry.

No natural resilience remains in this highly modified and disturbed plant community.

5.2.3 Sydney Turpentine Ironbark Forest

Sydney Turpentine Ironbark Forest (STIF) is mapped in the current survey adjacent to the south-eastern boundary of the subject site (Figure 4, Appendix B). Although outside the subject site, the area was targeted during field surveys based on the assessments of previous studies (EDAW, 2006). In determining the classification of the community this report has applied the diagnostic tests described for the community by Tozer (2003) and further detail on the outcome of the test is provided in following sections of the report.

Canopy of community is from 25 to 30m and dominated by *Angophora costata* Sydney Red Gum, with *Eucalyptus pilularis* Blackbutt and *Syncarpia glomulifera* ssp *glomulifera* Turpentine also present. A midstorey to 15m of regenerating canopy species is present. The sparse understorey is between 1 and 2m with common species including regenerating *Angophora costata* Sydney Red Gum and *Pittosporum undulatum* Sweet Pittosporum, with shrubs such as *Acacia longifolia* ssp *longifolia* Sydney Golden Wattle, *Leucopogon juniperinus* Prickly Beard-heath and *Ozothamnus diosmifolius* Rice Flower also present. The regenerated area of groundcover stratum is dominated by native grasses and herbs with the mown area of the community a mix of native and exotic groundcover species. Dominant native groundcover species throughout are *Dianella caerulea* Blue Flax-lily, *Entolasia* spp, *Glycine clandestina*, *Imperata cylindrica* Blady Grass, *Lomandra longifolia* Spiny-headed Mat-rush, *Microlaena stipoides* var *stipoides* Weeping Grass and *Pratia purpurascens* Whiteroot.

Regrowth woody weeds and vines including *Cinnamomum camphora* Camphor Laurel, *Ipomoea indica* Morning Glory and *Ligustrum lucidum* Large Leaved Privet are present and exotic grasses and annual or perennial herbs include *Digitaria sanguinalis* Summer Grass, *Conyza* sp Fleabane, *Ehrharta erecta* Panic Veldtgrass, *Paspalum dilatatum* Paspalum and *Taraxacum officinale* Dandelion.

This plant community has a moderate resilience with the lower stratums regenerating over the majority of the area most likely as a result of stop mow practices. Weed control works have also most likely been carried out and threatening classes such as woody and vine weeds are re-establishing.

5.3 Threatened Plant Species

A search of the DECC Wildlife Atlas and EPBC Act Protected Matters Report identified 18 threatened plant species previously recorded within 10km of the site (Table 1). Fourteen species have a dual listing under the TSC Act and EBPC Act.

Table 1 Threatened flora species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Common Name	TSC Act Status[1]	EPBC Act Status[2]
Acacia bynoeana	Bynoe's Wattle	E1	V
Acacia pubescens	Downy Wattle	V	V
Caladenia tessellata	Thick Lip Spider Orchid	E1	V
Callistemon linearifolius		V	-
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V
Darwinia biflora		V	V
Deyeuxia appressa		E1	E
Epacris purpurascens var.*purpurascens*		V	-
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V
Genoplesium baueri	Bauer's Midge Orchid	V	-
Haloragodendron lucasii		E1	E
Leptospermum deanei		V	V
Melaleuca deanei	Deane's Paperbark	V	V
Pimelea curviflora var curviflora		V	V
Syzygium paniculatum	Magenta Lilly Pilly	V	V
Tetratheca glandulosa		V	V
Wilsonia backhousei	Narrow-leafed Wilsonia	V	-

As highlighted in earlier sections, the arborist report (TUFM, 2008) has identified two threatened plant species in the northern portion of the subject site. Both *Eucalyptus nicholii* Narrow-leaved Black Peppermint and *Eucalyptus scoparia* Wallangarra White Gum have dual listings under the TSC and EPBC Acts. Details of these species and their occurrence on the subject site are provided in the following sub sections.

5.3.1 *Eucalyptus nicholii* Narrow-leaved Black Peppermint

Eucalyptus nicholii Narrow-leaved Black Peppermint is a Vulnerable plant species in NSW as listed under Schedule 2 of the TSC Act and Vulnerable under the federal EPBC Act. The single planted specimen (tree 9 of the arborists report) is located in the north eastern area of Planted Woodland

[1] E1 – endangered (Schedule 1 of the TSC Act); V – vulnerable (Schedule 2 of the TSC Act).

[2] E – endangered, V – vulnerable

(Figure 4, Appendix B). The arborists report has assessed the specimen as being in 'poor' health and condition and is declining (TUFM, 2008).

This species is a medium-sized tree from 15 to 20m tall with rough, thick, grey-brown bark which extends to the larger branches and the leaves have a strong peppermint smell when crushed (DECC, 2008a). The natural range and distribution of the species is confined to the New England Tablelands of NSW, occurring from Nundle to north of Tenterfield and largely on private property. Usually confined to shallow and infertile granite and porphyry soils (Brooker *et al*, 2002), the species is associated with dry grassy woodland (DECC, 2008a). The species is widely planted as an urban street tree and in gardens (Brooker *et al* 2002 and DECC 2008a).

Threats to the species within the natural range and distribution, identified by the DECC (2008a) are;

- Clearing and fragmentation of habitat for agriculture and grazing;
- Inappropriate fire regimes. There is a risk of population decline with short fire intervals of less than 10 years or long fire free intervals of more than 25 years;
- Destruction and disturbance of habitat for roadside management;
- Grazing by domestic stock;
- Collection of firewood; and
- Collection of seed for horticulture.

No recovery plan has been prepared for *Eucalyptus nicholii* Narrow-leaved Black Peppermint. However the DECC (2008a) has formulated 22 priority actions to help recover the species in NSW.

5.3.2 *Eucalyptus scoparia* Wallangarra White Gum

Eucalyptus scoparia Wallangarra White Gum is an Endangered plant species in NSW as listed under Schedule 1 of the TSC Act and Vulnerable under the federal EPBC Act. The single planted specimen (tree 16 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B). The arborists report has assessed the specimen as being in 'poor' health and condition and is declining (TUFM, 2008).

This is a small tree species to 15 m tall with smooth, powdery white to pale grey bark that occurs in Queensland and reaches its southern limit in NSW in only three locations near Tenterfield, including Bald Rock National Park (DECC, 2008b). Habitat of the species is open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops in its natural range and distribution (DECC, 2008b) and the species is commonly grown in south-eastern Australia as an ornamental (Brooker *et al*, 2002)

Threats to the species within the natural range and distribution, identified by the DECC (2008b) are;

- Clearing and fragmentation of open forest and woodland habitat for agriculture and development;
- Timber collection;
- Damage to plants by bushwalkers; and
- Risk of local extinction because populations are small.

No recovery plan has been prepared for *Eucalyptus scoparia* Wallangarra White Gum.

5.4 Threatened Populations

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

5.5 Endangered Ecological Communities

One endangered ecological community, Sydney Turpentine-Ironbark Forest (STIF) is recorded adjacent to the subject site in the current and previous surveys. STIF is listed as endangered under the TSC Act and critically endangered under the EPBC Act. In determining the identification of STIF, adjacent to the subject site, this report has applied the diagnostic tests described by Tozer (2003) for the two subunits of the community which are Turpentine-Ironbark Forest and Turpentine-Ironbark Margin Forest. In the first instance the 0.04 ha sample quadrat did not meet the required minimum native species for the test to proceed to diagnosis by floristic composition for Turpentine-Ironbark Forest (33 species) or Turpentine-Ironbark Margin Forest (38 species). However, the understorey and groundcover stratums are not at an advanced phase of regeneration and a total of 27 native species were recorded from all stratums. In proceeding with the test for Turpentine-Ironbark Forest (Tozer, 2003) the 12 positive diagnostic species present in the survey quadrat did not meet the required 18 to confirm the presence of the community. Alternatively in proceeding with the test for Turpentine-Ironbark Margin Forest the sample quadrat contained more than the minimum 11 positive diagnostic species to confirm the presence of the sub unit. Therefore STIF of the subject site in this assessment most closely corresponds to the Turpentine-Ironbark Margin Forest subunit described by Tozer (2003).

Regionally, Turpentine Ironbark Margin Forest occurs in higher rainfall areas on the margins of the Cumberland Plain in close proximity to a sandstone/shale boundary. The parent geology consists predominantly of Wianamatta Shale with lesser components of Mittagong Formation and Hawkesbury Sandstone. In areas with lower rainfall the community grades with Turpentine-Ironbark Forest and these two subunits cumulatively represent STIF (Tozer, 2003). STIF is an Open Forest community with a sparse shrub stratum and well developed groundcover stratum but can exist as woodland or as remnant trees dependant on disturbance history (NSW Scientific Committee, 1998).

STIF occurs within the local government areas Ashfield, Auburn, Canterbury, Concord, Drummoyne, Leichhardt, Marrickville, Bankstown, Ryde, Hunters Hill, Baulkham Hills, Ku-ring-gai, Hornsby, Parramatta, Bankstown, Rockdale, Kogarah, Hurstville, and Sutherland and is restricted to the Sydney Basin Bioregion. Large areas of STIF have been cleared for agriculture and urban development with remnants small and scattered and only small areas of STIF are presently included in conservation reserves (NSW Scientific Committee, 1998). In many of the LGA's where the community is known, particularly in the inner western suburbs, only remnant trees may remain. The NSW Scientific Committee (1998) suggests that these stands may have particular ecological and genetic significance and may be important sources of propagation material for use in rehabilitation projects.

Various estimates of the remaining area of the community range from 0.5% (NSW Scientific Committee, 1998) to 4.5% (NPWS, 2004) of its original extent. Threats to the community include clearing, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed invasion (NSW Scientific Committee, 1998).

The DECC has identified total of 10 strategies to help recover this endangered ecological community and these are accompanied by a total of 16 priority actions.

6 FAUNA

6.1 Fauna Species

A total of 12 vertebrate fauna species were recorded during the current field survey including two mammals, 8 birds, one amphibian and one fish. One mammal and one bird species are introduced and all fauna species recorded during the current survey are listed in Table A2 of Appendix A.

All species recorded on the subject site are generally typical of urban areas, urban fringes and adjoining natural areas within the Sydney Basin region and are widespread in distribution and common to abundant within their ranges.

6.2 Fauna Habitats

Fauna habitats of the subject and study area are assessed in two main categories for the current survey. Fauna habitat features and resources at a locality scale form part of the broader landscape of the study area. 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.

Table 2 Fauna habitat types and resources.

Scale	Habitat Features	Habitat Resources & Fauna
Locality	Regional Bushland Reserves – Lane Cove National Park	Remnant and regrowth native plant communities generally with statuary protection for conservation.
	Landscape planted and street trees	Scattered native or exotic shrubs and trees with some connectivity.
	Drainage corridors	Transitional aquatic to terrestrial environments with some connectivity to broader habitats.
Site Specific	Broken canopy of native and/or exotic trees	Foraging, nesting, roosting and sheltering for small, medium and large birds, reptiles, arboreal mammals and megachiropteran and microchiropteran bat species.
	Sparse and disjunct midstorey and/or understorey	Foraging, nesting, roosting and sheltering for small and medium birds, reptiles, arboreal mammals and arboreal frogs.
	Highly modified groundcover	Foraging for small and medium birds, reptiles, amphibians and terrestrial mammals.
	Low occurrence of stags and tree hollows	Nesting, sheltering and roosting for small, medium and large birds, reptiles, arboreal mammals and microchiropteran bats.
	Open drain	Foraging or watering for small and medium birds, reptiles, amphibians and terrestrial mammals.
		Foraging and sheltering for a narrow range of disturbance tolerant aquatic species.
	Damp areas	Foraging and sheltering for reptiles and amphibians.

In summary the Planted Woodland of the subject site is likely to provide the majority of fauna habitat resources. However this habitat type is mainly limited to the provision of canopy with the lower stratums discontinuous, highly modified and disturbed by past and current land use. Some general foraging for medium size birds and common reptiles or amphibians is provided by the Exotic Grassland but this very marginal. Overall the subject site is a highly modified landscape that lacks many of the natural habitat features and resources that are important in the maintenance of native fauna diversity and life cycles, including fully structured vegetation, a diverse shrub layer for food sources and protection, leaf litter and loose surface soils, sandstone outcrops and ledges, loose rocks, logs on the ground and rotting stumps. In addition to the altered nature of fauna habitats, intense human activities within the subject site and surrounding area are likely to reduce fauna habitat potential. These activities include high levels of night light, noise and vehicle or human traffic.

6.3 Threatened Fauna Species

No threatened fauna species listed under the TSC Act and EBPC Act were recorded in the current field surveys. A search of the DECC Wildlife Atlas and EPBC Act Protected Matters Report identified 22 threatened fauna species previously recorded within 10km of the site (Table 3). Six species have a dual listing under the TSC Act and EBPC Act.

Table 3 Threatened fauna species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Common Name	TSC Act Status[3]	EPBC Act Status[4]
Botaurus poiciloptilus	Australasian Bittern	V	-
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	E
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Dasyurus maculatus	Spotted-tailed Quoll	V	E
Ephippiorhynchus asiaticus	Black-necked Stork	E1	-
Falco hypoleucos	Grey Falcon	V	-
Ixobrychus flavicollis	Black Bittern	V	-
Limosa limosa	Black-tailed Godwit	V	-
Litoria aurea	Green and Golden Bell Frog	E	V
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	V	-
Nettapus coromandelianus	Cotton Pygmy-Goose	E1	-
Ninox connivens	Barking Owl	V	-
Ninox strenua	Powerful Owl	V	-
Pandion haliaetus	Osprey	V	-
Petaurus australis	Yellow-bellied Glider	V	-
Pseudophryne australis	Red-crowned Toadlet	V	-
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Ptilinopus superbus	Superb Fruit-Dove	V	-

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

[4] CE - critically endangered, E – endangered, V – vulnerable

Table 3 cont' Threatened fauna species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Common Name	TSC Act Status[5]	EPBC Act Status[6]
Saccolaimus flaviventris	Yellow-bellied Sheathtailbat	V	-
Xanthomyza phrygia	Regent Honeyeater	E1	E

6.4 Endangered Populations

No endangered fauna populations listed under the TSC Act were recorded on the subject site in the current investigation. A search of the DECC Wildlife Atlas identified one threatened fauna population previously recorded within 10km of the site (Table 4).

Table 4 Threatened fauna populations previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Common Name	TSC Act Status[7]	EPBC Act Status[8]
Callocephalon fimbriatum	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai LGAs	E2	-

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

[6] CE - critically endangered, E – endangered, V – vulnerable

[7] CE critically endangered (Schedule 1A of the TSC Act); E1 & E2 – endangered (Schedule 1 of the TSC Act); V – vulnerable (Schedule 2 of the TSC Act).

[8] CE - critically endangered, E – endangered, V – vulnerable

7 HABITAT POTENTIAL FOR THREATENED SPECIES

7.1 Flora

Table 5 summarises the habitat potential of the subject site for the threatened plants previously recorded as occurring within 10km of the subject site on the DECC Wildlife Atlas and EPBC Act Protected Matters Report.

Table 5 Habitat potential for threatened flora species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Species Habitat Preference	Likelihood of Species to Occur on Subject Site
Acacia bynoeana	Bynoe's Wattle is a semi-prostrate shrub to a metre high. The species is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Occurs in heath or dry sclerophyll forest on sandy soils. 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 Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leafed Apple.	Low. Subject site does not support preferred habitat or plant species of known association.
Acacia pubescens	A spreading shrub, 1 - 4 m high, bipinnate leaves and conspicuously hairy branchlets. The species is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with some outlying occurrences. Prefers alluvium soils, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Known from a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. Recruitment is more commonly from vegetative reproduction than from seedlings.	Low. Subject site does not support preferred soil habitat or plant community types of known association.
Caladenia tessellata	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.	Low. Subject site does not support preferred soil habitat or plant community types of known association.
Callistemon linearifolius	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. The species is highly restricted and subject site does not support plant community types of known association.

Table 5 cont' Habitat potential for threatened flora species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Species Habitat Preference	Likelihood of Species to Occur on Subject Site
Cryptostylis hunteriana	Recorded from Gibraltar Range National Park south into Victoria around the coast as far as Orbost. In NSW the species is known many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Also recorded at Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park and Ben Boyd National Park. The species does not appear to have well defined habitat preferences. Associated with a range of communities, including swamp-heath and woodland and larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black Sheoak. Appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (C. subulata) and the Tartan Tongue Orchid (C. erecta).	Low. Subject site does not support preferred habitat or plant communities and species of known association.
Darwinia biflora	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 *Eucalyptus haemastoma*, *Corymbia gummifera* and/or *E. squamosa*. 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.	Low. Subject site does not support preferred habitat or plant communities and species of known association.
Deyeuxia appressa	An erect perennial grass that is a highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas. Grows on wet ground.	Low. The species is highly restricted.
Epacris purpurascens var. *purpurascens*	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 have a strong shale soil influence including sclerophyll forest, scrubs and swamps on sandstone. 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.	Low. Subject site does not support preferred habitat or plant communities of known association.

Table 5 cont' Habitat potential for threatened flora species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Species Habitat Preference	Likelihood of Species to Occur on Subject Site
Eucalyptus camfieldii	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 *E. oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum. Poor response to too frequent fires.	Low. The species is highly restricted and subject site does not support plant community types of known association.
Eucalyptus nicholii	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.	Known from the subject site although the single planted specimen is outside its natural range.
Genoplesium baueri	Grows in sparse sclerophyll forest and moss gardens over sandstone from the Hunter Valley to Nowra district.	Low. Subject site does not support preferred habitat.
Haloragodendron lucasii	An erect hairless shrub to 1.5 m tall, with four-winged branches arising in pairs. The flowers are creamy-white and almost stalkless, with four triangular erect sepals (petal-like structures). The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. The species is associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels.	Low. The species is highly restricted and subject site does not preferred habitat.
Leptospermum deanei	A shrub known from Hornsby, Warringah, Ku-ring-gai and Ryde LGAs the species occurs in Woodland on lower hill slopes or near creeks preferring sandy alluvial soil or sand over sandstone. Vegetation associations are Riparian Scrub - e.g. *Tristaniopsis laurina, Baechea myrtifolia*; Woodland - e.g. *Eucalyptus haemstoma*; and Open Forest - e.g. *Angophora costata*, *Leptospermum trinervium, Banksia ericifolia*. The species is probably killed by fire	Low. Subject site supports very few associated species and does not support plant communities of known association.

Table 5 cont' Habitat potential for threatened flora species previously recorded within the locality (10km of the subject site) from the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Scientific Name	Species Habitat Preference	Likelihood of Species to Occur on Subject Site
Melaleuca deanei	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.	Low. The species is fairly restricted and subject site does not preferred habitat.
Pimelea curviflora var. *curviflora*	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.	Low. Subject site does not support preferred habitat.
Syzygium paniculatum	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.	Low. Subject does not support preferred habitat.
Tetratheca glandulosa	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.	Low. Subject site does not support preferred soil habitat or plant community types of known association
Wilsonia backhousei	A perennial, sprawling, matted shrub less than 15 cm tall. The narrow, pointed, dark green, stalkless leaves are succulent and less than 20 mm long. Is found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney including Parramatta River at Ermington and Clovelly. The species occurs on the margins of salt marshes and lakes, both coastal and inland.	Low. Subject does not support preferred habitat.

7.2 Fauna

Table 6 summarises the habitat potential of the subject site for the threatened fauna species and populations previously recorded as occurring within 10km of the subject site on the DECC Wildlife Atlas and EPBC Act Protected Matters Report.

Table 6 Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Botaurus poiciloptilus	The Australasian Bittern occurs from southern Queensland through south-eastern Australia to Tasmanian 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).	Foraging – low. Nesting – nil.
Callocephalon fimbriatum	The species is listed as Vulnerable in NSW and the population found in the Ku-ring-gai and Hornsby LGA's is listed as Endangered. This population is believed to be largely confined to an area bounded by Thornleigh and Wahroonga in the north, Epping and North Epping in the south, Beecroft and Cheltenham in the west and Turramurra/South Turramurra to the east. It is known to inhabit areas of Lane Cove National Park, Pennant Hills Park and other forested gullies in the area. It occurs within a variety of forest and woodland types and usually frequents forested areas with old growth attributes required for nesting and roosting purposes. Also tilizes less heavily timbered woodlands and urban fringe areas to forage, but appears to favour well timbered country through which it habitually flies as it moves about. Individuals of this population are likely to move outside the 'defined' population boundary in the general area and should still be considered of this population.	Foraging – low. Nesting – nil.
Calyptorhynchus lathami	The species is 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.	Foraging – low. Nesting – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Chalinolobus dwyeri	A microchiropteran bat found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*). Forage in low to mid-elevation dry open forest and woodland and well-timbered areas containing gullies close to roosting habitat. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and have a high fidelity to the same cave over many years. This species probably forages for small, flying insects below the forest canopy and likely to hibernate through the coolest months.	Foraging – low to medium. Roosting - nil. Maternity camp – nil.
Dasyurus maculatus	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.	Foraging – low. Nesting – nil.
Ephippiorhynchus asiaticus	The Black-necked Stork is the only stork species in Australia. The species is widespread across coastal northern and eastern Australia, becoming increasingly uncommon further south into NSW, and rarely south of Sydney. Some birds may move long distances and can be recorded well outside their normal range. Preferred habitats are swamps, mangroves, mudflats, floodplains, saltmarsh or farm dams. Nests in live or dead tree in or near foraging habitat.	Foraging – low. Nesting – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Falco hypoleucos	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Recorded utilizing a range of habitat from coastal to arid areas. Roosts and nests in dead or alive trees.	Foraging – low. Nesting – nil.
Ixobrychus flavicollis	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.	Foraging – low. Nesting – nil.
Limosa limosa	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia (Palaearctic) and flies to Australia for the southern summer, arriving in August and leaving in March. Primarily a coastal species in NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats and individuals have been recorded in wet fields and sewerage treatment works. Forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loafs on low banks of mud, sand and shell bars. Frequently recorded in mixed flocks with Bar-tailed Godwits.	Foraging – low. Nesting – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Litoria aurea	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 bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), 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.	Foraging – nil. Sheltering – nil. Breeding – nil.
Miniopterus schreibersii oceanensis	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.	Foraging – low. Roosting - low. Maternity camp – nil.
Mormopterus norfolkensis	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occurs 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.	Foraging – low. Roosting - low.
Nettapus coromandelianus	The Cotton Pygmy-goose was once found from north Queensland to the Hunter River in NSW, but is now only a rare visitor to NSW and uncommon in Queensland. Habitats include freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation. Uses standing dead trees with hollows close to water for roosting and breeding.	Foraging – nil. Nesting – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Ninox connivens	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. Denser vegetation is used occasionally for roosting. Roost during the day they roost along creek lines, usually in tall understorey 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.	Foraging – low. Roosting – low. Nesting – nil.
Ninox strenua	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.	Foraging – low. Roosting – low. Nesting – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Pandion haliaetus	The 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.	Foraging – low. Roosting – low. Nesting – nil.
Petaurus australis	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Live in small family groups of two - six individuals and are nocturnal. Den, often in family groups, in hollows of large trees. The species is highly mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	Foraging – low. Nesting – nil
Pseudophryne australis	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.	Foraging – nil. Sheltering – nil. Breeding – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Pteropus poliocephalus	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.	Foraging – medium. Roosting - low. Maternity camp – nil.
Ptilinopus superbus	The Superb Fruit-dove is distributed mainly from north-eastern in Queensland to north-eastern NSW becoming much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. The species inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree 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 and at least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January and the nest is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species.	Foraging – low. Nesting – nil.
Saccolaimus flaviventris	The Yellow-bellied Sheathtail Bat is widely distributed through northern and eastern Australia. The species occur in a wide range of habitats including forest, open woodlands, mallee, grasslands and desert. Forage over the tree canopy. Beetles form the major component of the diet but also take other insects. Roost in hollows in old trees. and sometimes in the abandoned nests of sugar gliders. They usually form small colonies of up to 30. The species probably migrate in winter from cooler areas in southern Australia to warmer northern areas.	Foraging – low to medium. Roosting – nil.

Table 6 cont' Habitat potential for threatened fauna species previously recorded within the locality (10km of the site) on the DECC Wildlife Atlas EPBC Act Protected Matters Report.

Genus Species	Habitat and Ecology Summary	Likelihood of Species to Occur on Subject Site
Xanthomyza phrygia	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.	Foraging – low. Nesting – low.

8 WILDLIFE CORRIDORS

The importance of natural corridors such as drainage lines and fully or partially contiguous vegetation cover, for the movement and genetic exchange of flora and fauna, is well documented (eg Recher *et al*, 1986). At a locality scale the Planted Woodland community and drainage line of the subject site are providing some level of wildlife habitat and therefore in association with other adjacent similar habitats form part of a fragmented corridor from the University campus toward Lane Cove National Park to the north east. However the structure of the Planted Woodland, highly modified drainage line and adjoining similar habitats are not likely to form a significant wildlife corridor for the movement and dispersal of native flora and fauna for the locality, into or out of the Lane Cove National Park regional corridor.

9 LEGISLATION AND POLICY

9.1 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.

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.

9.2 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 under Parts 4 and 5 of 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 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*. document to technically inform the preparation of 7-part tests.

One endangered ecological community listed under the Schedule 1 of the TSC Act is recorded in the current survey adjacent to the subject site (Figure 4, Appendix B). Additionally two threatened plant species listed under the schedules of the TSC Act are recorded on the subject and these are proposed for removal. Assessment of significance of the potential impacts of the current proposal in relation to Sydney Turpentine-Ironbark Forest of the study area and *Eucalyptus nicholii* Narrow-leaved Black Peppermint and *Eucalyptus scoparia* Wallangarra White Gum of the subject site, have been prepared in this report (Appendix C). The conclusions of the 7-part tests are summarised in the impact assessment.

9.3 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 and Water, Heritage and the Arts.

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.

One critically endangered ecological community listed under the EPBC Act, Sydney Turpentine-Ironbark Forest is recorded in the current survey adjacent to the subject site (Figure 4, Appendix B). Two plant species listed as Vulnerable under the EPBC Act *Eucalyptus nicholii* Narrow-leaved Black Peppermint and *Eucalyptus scoparia* Wallangarra White Gum are recorded in the north eastern area of the subject site. Accordingly the provisions of the Significant Impact Guidelines (DEH, 2006), to

determine whether the current proposal is likely to have a significant impact on these matters of national environmental significance protected by the EPBC Act, have been addressed in this report (Appendix C) with the outcomes summarised in the impact assessment.

9.4 Commonwealth and NSW Governments Bilateral Agreement Relating to Environmental Impact Assessment

A bilateral agreement has been made between the Commonwealth and NSW regarding environmental impact assessment. Essentially the agreement removes the need for the Commonwealth to assess actions occurring within NSW which would otherwise be assessed under Part 8 of the EPBC Act. Instead, NSW carries out the assessment under NSW legislation and the agreement is aimed at actions which would need assessment under the EPBC Act, TSC Act and EP&A Act. In NSW most developments that would be controlled actions in relation to matters of national environmental significance are assessed and approved under the EP&A Act and it is recognised that under this Act there is an obligation on all consent authorities to consider the impacts of the development on the environment (including biophysical, social and economic factors) including impacts on:

- World Heritage values of a World Heritage property in New South Wales;
- National Heritage values of a National Heritage place in New South Wales;
- the ecological character of a Ramsar wetland property in New South Wales;
- threatened species, populations or ecological communities and their habitats listed under the TSC Act, where any recovery plan for the species or community, and any threat abatement plan for a process that threatens the species or community is relevant; and
- listed migratory species.

9.5 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. Ryde LGA is listed on Schedule 1 as an area to which SEPP 44 applies.

"Potential koala habitat" is defined by SEPP 44 as "areas of native vegetation where the trees of types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component". On tree species recorded within the study area, *Eucalyptus microcorys* Tallowwood (which has been planted), is listed under Schedule 2 of the Policy as Koala "feed tree species". This species constitutes less than 15% of the total number of trees in the canopy stratum in any of the plant communities described in the current survey of the subject site. As such the subject site does not support "potential koala habitat", as defined under SEPP 44.

"Core koala habitat" is defined under SEPP 44 as areas of land that contain "a resident population of koalas, evidenced by attributes such as breeding females and recent sightings of and historical records of a population". No evidence (such as sightings, calls, scats and fur) of a resident population of the Koala were recorded during the current investigation. As such the subject site does not support and "core koala habitat", within the meaning of SEPP 44.

9.6 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). Ryde 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 Ryde LEP 2000, and thus Clauses 6, 7 and 8 of SEPP 19 do not apply to the proposed development.

10 IMPACT ASSESSMENT

The current proposal for the construction of the Cochlear Global HQ at Macquarie University is to be limited to area identified as the 'subject site'. This flora and fauna assessment has found that no native plant communities exist on the subject site and those plant communities that occur are limited in the provision of flora and fauna habitat in the context of the locality. Assessment of the potential habitats on the subject and adjacent areas for threatened flora and fauna species previously recorded from the locality have not identified significant habitat for any species investigated.

The plant community Sydney Turpentine-Ironbark Forest is identified in the current survey adjacent to the subject site (Figure 4, Appendix B) and it is listed as an endangered ecological community under the TSC Act and critically endangered under the EPBC Act. Accordingly assessments of significance have been prepared under the provisions of both Acts and these are provided in full in Appendix C.

Eucalyptus nicholii Narrow-leaved Black Peppermint and *Eucalyptus scoparia* Wallangarra White Gum of the subject site, are respectively listed as Vulnerable and Endangered under the TSC Act and Vulnerable under the EPBC Act. Accordingly assessments of significance have been prepared under the provisions of both Acts for both species and these are provided in full in Appendix C.

In relation to the current proposal for the subject site within this report assesses that:

- there is unlikely to be a significant impact on the general native flora and fauna of the subject site and study area as a result of the proposal;
- there is unlikely significant impact on native flora and fauna habitats as a result of the proposal;
- the assessments of the 7-part Test under Section 5A of the EP&A Act and Assessment of Significance under the EPBC Act have concluded that there is unlikely to be an impact on the STIF endangered ecological community adjacent to the subject site as a result of the proposal provided precautionary measures to protect the area are implemented during construction and design elements consider the potential for ongoing impacts during operation of the proposed facility;
- the assessments of the 7-part Test under Section 5A of the EP&A Act and Assessment of Significance under the EPBC Act have concluded that there is unlikely to be an impact on the either *Eucalyptus nicholii* Narrow-leaved Black Peppermint or *Eucalyptus scoparia* Wallangarra White Gum of the subject site as a result of the removal of the two specimens under the current proposal. Primarily this due to the fact that; neither specimen forms part of an important population of the species as the occurrence is well outside both species natural range and distribution; and the subject site does not support important habitat features and preferences that would be required for either species to naturally recruit to form part of a perpetuating natural population and ecological community.

11 RECOMMENDATIONS

This assessment has concluded that the current proposal is unlikely to impact on the known native flora and fauna of the subject site and threatened biodiversity of adjacent areas. Further to the assessment of this report and 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.

- 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. This would include but not be limited *to City of Ryde Development Control Plan 2006 – 8.2 Stormwater Management* (RCC, 2006) and *Managing Urban Stormwater. Soils and Construction. Volume 1, 4th Edition* (Landcom, 2004).
- Temporary fencing is to be installed around the construction area and machinery or materials storage areas to eliminate the potential for accidental damage to the STIF adjacent to the subject site during construction works.
- The presence of and conservation significance of STIF adjacent of the subject site is to be incorporated in a construction environmental management plan (or similar) for the entire staged construction project.
- Installation, maintenance and decommissioning of sediment and erosion controls as required and as specified in any consent and soil and water management plan
- Machinery parking and equipment or materials storage compounds are to be in areas of pre existing disturbance.
- Removal of hollow-bearing trees requires pre clearance fauna survey and removal/relocation of fauna by a licensed and qualified handler.
- Native trees or limbs of trees that are removed as part of clearing for the current proposal should be mulched and used on site in rehabilitation or landscaping works; for temporary sediment and erosion control during construction; or as habitat features in any restoration works of the drainage line.
- Integration and development of the VMP during design of stormwater and flood management infrastructure for the drainage line.
- Design of any proposed works to reconstruct the drainage line for the purposes of stormwater and flood management should incorporate structures and elements that improve fauna habitat potential of the drainage line. This may include but not be limited to retention basins and placement of riparian habitat features such as large rocks, logs or sections of concrete pipe (to simulate logs).
- The VMP drainage line rehabilitation works is to consider the presence of STIF adjacent to the subject site. Design and construction of any drainage line restoration works must minimise the potential for direct or indirect impacts on the STIF community and attempt to enhance the condition of the stand. Maintenance weeding of the riparian restoration works should incorporate weeding of the STIF.
- Any landscaping or revegetation works are to incorporate locally indigenous native plant species.
- As far as possible vegetation works recommended in the VMP should use local provenance plant stock.

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Appendix A

Flora and Fauna Species Inventories

Flora and Fauna Assessment
Cochlear Global Headquarters Project, Stage 1
Macquarie University

Table A1 Native and exotic plant species for current survey.

General Status	
*	Exotic (not native to Australia)
N( )	Noxious weeds and 'Control Class' as listed on the NSW Noxious Weeds Act 1993 for the Ryde 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
E+	Endangered - listed under the EPBC Act
V+	Vulnerable - listed under the EPBC Act
Plant Community	
STIF	Sydney Turpentine Ironbark Forest
PW	Planted Woodland
EG	Exotic Grassland
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
Survey	
TEC	Total Earth Care
TUFM	Treescan Urban Forest Management

Survey	Status	Family	*Genus species*	Common Name	STIF	PW	GL
TEC	*	Caprifoliaceae	*Abelia* x *grandiflora*	Abelia		o	
TEC		Fabaceae - Mimosoideae	*Acacia binervia*	Coast Myall		o	
TEC		Fabaceae - Mimosoideae	*Acacia longifolia* ssp *longifolia*	Sydney Golden Wattle	uc		
TEC		Fabaceae - Mimosoideae	*Acacia parramattensis*	Sydney Green Wattle		uc	
TEC	*	Sapindaceae	*Acer* sp	Maple		c	
TEC	*	Polygonaceae	*Acetosa sagittata*	Rambling Dock			o
TEC	*	Alliaceae	*Agapanthus praecox* ssp *orentalis*	African Lily		o	
TEC		Casuarinaceae	*Allocasuarina littoralis*	Black She-oak		o	
TEC		Myrtaceae	*Angophora costata*	Sydney Red Gum	c		

Survey	Status	Family	*Genus species*	Common Name	STIF	PW	GL
TEC	N4	Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	o	uc	
TEC		Rubiaceae	*Asperula conferta*	Common Woodruff		c	c
TEC	*	Asteraceae	*Bidens pilosa*	Cobblers Pegs	uc		
TEC	*	Poaceae	*Bromus catharticus*	Praire Grass		uc	
TEC		Myrtaceae	*Callistemon citrinus*	Crimson Bottlebrush		uc	
TEC		Myrtaceae	*Callistemon rigidus*	Stiff Bottlebrush		o	
TEC		Apiaceae	*Centella asiatica*	Indian Pennywort	o		o
TEC	*	Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed			c
TEC	N4	Lauraceae	*Cinnamomum camphora*	Camphor Laurel	c		
TEC	*	Asteraceae	*Cirsium vulgare*	Spear Thistle	uc		o
TEC	*	Asteraceae	*Conyza* sp	Fleabane	c	c	o
TUFM		Myrtaceae	*Corymbia eximia*	Yellow Bloodwood		o	
TEC		Myrtaceae	*Corymbia maculata*	Spotted Gum		c	
TEC	*	Apiaceae	*Cyclospermum leptophyllum*	Slender Celery			uc
TEC		Poaceae	*Cynodon dactylon*	Couch	c	c	c
TEC	*	Cyperaceae	*Cyperus brevifolius*			c	
TEC		Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge		c	o
TEC		Phormiaceae	*Dianella caerulea*	Blue Flax-lily	c		
TEC		Phormiaceae	*Dianella longifolia var longifolia*	Blueberry Lily	c		
TEC		Convolvulaceae	*Dichondra repens*	Kidney Weed	o	o	o
TEC	*	Iridaceae	*Dietes* sp			o	
TEC	*	Poaceae	*Digitaria sanguinalis*	Summer Grass	c	c	c
TEC		Doryanthaceae	*Doryanthes excelsa*	Gymea Lily		o	
TEC	*	Poaceae	*Ehrharta erecta*	Panic Veldtgrass	o	c	c
TEC		Chenopodiaceae	*Einadia trigonos* ssp *trigonos*	Fishweed		o	o
TEC	*	Poaceae	*Eleusine indica*	Crowsfoot Grass			c
TEC		Poaceae	*Entolasia marginata*	Bordered Panic	c		
TEC		Poaceae	*Entolasia stricta*	Wiry Panic	c		
TEC		Poaceae	*Eragrostis brownii*	Brown's Lovegrass		c	
TUFM		Myrtaceae	*Eucalyptus botryoides*	Bangalay		o	
TEC	ni	Myrtaceae	*Eucalyptus cinerea* ssp *cinerea*	Argyle Apple		o	
TEC	ni	Myrtaceae	*Eucalyptus elata*	River Peppermint		c	
TEC	ni	Myrtaceae	*Eucalyptus globulus* ssp *bicostata*	Southern Blue Gum		uc	

Survey	Status	Family	*Genus species*	Common Name	STIF	PW	GL
TUFM	ni	Myrtaceae	*Eucalyptus grandis*	Flooded Gum		c	
TEC	ni	Myrtaceae	*Eucalyptus microcorys*	Tallowwood		c	
TUFM	V, V+, ni	Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint		uc	
TEC		Myrtaceae	*Eucalyptus pilularis*	Blackbutt	uc		
TUFM		Myrtaceae	*Eucalyptus resinifera*	Red Mahogany		uc	
TEC		Myrtaceae	*Eucalyptus saligna*	Sydney Blue Gum		o	uc
TUFM	E, V+, ni	Myrtaceae	*Eucalyptus scoparia*	Wallangarra White Gum		uc	
TUFM		Myrtaceae	*Eucalyptus sideroxylon*	Mugga Ironbark		o	
TEC		Myrtaceae	*Eucalyptus sparsifolia*	Narrow-leaved Stringybark	o		
TEC	*	Euphorbiaceae	*Euphorbia peplus*	Petty Spurge	uc	o	
TEC		Geraniaceae	*Geranium homeanum*	Native Geranium			o
TEC		Fabaceae - Faboideae	*Glycine clandestina*		c	c	
TEC		Fabaceae - Faboideae	*Glycine tabacina*				uc
TEC	ni	Proteaceae	*Grevillea* sp hort			uc	
TEC		Fabaceae - Faboideae	*Hardenbergia violacea*	Purple Coral Pea	uc		
TEC		Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	c		
TEC	*	Asteraceae	*Hypochaeris glabra*	Smooth Catsear	o		
TEC		Poaceae	*Imperata cylindrica*	Blady Grass	c		
TEC	N4	Convolvulaceae	*Ipomoea indica*	Morning Glory	c		
TEC	*	Bignoniaceae	*Jacaranda mimosifolia*	Jacaranda		o	
TEC		Myrtaceae	*Kunzea ambigua*	Tick Bush		o	
TEC		Myrtaceae	*Leptospermum laevigatum*	Coast Teatree		o	
TEC		Myrtaceae	*Leptospermum polygalifolium*	Yellow Tea-tree		o	
TEC		Ericaceae	*Leucopogon juniperinus*	Prickly Beard-heath	c		
TEC	N4	Oleaceae	*Ligustrum lucidum*	Large Leaved Privet	c		
TEC	*	Altingiaceae	*Liquidambar styraciflua*	Liquidambar		o	
TEC		Lomandraceae	*Lomandra filiformis* ssp *filiformis*	Wattle Mat-rush	c		
TEC		Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	c	c	
TEC		Lomandraceae	*Lomandra multiflora* ssp *multiflora*	Many-flowered Mat-rush	c		
TEC	ni	Myrtaceae	*Lophostemon confertus*	Brush Box		c	
TUFM		Myrtaceae	*Melaleuca armillaris*	Bracelet Honey-myrtle		uc	
TEC		Myrtaceae	*Melaleuca* sp			o	
TEC		Meliaceae	*Melia azedarach*	White Cedar	uc	o	

Survey	Status	Family	*Genus species*	Common Name	STIF	PW	GL
TEC		Poaceae	*Microlaena stipoides* var *stipoides*	Weeping Grass	c	o	o
TEC	*	Malvaceae	*Modiola caroliniana*	Red-flowered Mallow		c	c
TEC	*	Araceae	*Monstera deliciosa*	Fruit Salad Plant		uc	
TEC	*	Moraceae	*Morus alba*	White Mulberry			uc
TEC	*	Rutaceae	*Murraya paniculata*			o	
TEC	N4	Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	uc		
TEC	N4	Oleaceae	*Olea europaea* ssp *cuspidata*	Olive	uc		
TEC		Poaceae	*Oplismenus aemulus*	Oplismenus			o
TEC	N5	Oxalidaceae	*Oxalis corniculata*			c	c
TEC		Asteraceae	*Ozothamnus diosmifolius*	Rice Flower	o		
TEC		Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine		o	
TEC	*	Poaceae	*Paspalum dilatatum*	Paspalum	o	o	c
TEC	*	Poaceae	*Pennisetum clandestinum*	Kikuyu Grass		c	c
TEC	N5	Poaceae	*Pennisetum setaceum*	Fountain Grass		c	
TEC		Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	c	uc	
TEC		Poaceae	*Poa labillardierei*	Tussock Grass		c	
TEC		Portulacaceae	*Portulaca oleracea*	Pigweed			uc
TEC		Lobeliaceae	*Pratia purpurascens*	Whiteroot	c		uc
TEC		Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	uc		
TEC	N4	Rosaceae	*Rubus fruticosus* agg sp	Blackberry	uc		
TEC	*	Polygonaceae	*Rumex crispus*	Curled Dock			uc
TEC	ni	Araliaceae	*Schefflera actinophylla*	Umbrella Tree		uc	
TEC	*	Poaceae	*Setaria pumila*	Pale Pigeon Grass	uc	uc	
TEC	*	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne		c	o
TEC	*	Solanaceae	*Solanum nigrum*	Black-berry Nightshade	uc		o
TEC	*	Asteraceae	*Soliva sessilis*	Bindyi			c
TEC	*	Poaceae	*Sporobolus africanus*	Parramatta Grass		o	
TEC	*	Caryophyllaceae	*Stellaria media*	Common Chickweed		c	c
TEC	*	Poaceae	*Stenotaphrum secundatum*	Buffalo Grass			o
TEC	*	Strelitziaceae	*Strelitzia reginae*	Bird of Paradise		o	
TEC		Myrtaceae	*Syncarpia glomulifera* ssp *glomulifera*	Turpentine	o	o	uc
TEC	*	Asteraceae	*Taraxacum officinale*	Dandelion	o	c	c
TEC	*	Fabaceae - Faboideae	*Trifolium repens*	White Clover			c

Survey	Status	Family	*Genus species*	Common Name	STIF	PW	GL
TEC	*	Verbenaceae	*Verbena bonariensis*	Purpletop	uc		
TEC	*	Scrophulariaceae	*Veronica arvensis*			c	
TEC		Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell	o		
TEC	*	Violaceae	*Viola odorata*			uc	
TEC		Lamiaceae	*Westringia fruticosa*	Coastal Rosemary		o	

Table A2 Native and exotic fauna species for current survey.

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			
A	Anecdotal	An	Ultrasonic call recognition (Anabat)
Au	Aural (call recognition)	Cg	Cage
B	Burrow	CP	Call Playback
Bn	Bones	El	Elliot
D	Diggings	Hp	Harp
E	Eggs or juvenile morphs	Pt	Pittfalls
F	Fur or feathers		
Fe	Feeding signs		
Fl	Flying over the site		
H	Hollows (in trees, trunks or other)		
N	Nest		
Sc	Scat or scent		
Scr	Scratch marks on tree trunks or other		
T	Tracks		
Vi	Visual observation		

General Status	Group	Family	Genus species	Common Name	Record Type
P	Mammal	Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	Vi
* U	Mammal	Leporidae	*Oryctolagus cuniculus*	Rabbit	Vi
P	Bird	Charadriidae	*Vanellus miles*	Masked Lapwing	Au
P	Bird	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	Vi
* U	Bird	Columbidae	*Streptopelia chinensis*	Spotted Turtle-Dove	Vi
P	Bird	Dicruridae	*Grallina cyanoleuca*	Magpie-lark	Vi

General Status	Group	Family	Genus species	Common Name	Record Type
P	Bird	Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	Vi
P	Bird	Hirundinidae	*Hirundo neoxena*	Welcome Swallow	Vi
P	Bird	Meliphagidae	*Manorina melanocephala*	Noisy Miner	Vi
P	Bird	Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	Vi
P	Frog	Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	Au
	Fish	Anguillidae	*Anguilla australis*	Shortfin Eel	Vi

Appendix B

Figures

Flora and Fauna Assessment
Cochlear Global Headquarters Project, Stage 1
Macquarie University

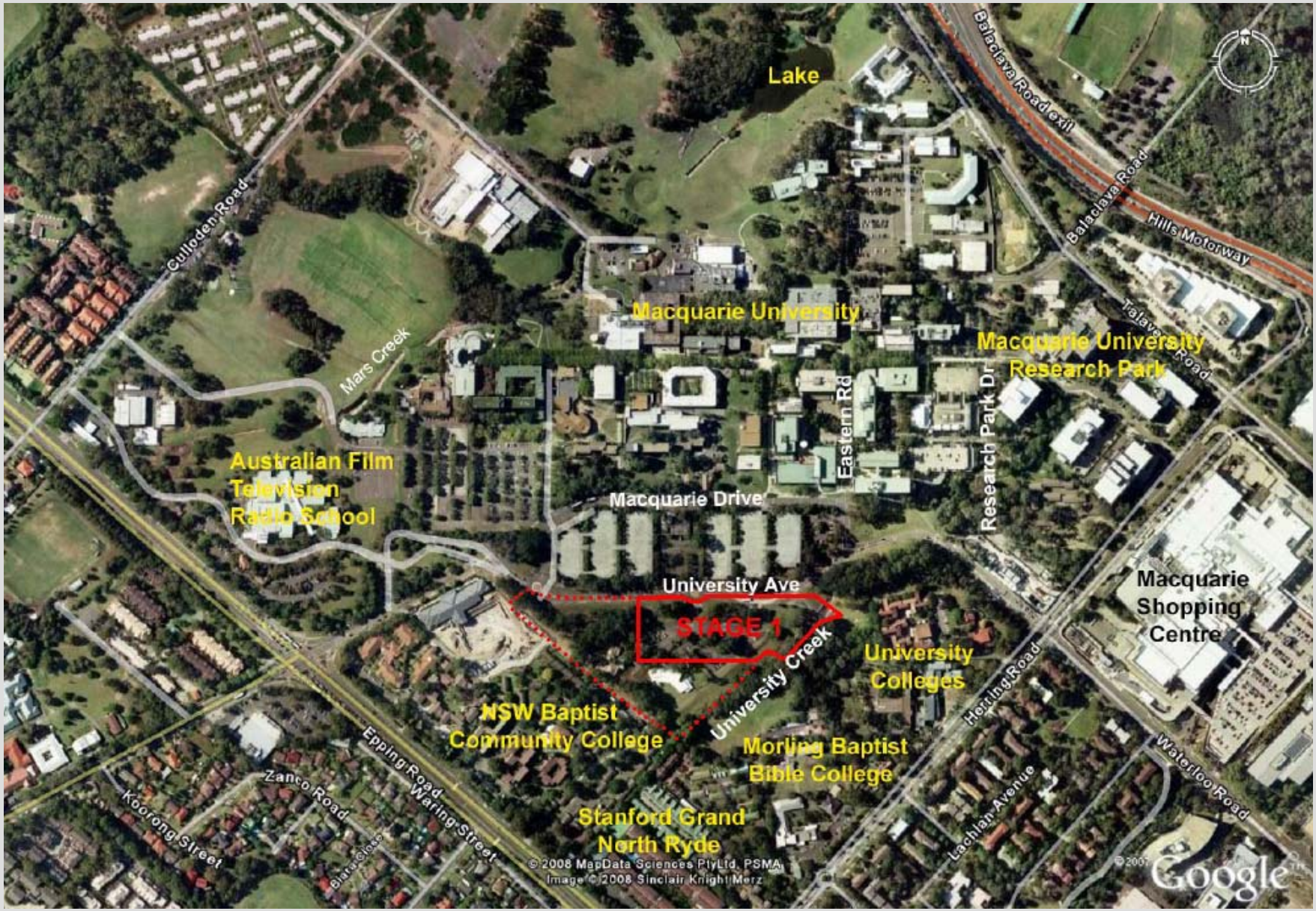

Figure 1

Locality & Subject Site

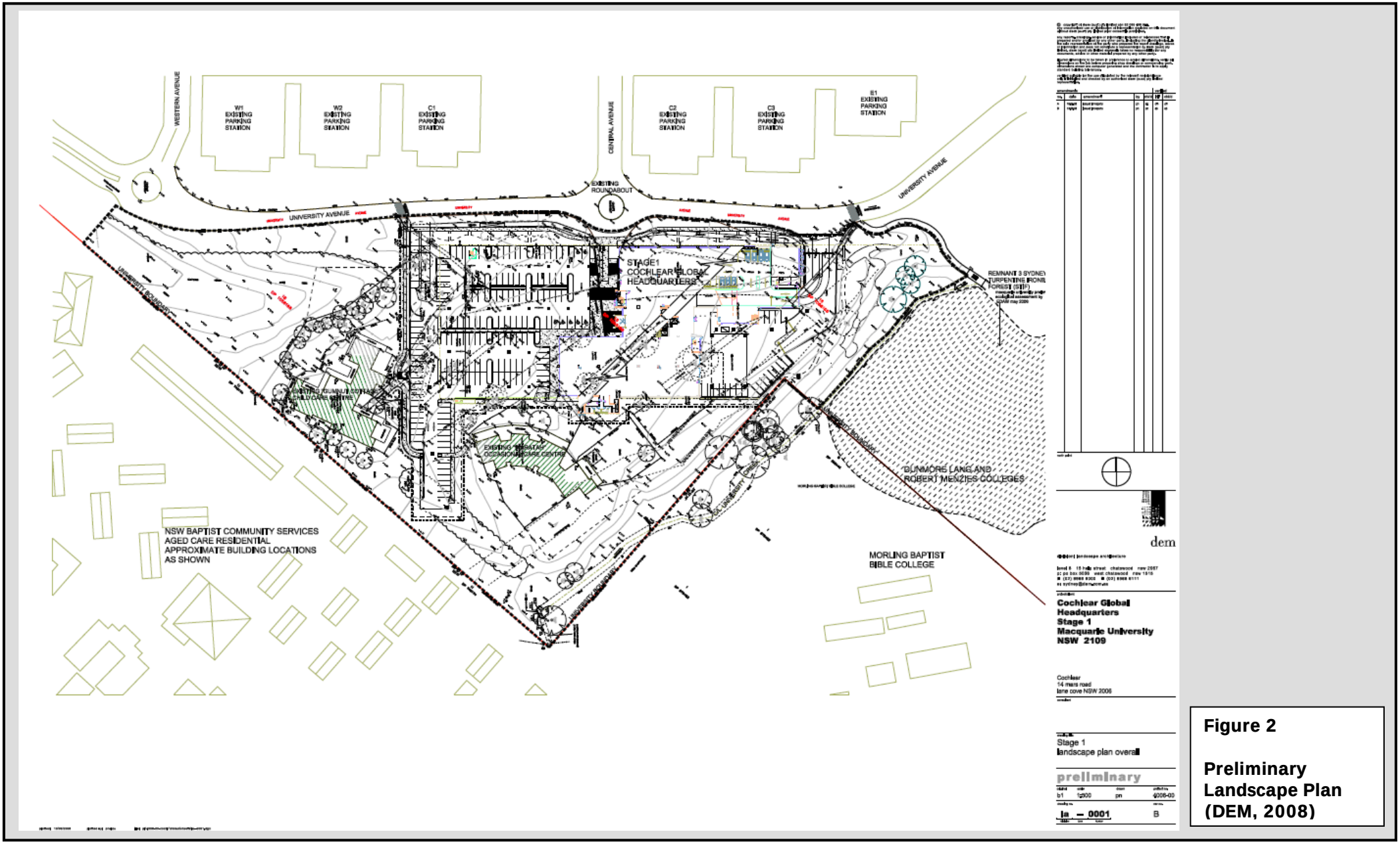

Figure 2

Preliminary Landscape Plan (DEM, 2008)

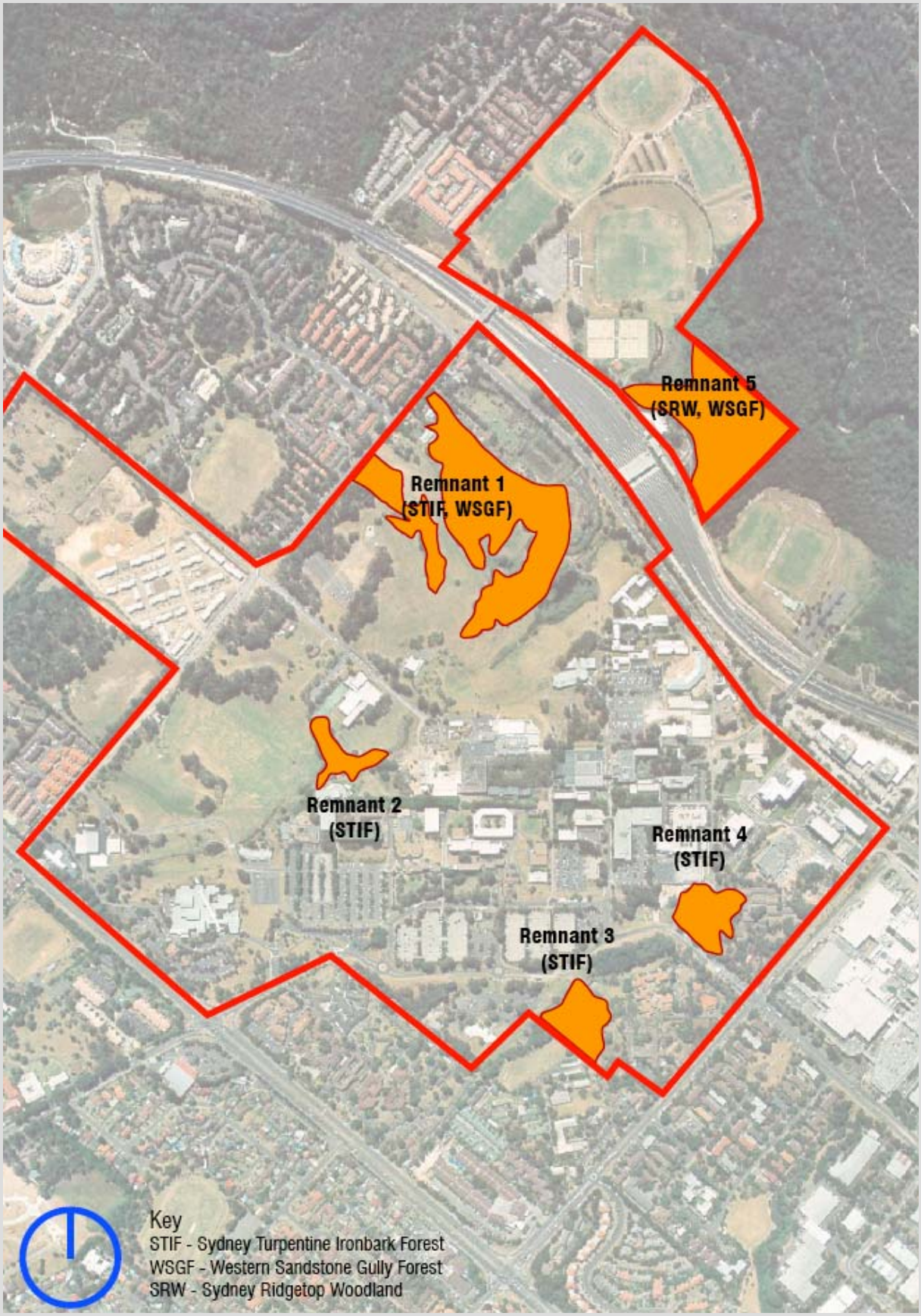

Figure 3
Remnant Vegetation at Macquarie University Plan (EDAW, 2006)

Legend

- Subject Site
- Planted Woodland
- Exotic Grassland
- Approximate area of STIF

Figure 4
Subject Site & Plant Communities

Site: Proposed Cochlear Global HQ, Stage 1
Macquarie University
Date: 20 March, 2008
Project No: C1054 – DEM
Author: B Morrisey

Not to Scale

Source: Google Earth

total earth care

Appendix C

Assessments of Significance for Threatened Biodiversity

Flora and Fauna Assessment
Cochlear Global Headquarters Project, Stage 1
Macquarie University

7-part Test – Sydney Turpentine-Ironbark Forest

(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 TSC Act defines a 'threatened species' as 'a species specified in Part 1 or 4 of Schedule 1 or in Schedule 2' of the Act. STIF is not a 'threatened species', as defined under the TSC Act.

(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. STIF is not 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.**

No clearing or construction works are proposed in the STIF of the study area. However some potential exists for other direct impacts during construction and operation. Although the STIF of the study area is outside the proposed construction footprint and probable construction exclusion zone, the drainage line may provide a direct physical link between the construction site and STIF. Accordingly the impacts of stormwater runoff such as sedimentation, erosion and altered water chemistry have some potential to directly impact on the STIF during construction and operation of the proposal. The risk of these potential stormwater impacts is likely to be addressed during construction as part of the DGR's 'Construction and operational impacts' key issue. The risk of stormwater impacts during operation of the proposal is likely to be addressed as part of the 'Stormwater drainage and flooding' 'ESD measures' key issues and preparation of the VMP for the drainage line from the DGR's.

Some potential exists for the eastern buildings of the proposal to increase shading on the STIF that may influence the floristic composition of the STIF (ie establishment and growth of some plant species). However, apart from the riparian zone set backs between the STIF and development footprint, all buildings of the proposal have an east west longitudinal orientation and this will minimise the potential for effects from shading on the STIF.

Provided that potential for stormwater impacts are addressed in the design phases, the current proposal is not likely to have and adverse effect on the extent or substantially and adversely modify the composition of the STIF of the subject site such that its local occurrence is places at the risk of extinction.

(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.**

No clearing or construction works are proposed in the STIF of the study area. Additionally the subject site and study area have undergone significant earthworks during construction for the current land use and this will have included introduction of fill material and inversion, destruction or modification of the original soil profile and seedbank over the majority of the study area.

STIF has been identified over the wider locality in previous surveys (NPWS 2002, EDAW 2006, and Oculus 2001). The area of STIF described and mapped in the current survey is an isolated fragment of this community type in the wider locality (Figures 3 and 4, Appendix B). The current proposal will not further fragment it, or cause it to become further isolated from other nearby known or predicted remnants of STIF, or potential STIF habitats.

No known area of, or habitat for, STIF will be removed, modified fragmented or isolated as a result of the current proposal.

The DGR's for the current proposal have specified the provision of a riparian zone and vegetated buffer along the creek at the interface between the STIF and the subject site. The preparation of a VMP for the riparian zone which adjoins the STIF of the study area is likely to address long term management of the stand including issues such as stormwater, weed removal and control and planting of locally endemic native vegetation in either riparian restoration or landscaped areas. Ultimately the works recommended in the VMP will improve the habitat of STIF in the study area by managing threats and improving resilience.

(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 STIF.

(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 in place for STIF. There are no Threat Abatement Plans currently in operation for any Key Threatening Processes threatening the STIF.

There are 16 priority actions identified by the DECC to assist the recovery of this community. The proposed development is not inconsistent with the overall strategies and actions listed in the priority action statement. The preparation of a VMP for the drainage line and other construction operation management plans that recognise and consider the conservation status of the STIF will be consistent with the following priority actions for STIF;

- Promote best practice management guidelines;
- Incorporate consideration of EEC protection in regional open space planning;
- Manage, to best practice standards, areas of EECs which have conservation as a primary objective, or where conservation is compatible;
- Public authorities will promote management agreements to landholders through their ongoing land use planning activities.

(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 '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). Of the KTP's listed in Schedule 3 of the TSC Act the following are currently in operation that may impact the STIF of the study area;

- Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*. The current survey has identified the presence of European Rabbit on the subject site;
- Invasion and establishment of exotic vines and scramblers. Two species listed under the Final Determination of this KTP *Asparagus aethiopicus* Asparagus Fern and *Ipomoea indica* Morning Glory (NSW Scientific Committee, 2006) are recorded in the STIF of the study area; and

- Invasion of native plant communities by exotic perennial grasses. Several species of exotic perennial grass are recorded in the STIF of the study area.

KTP's as listed in Schedule 3 of the TSC Act that have the potential to either be introduced to the subject site, or operate as a result of the current proposal and which may impact on the STIF of the study area are;

- Infection of native plants by *Phytophthora cinnamomi*. One mechanism of dispersal of this plant pathogen is the movement of soil from an infected area attached to machinery and plant (NSW Scientific Committee, 2003) as would be used in the construction of the current proposal;
- Loss of hollow-bearing trees. Some small tree hollows were observed in the current survey in the subject site and study area; and
- Removal of dead wood and dead trees. Several stags were observed in the current survey in the study area, mainly on the eastern side of the drainage line outside the subject site.

The main KTP's that have a potential to either commence to operate or be exacerbated on the subject site as a result of the current proposal are Infection of native plants by *Phytophthora cinnamomi* and Loss of hollow-bearing trees. However it is equally or more likely that *Phytophthora cinnamomi* would infect the subject site or study area due to dispersal in the current stormwater flows of the drainage line on the subject site boundary and the size and density of tree hollows that may be lost will possibly only provide sheltering and nesting habitat for a limited range of native fauna species.

The proposed development does not constitute a scheduled or preliminary KTP.

Conclusion

In light of the consideration of the above seven factors (1 -7), the proposed activity on the subject site is not likely to impose "a significant effect" on the STIF endangered ecological community of the study area as a result of the current proposal, as:

- The proposal will not adversely affect the extent or composition of the ecological community;
- The proposal will not further fragment or isolate the community or affect its long term survival; and
- The proposal does not significantly contribute to any KTP threatening the community.

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

7-part Test – *Eucalyptus nicholii* Narrow-leaved Black Peppermint

(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.

Eucalyptus nicholii Narrow-leaved Black Peppermint is a medium-sized tree from 15 to 20m tall with rough, thick, grey-brown bark which extends to the larger branches and the leaves have a strong peppermint smell when crushed (DECC, 2008a). The natural range and distribution of the species is confined to the New England Tablelands of NSW, occurring from Nundle to north of Tenterfield and largely on private property. Usually confined to shallow and infertile granite and porphyry soils (Brooker *et al*, 2002), the species is associated with dry grassy woodland (DECC, 2008a). The species is widely planted as an urban street tree and in gardens (Brooker *et al* 2002 and DECC 2008a).

The single planted specimen (tree 9 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B). The arborists report has assessed the specimen as being in 'poor' health and condition and is declining (TUFM, 2008).

The species is recorded from the DECC Wildlife Atlas at one other location in the Ryde LGA within one kilometre and to the north of the subject site. There are three records of the species within 10km of the subject site to the northwest in the Hornsby LGA. Although there is potential that more specimens of the species occur in the study area or wider locality, given that individual of the current survey is planted and it occurs well outside its natural range and distribution there is no potential for it to form part of a 'viable local population'. Additionally the subject site does not support the species preferred soil and vegetation association habitats that would be integral components necessary for the operation of the species life cycle.

The current proposal will involve the removal of the single known specimen of *Eucalyptus nicholii* Narrow-leaved Black Peppermint of the subject site. The subject site and study area are unlikely to support a 'viable local population' of the species or preferred habitat for the species. Therefore the removal of the specimen is not likely to place at risk of extinction a 'viable local population'.

(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. *Eucalyptus nicholii* Narrow-leaved Black Peppermint is not 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 "a community specified in Part 3 of Schedule 1" of the Act, and a "critically endangered ecological" as "a community specified in Part 2 of Schedule 1a of the Act. *Eucalyptus nicholii* Narrow-leaved Black Peppermint is 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.**

As stated above, there is no preferred habitat for *Eucalyptus nicholii* Narrow-leaved Black Peppermint located within the subject site including natural soils or vegetation associations. Additionally the species is recorded as a single observation in an area that is subject to landscape maintenance and other land uses that have resulted in a high level of medication of the previous natural vegetation and soil profiles.

The habitat for *Eucalyptus nicholii* Narrow-leaved Black Peppermint on the subject site is considered to be of relatively low importance in a regional context. As such, the current proposal will not significantly affect the species as no habitat will be removed, habitat will not become fragmented or isolated from other areas of habitat such that it will effect the species long term survival in the locality or its natural range

(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 *Eucalyptus nicholii* Narrow-leaved Black Peppermint.

(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 in place for *Eucalyptus nicholii* Narrow-leaved Black Peppermint. There are no Threat Abatement Plans for any Key Threatening Processes threatening *Eucalyptus nicholii* Narrow-leaved Black Peppermint.

There are 22 priority actions identified by the DECC to assist the recovery of this species. In the context of the presence of the species on the subject site (ie a planted specimen well outside its natural range and preferred habitat) the proposed development is not inconsistent with the overall strategies and actions listed in the priority action statement.

(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 '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). Of the KTP's listed in Schedule 3 of the TSC Act the following are currently in operation in the study area;

- Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*. The current survey has identified the presence of European Rabbit on the subject site;
- Invasion and establishment of exotic vines and scramblers. Two species listed under the Final Determination of this KTP *Asparagus aethiopicus* Asparagus Fern and *Ipomoea indica* Morning Glory (NSW Scientific Committee, 2006) are recorded in the STIF plant community of the study area; and
- Invasion of native plant communities by exotic perennial grasses. Apart from the STIF plant community of the study area, the groundcover stratum of all other plant communities is dominated by exotic perennial grasses.

KTP's as listed in Schedule 3 of the TSC Act that have the potential to either be introduced to the subject site, or operate as a result of the current proposal are;

- Infection of native plants by *Phytophthora cinnamomi*. One mechanism of dispersal of this plant pathogen is the movement of soil from an infected area attached to machinery and plant (NSW Scientific Committee, 2003) as would be used in the construction of the current proposal;
- Loss of hollow-bearing trees. Some small tree hollows were observed in the current survey in the subject site and study area; and
- Removal of dead wood and dead trees. Several stags were observed in the current survey in the study area, mainly on the eastern side of the drainage line outside the subject site.

The main KTP's that have a potential to either commence to operate or be exacerbated on the subject site as a result of the current proposal are Infection of native plants by *Phytophthora cinnamomi* and Loss of hollow-bearing trees. However it is equally or more likely that *Phytophthora cinnamomi* would infect the subject site or study area due to dispersal in the current stormwater flows of the drainage line on the subject site boundary and the size and density of tree hollows that may be lost will possibly only provide sheltering and nesting habitat for a limited range of native fauna species.

In the context of the presence of *Eucalyptus nicholii* Narrow-leaved Black Peppermint on the subject site (ie a planted specimen well outside its natural range and preferred habitat) and the highly modified landscape of the subject site, the proposed development does not constitute a scheduled or preliminary KTP.

Conclusion

In light of the consideration of the above seven factors (1 -7), the proposed activity on the subject site is not likely to impose "a significant effect" on the vulnerable species *Eucalyptus nicholii* Narrow-leaved Black Peppermint as a result of the current proposal, as:

- The proposal will not compromise the viability of a 'local population' through impact on the species;
- The proposal will not involve the removal or modification, fragmentation or isolation of a 'significant area of known habitat' for the species; and
- The proposal does not significantly contribute to any KTP threatening this species within its natural range and habitats.

Consequently, a Species Impact Statement is not required to be prepared for *Eucalyptus nicholii* Narrow-leaved Black Peppermint of the subject site.

7-part Test – *Eucalyptus scoparia* Wallangarra White Gum

(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.

Eucalyptus scoparia Wallangarra White Gum occurs in Queensland and reaches its southern limit in NSW in only three locations near Tenterfield, including Bald Rock National Park (DECC, 2008b). Habitat of the species is open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops in its natural range and distribution (DECC, 2008b) and the species is commonly grown in south-eastern Australia as an ornamental (Brooker *et al*, 2002).

The single planted specimen of *Eucalyptus scoparia* Wallangarra White Gum of the subject site (tree 16 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B). The arborists report has assessed the specimen as being in 'poor' health and condition and is declining (TUFM, 2008).

The species is recorded elsewhere in the Ryde LGA on the DECC Wildlife Atlas. The next nearest record of the species is to the northwest and within 10km of the subject site in the Hornsby LGA. Although there is potential that more specimens of the species occur in the study area or wider locality, given that individual of the current survey is planted and it occurs well outside its natural range and distribution there is no potential for it to form part of a 'viable local population'. Additionally the subject site does not support the species preferred soil, vegetation association and other specific habitats that would be integral components necessary for the operation of the species life cycle.

The current proposal will involve the removal of the single known specimen of *Eucalyptus scoparia* Wallangarra White Gum of the subject site. The subject site and study area are unlikely to support a 'viable local population' of the species or preferred habitat for the species. Therefore the removal of the specimen is not likely to place at risk of extinction a 'viable local population'.

(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. *Eucalyptus scoparia* Wallangarra White Gum is not 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 'a community specified in Part 3 of Schedule 1" of the Act, and a 'critically endangered ecological' as "a community specified in Part 2 of Schedule 1a of the Act. *Eucalyptus scoparia* Wallangarra White Gum is 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.**

As stated above, there is no preferred habitat for *Eucalyptus scoparia* Wallangarra White Gum located within the subject site including natural soils or geological and vegetation associations. Additionally the species is recorded as a single observation in an area that is subject to landscape maintenance and other land uses that have resulted in a high level of medication of the previous natural vegetation and soil profiles.

The habitat for *Eucalyptus scoparia* Wallangarra White Gum on the subject site is considered to be of relatively low importance in a regional context. As such, the current proposal will not significantly affect the species as no habitat will be removed, habitat will not become fragmented or isolated from other areas of habitat such that it will effect the species long term survival in the locality or its natural range

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 *Eucalyptus scoparia* Wallangarra White Gum.

(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 in place for *Eucalyptus scoparia* Wallangarra White Gum. There are no Threat Abatement Plans for any Key Threatening Processes threatening *Eucalyptus scoparia* Wallangarra White Gum. Additionally the DECC has not yet identified any priority actions to assist the recovery of this species.

(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 '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). Of the KTP's listed in Schedule 3 of the TSC Act the following are currently in operation in the study area;

- Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*. The current survey has identified the presence of European Rabbit on the subject site;
- Invasion and establishment of exotic vines and scramblers. Two species listed under the Final Determination of this KTP *Asparagus aethiopicus* Asparagus Fern and *Ipomoea indica* Morning Glory (NSW Scientific Committee, 2006) are recorded in the STIF plant community of the study area; and
- Invasion of native plant communities by exotic perennial grasses. Apart from the STIF plant community of the study area, the groundcover stratum of all other plant communities is dominated by exotic perennial grasses.

KTP's as listed in Schedule 3 of the TSC Act that have the potential to either be introduced to the subject site, or operate as a result of the current proposal are;

- Infection of native plants by *Phytophthora cinnamomi*. One mechanism of dispersal of this plant pathogen is the movement of soil from an infected area attached to machinery and plant

(NSW Scientific Committee, 2003) as would be used in the construction of the current proposal;

- Loss of hollow-bearing trees. Some small tree hollows were observed in the current survey in the subject site and study area; and
- Removal of dead wood and dead trees. Several stags were observed in the current survey in the study area, mainly on the eastern side of the drainage line outside the subject site.

The main KTP's that have a potential to either commence to operate or be exacerbated on the subject site as a result of the current proposal are Infection of native plants by *Phytophthora cinnamomi* and Loss of hollow-bearing trees. However it is equally or more likely that *Phytophthora cinnamomi* would infect the subject site or study area due to dispersal in the current stormwater flows of the drainage line on the subject site boundary and the size and density of tree hollows that may be lost will possibly only provide sheltering and nesting habitat for a limited range of native fauna species.

In the context of the presence of *Eucalyptus scoparia* Wallangarra White Gum on the subject site (ie a planted specimen well outside its natural range and preferred habitat) and the highly modified landscape of the subject site, the proposed development does not constitute a scheduled or preliminary KTP.

Conclusion

In light of the consideration of the above seven factors (1 -7), the proposed activity on the subject site is not likely to impose "a significant effect" on the vulnerable species *Eucalyptus scoparia* Wallangarra White Gum as a result of the current proposal, as:

- The proposal will not compromise the viability of a 'local population' through impact on the species;
- The proposal will not involve the removal or modification, fragmentation or isolation of a 'significant area of known habitat' for the species; and
- The proposal does not significantly contribute to any KTP threatening this species within its natural range and habitats.

Consequently, a Species Impact Statement is not required to be prepared for *Eucalyptus scoparia* Wallangarra White Gum of the subject site.

EPBC Act Significant Impact Criteria – Critically endangered and endangered ecological communities

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

reduce the extent of an ecological community;

Clearing of vegetation for the current proposal is to be limited to the development footprint of the subject site (Figure 4, Appendix B) and the Sydney Turpentine-Ironbark Forest (STIF) is outside the subject site but in the study area. The current proposed action will not reduce the extent of STIF in the study area or wider locality.

fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;

No vegetation clearing or construction works are proposed in the STIF of the study area and clearing of vegetation for the current proposal is to be limited to the development footprint of the subject site (Figures 2 and 4, Appendix B). Clearing of vegetation on the subject site (Planted Woodland and Exotic Grassland) will not further fragment or increase the current fragmentation of the stand of STIF from other stands of the ecological community identified from the locality (NPWS 2002, EDAW 2006, and Oculus 2001).

adversely affect habitat critical to the survival of an ecological community;

Areas immediately surrounding the STIF of the study area are highly modified due past and continuing land use including significant earthworks that have altered soil profiles and maintenance of landscaped open space. This land use and management has severely altered the potential habitat for the ecological community and this affects and limits the dispersal of the ecological community to reestablishment in previously occupied areas. The current proposed action will not adversely affect habitat critical to the survival of STIF.

modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;

There is potential for the modification of stormwater processes during and post construction of the proposed action that may affect the STIF of the study area. However the stand of STIF is currently subject to the impacts of stormwater and measures are specified in environmental planning instruments to address the potential for stormwater impacts on the drainage line. Given the specification for design solutions and riparian restoration works, as part of the approval and assessment process for the proposed action to limit and control stormwater impacts on the drainage line, the proposed action is unlikely to have a significant impact on the ecological community.

Additionally some potential exists for the eastern buildings of the proposal to increase shading on the STIF that may influence ecological processes of the STIF (ie establishment and growth of some plant species). However, apart from the riparian zone set backs between the STIF and development footprint, all buildings of the proposal have an east west longitudinal orientation and this will minimise the potential for effects from shading on the STIF.

cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;

As noted, there is potential for some changes to abiotic factors that will be affecting the ecological integrity of the STIF, as a result of the proposed action. These are potential for altered hydrological

processes and insolation. Specification has been made by consent authorities to address the potential for general environmental impacts of stormwater and design features will limit the potential for shading to occurring. It is unlikely that the proposed action will substantially change the ecological function of the STIF of the study area such that keystone or integral species of the ecological community are substantially affected or lost entirely.

cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

assisting invasive species, that are harmful to the listed ecological community, to become established;

The integrity of the STIF of the study area is limited by the current surrounding land use, previous and potential continuing disturbances (including weed invasion) and a high edge to area ratio. There is evidence the stand is recently under 'stop mow' management and there is likely to be have been some past maintenance weeding although vine weeds are re-establishing over a regenerating understorey. The establishment of a vegetated buffer on the drainage line separating the STIF and subject site that will be implemented and managed by the preparation of a VMP that has been specified as part of the assessment and approval process for the proposed action. The VMP is likely to consider the presence of the STIF and aim to integrate the riparian restoration works to improve the condition and resilience of the remnant/regrowth native vegetation. This will include weed control and planting of locally occurring native plant species. In view of the above the proposed action is not likely to cause a substantial reduction in the quality, integrity or occurrence of STIF in the study area and specification of the assessment and approvals processes may enhance the condition of the stand.

or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community;

There is potential for the modification of stormwater processes during and post construction of the proposed action that may affect the STIF of the study area. This modification may include increased sediment loads, plant nutrients or chemicals. However the stand of STIF is currently subject to the impacts of stormwater and measures are specified in environmental planning instruments to address the potential for stormwater impacts on the drainage line. Given the specification for design solutions and riparian restoration works, as part of the approval and assessment process for the proposed action to limit and control stormwater impacts on the drainage line, the proposed action is unlikely to have a significant impact on the ecological community.

interfere with the recovery of an ecological community.

The potential of the stand of STIF in the subject site to recover is currently limited by factors such as past and ongoing impacts as previously highlighted. The proposed action is not likely to significantly increase or affect the operation of these factors such that it further limits the recovery of the STIF of the study area or other stands known or predicted from the locality.

EPBC Act Significant Impact Criteria – Vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of an important population of a species

In its natural range and distribution *Eucalyptus nicholii* Narrow-leaved Black Peppermint is confined to the New England Tablelands of NSW, occurring from Nundle to north of Tenterfield and largely on private property. Usually confined to shallow and infertile granite and porphyry soils (Brooker ***et al***, 2002), the species is associated with dry grassy woodland (DECC, 2008a). The species is widely planted as an urban street tree and in gardens (Brooker ***et al*** 2002 and DECC 2008a).

The single planted specimen (tree 9 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B) of the subject site and one other specimen of the species is recorded on the DECC Wildlife Atlas for the Ryde LGA. Although other specimens of the species may occur in the study and wider locality cumulatively these would not form 'an important population'. Accordingly the removal of the known specimen of the species as a result of the current proposal will not lead to a long term decrease in the size of an important population of *Eucalyptus nicholii* Narrow-leaved Black Peppermint.

reduce the area of occupancy of an important population

The current proposal will involve the removal of the majority of trees within the development footprint of the subject site and these form the bulk of native vegetation cover of the Planted Woodland (Figures 1 and 3, Appendix B). The single planted specimen of *Eucalyptus nicholii* Narrow-leaved Black Peppermint (tree 9 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B) of the subject site and does not form part of a population of the species that would be reduced as a result of the proposal.

fragment an existing important population into two or more populations

Eucalyptus nicholii Narrow-leaved Black Peppermint occur on the subject site as an isolated individual and does not form part of an important population. Therefore the current proposal will not fragment an existing important population into two or more populations.

adversely affect habitat critical to the survival of a species

General habitats for the species have been summarised by the DECC (2008a) as dry grassy woodland, on shallow and infertile soils, on granite geology none of which are supported by the subject site. Additionally no critical habitat for the species is listed on the EPBC Act Register of Critical Habitat. The current proposal will not adversely affect habitat critical to the survival of the species.

disrupt the breeding cycle of an important population

The subject site does not support a population or important population of *Eucalyptus nicholii* Narrow-leaved Black Peppermint. Therefore the current proposal will not disrupt the breeding cycle of an important population of *Eucalyptus nicholii* Narrow-leaved Black Peppermint.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The subject site does not support the biotic and biotic habitat features preferred by the species with the existing habitat limited to a highly modified environment that is maintained as a landscaped area.

The current proposed action will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species will decline.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The subject site does not provide the preferred habitat of *Eucalyptus nicholii* Narrow-leaved Black Peppermint. Therefore the current proposed action will not result in the introduction of invasive species that are harmful to a *Eucalyptus nicholii* Narrow-leaved Black Peppermint becoming established in the species habitat.

introduce disease that may cause the species to decline

There is potential that the plant pathogen *Phytophthora cinnamomi* that is known to infect species of the genus Eucalyptus, may be introduced to the subject site as a result of the current proposed action. The known specimen of the subject site is considerably outside its natural range and distribution and if introduction of *Phytophthora cinnamomi* were to occur on the subject site it will would not cause the species as a whole to decline.

or interfere substantially with the recovery of the species

There is no recovery plan prepared or in preparation for *Eucalyptus nicholii* Narrow-leaved Black Peppermint under the provision of the EPBC Act. The known specimen of the *Eucalyptus nicholii* Narrow-leaved Black Peppermint on the subject site is considerably outside its natural range and distribution. Further there is a distinct absence of the species preferred habitat features that would be necessary for the normal operation of the species life cycle to sustain a recruiting population that would form part of partially or fully structured ecological community. The current proposed action will not interfere substantially with the recovery of *Eucalyptus nicholii* Narrow-leaved Black Peppermint.

EPBC Act Significant Impact Criteria – Vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of an important population of a species

In its natural range and distribution *Eucalyptus scoparia* Wallangarra White Gum occurs in Queensland and reaches its southern limit in NSW in only three locations near Tenterfield, including Bald Rock National Park (DECC, 2008b). Habitat of the species is open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops in its natural range and distribution (DECC, 2008b) and the species is commonly grown in south-eastern Australia as an ornamental (Brooker *et al*, 2002).

The single planted specimen (tree 16 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B) of the subject site and no other specimens of the species are recorded on the DECC Wildlife Atlas for the Ryde LGA. Although other specimens of the species may occur in the study and wider locality cumulatively these would not form 'an important population'. Accordingly the removal of the known specimen of the species as a result of the current proposal will not lead to a long term decrease in the size of an important population of *Eucalyptus scoparia* Wallangarra White Gum.

reduce the area of occupancy of an important population

The current proposal will involve the removal of the majority of trees within the development footprint of the subject site and these form the bulk of native vegetation cover of the Planted Woodland (Figures 2 and 4, Appendix B). The single planted specimen of *Eucalyptus scoparia* Wallangarra White Gum (tree 16 of the arborists report) is located in the north eastern area of Planted Woodland (Figure 4, Appendix B) of the subject site and does not form part of a population of the species that would be reduced as a result of the proposal.

fragment an existing important population into two or more populations

Eucalyptus scoparia Wallangarra White Gum occur on the subject site as an isolated individual and does not form part of an important population. Therefore the current proposal will not fragment an existing important population into two or more populations.

adversely affect habitat critical to the survival of a species

General habitats for the species have been summarised by the DECC (2008b) as open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops none of which are supported by the subject site. Additionally no critical habitat for the species is listed on the EPBC Act Register of Critical Habitat. The current proposal will not adversely affect habitat critical to the survival of the species.

disrupt the breeding cycle of an important population

The subject site does not support a population or important population of *Eucalyptus scoparia* Wallangarra White Gum. Therefore the current proposal will not disrupt the breeding cycle of an important population of *Eucalyptus scoparia* Wallangarra White Gum.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The subject site does not support the biotic and biotic habitat features preferred by the species with the existing habitat limited to a highly modified environment that is maintained as a landscaped area. The current proposed action will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species will decline.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The subject site does not provide the preferred habitat of *Eucalyptus scoparia* Wallangarra White Gum. Therefore the current proposed action will not result in the introduction of invasive species that are harmful to a *Eucalyptus scoparia* Wallangarra White Gum becoming established in the species habitat.

introduce disease that may cause the species to decline

There is potential that the plant pathogen *Phytophthora cinnamomi* that is known to infect species of the genus Eucalyptus, may be introduced to the subject site as a result of the current proposed action. The known specimen of the subject site is considerably outside its natural range and distribution and if introduction of *Phytophthora cinnamomi* were to occur on the subject site it will would not cause the species as a whole to decline.

or interfere substantially with the recovery of the species

There is no recovery plan prepared or in preparation for *Eucalyptus scoparia* Wallangarra White Gum under the provision of the EPBC Act. The known specimen of the *Eucalyptus scoparia* Wallangarra White Gum on the subject site is considerably outside its natural range and distribution. Further there is a distinct absence of the species preferred habitat features that would be necessary for the normal operation of the species life cycle to sustain a recruiting population that would form part of partially or fully structured ecological community. The current proposed action will not interfere substantially with the recovery of *Eucalyptus scoparia* Wallangarra White Gum.