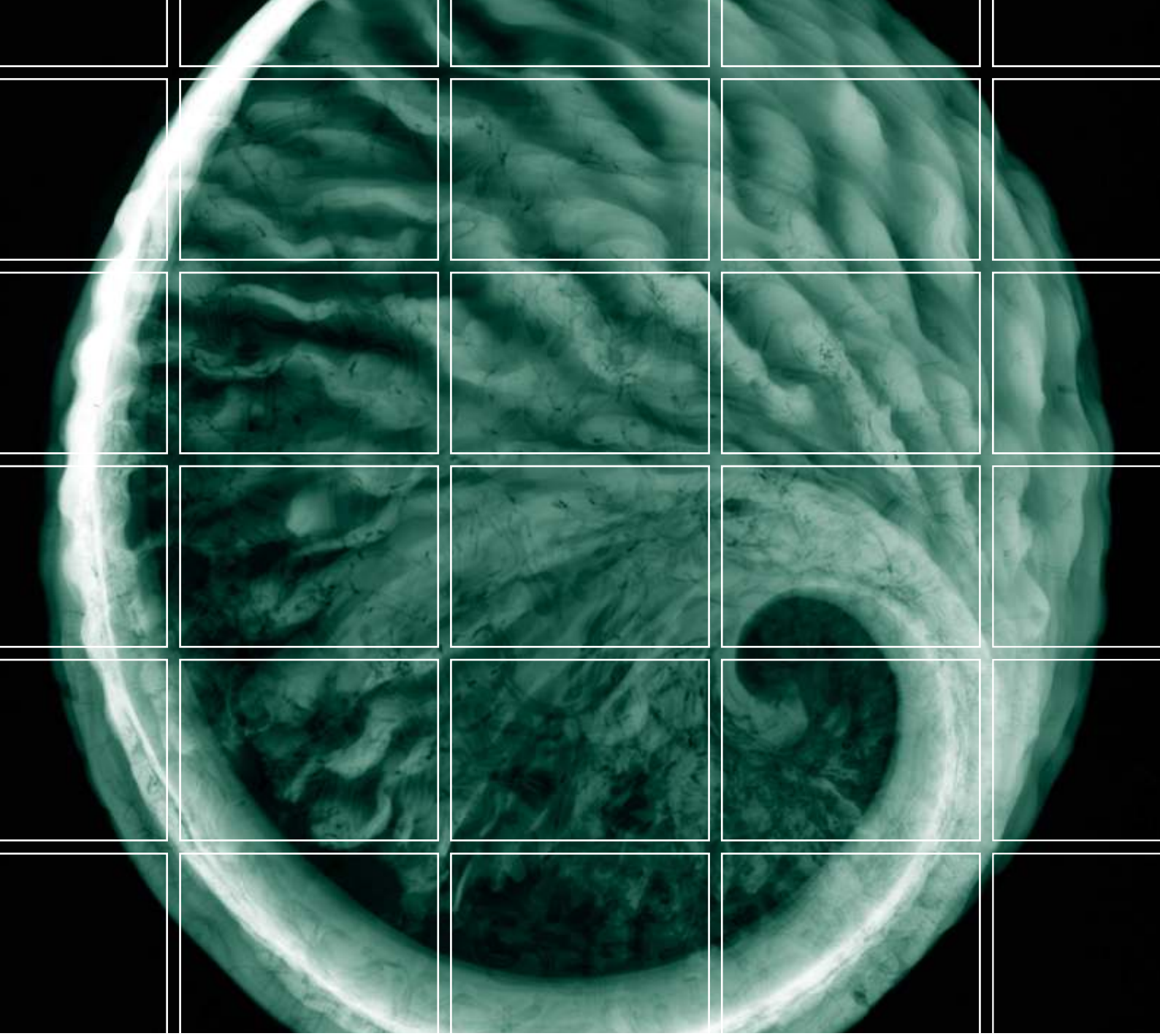

UTS Kuring-gai Concept Plan / SSS Amendment

Ecology Report

CRI Australia Pty Ltd

September 2007

0034033rp01v13

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Approved by:	*Renae Baker*
Position:	Project Manager
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Date:	*21 September, 2007*
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Position:	Project Director
Signed:	
Date:	*21 September, 2007*

Environmental Resources Management Australia Pty Ltd Quality System

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FINAL REPORT

CRI Australia Pty Ltd

UTS Kuring-gai Concept Plan / SSS Amendment

Ecology Report

September 2007

Environmental Resources Management Australia
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EXECUTIVE SUMMARY

The purpose of this report is to provide a flora and fauna assessment of the proposed Concept Plan / SSS Amendment for the University of Technology, Sydney (UTS) Kuring-gai Campus (hereafter referred to as 'the site'). The site is situated in a bushland setting, and existing buildings and car parking areas are interspersed throughout. The site is bound to the south, east and west by the Lane Cove National Park (LCNP) and to the north by the Film Australia site and residential lots.

Native vegetation and other habitat features on the site provide potential habitat for a range of flora and fauna species that are typical of Sydney Sandstone vegetation. The majority of these species are well conserved in the Sydney region, including in the adjacent LCNP.

The current Concept Plan / SSS Amendment comprises development of the land for residential and commercial land uses and adaptive reuse of the existing buildings in accordance with the Development Scheme.

The proposal will result in a total of approximately 2.8 ha of native vegetation being removed from the site, mainly from areas between existing buildings and from an area of bushland in the southwest of the site, and 1.3 ha of vegetation being modified for the creation of an Asset Protection Zone (APZ).

The development of the Concept Plan / SSS Amendment has been undertaken with close integration of the bushfire risk management requirements and ecological requirements for management of threatened species within the site. This collaborative approach has aimed to ensure that the management and creation of the APZ will not impact on the viability of threatened species within the site.

Threatened species that have been recorded on the site include Darwinia biflora (a shrub), the Red-Crowned Toadlet (Pseudophryne australis) and the Powerful Owl (Ninox strenua). Assessments of significance for potential impacts of the Concept Plan / SSS Amendment to these species, and others with the potential to occur on the site, were undertaken. The assessments concluded that if the proposed impact amelioration measures and proposed management plans are implemented at the site, then potential impacts to these threatened species were unlikely to be significant.

The proposed Concept Plan / SSS Amendment has also been assessed against relevant legislative documents, policies and guidelines, to ensure the project fulfils the environmental objectives of, and addresses the environmental considerations of, Ku-ring-gai Council, the Department of Environment and Climate Change (DECC) and the Department of Planning (DoP).

1 INTRODUCTION

1.1 PURPOSE

The purpose of this report is to provide a flora and fauna assessment of the proposed Concept Plan / SSS Amendment for the University of Technology, Sydney (UTS) Kuring-gai Campus (hereafter referred to as 'the site'). The location of the site is shown in *Figure 1.1*.

1.2 OBJECTIVES

The objectives of this report are to:

- provide a summary of the ecology of the site including vegetation communities and flora and fauna habitat;
- identify and map any flora and fauna listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) occurring within the site;
- predict any potential impacts to flora and fauna of the proposed Concept Plan / SSS Amendment and suggest measures to minimise and mitigate these impacts;
- outline strategies to ensure that there will be no significant impact to threatened and migratory species listed under NSW and Commonwealth legislation;
- outline the proposed conservation management options for flora and fauna in relation to the proposal that are compatible with the conservation objectives for Lane Cove National Park (LCNP), including management of conservation areas and corridors; and
- assess the Concept Plan / SSS Amendment against the objectives of relevant legislation, policies and guidelines.

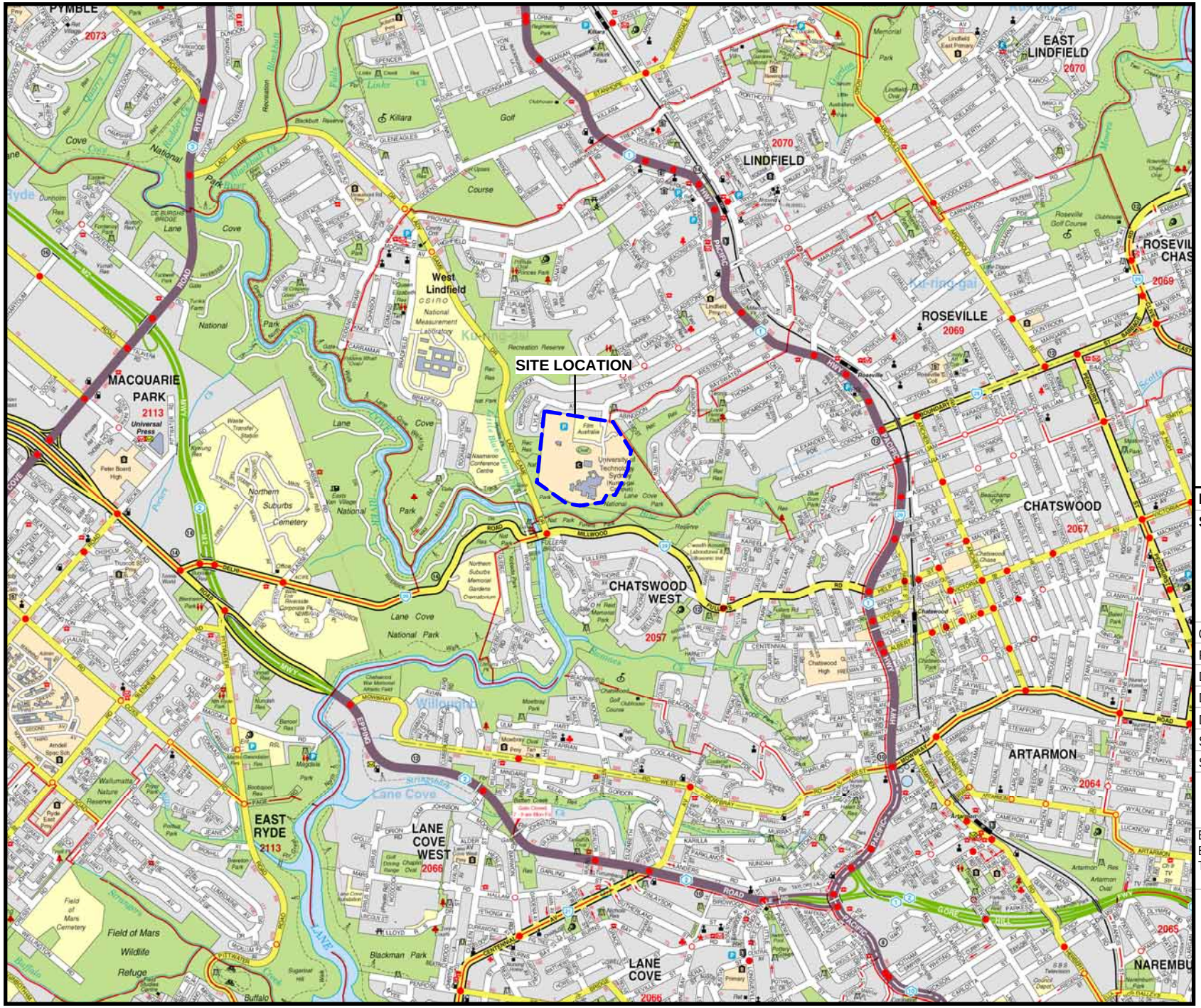

Figure 1.1

Site Location

Client:	CRI Australia Pty Ltd	
Project:	UTS Kuring-gai Concept Plan	
Drawing No:	0034033s_GIS01	
Date:	19/08/2007	Drawing Size: A4
Drawn By:	DH	Reviewed By: RB
Source:	UBD	
Scale:	Refer to Scale Bar	

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0 300 600 900m

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1.3 SITE DESCRIPTION

The site is located in the northern suburbs of Sydney on a sandstone ridge that slopes away on all sides except for the north. It is situated in a bushland setting, and existing buildings and car parking areas are interspersed throughout. The site is bound to the south, east and west by the LCNP and to the north by the Film Australia site and residential lots.

The site and surrounds include bushland that is contiguous with the LCNP and the site lies within the catchments of Sugarbag, College and Blue Gum Creeks. The College Creek catchment is a steep-sided gully with sandstone outcrops which cuts into the south-western section of the site. Blue Gum Creek drains the south-eastern part of the site and Sugarbag Creek drains the eastern sector. All these creeks are tributaries of the Lane Cove River.

The bushland associated with the site adjoins the narrow valley of LCNP. Much of the ridgetop vegetation in this area has been impacted by urban development including residential and industrial development, which in many areas has encroached on the remaining remnant bushland.

1.4 PROPOSED CONCEPT PLAN / SSS AMENDMENT

The current Concept Plan / SSS Amendment comprises development of the site for residential and commercial land uses and adaptive reuse of existing buildings in accordance with the Development Scheme.

The proposal will result in a total of approximately 2.8 ha of native vegetation being removed from the site, mainly from areas between existing buildings and from an area of bushland in the southwest of the site. The proposal will also result in the creation of an APZ, which will result in modification of 1.3 ha of vegetation and fire trail for fire fighting access. The area to be affected by the fire trail will be approximately 0.24 ha.

1.5 POLICY CONTEXT

1.5.1 Commonwealth Legislation

The EPBC Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of matters of National Environmental Significance (NES).

Under the EPBC Act, any action that has, or is likely to have, a significant impact on a matter of NES, may progress only with the approval of the Commonwealth Minister for the Environment. An action is defined as a project, development, undertaking, activity (or series of activities), or alteration to any of these.

Matters of NES listed under the EPBC Act include:

- world heritage properties;
- wetlands of international importance (Ramsar wetlands);
- listed threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- nuclear actions; and
- National Heritage Places.

When a person proposes to take an action they believe may need approval under the EPBC Act, they must refer the proposal to the Commonwealth Environment Minister. The purpose of the referral stage is to determine whether a proposed action requires approval under the EPBC Act. If the Minister determines that an approval is required, the proposed action will proceed through the assessment and approval process specified by the EPBC Act.

1.5.2 State Legislation

Environmental Planning and Assessment Act 1979 and *Threatened Species Conservation Act 1995*

The development assessment system in New South Wales is governed by the *Environmental Planning and Assessment Act 1979* (EP&A Act). Under this Act, the potential impacts on the environment need to be considered in any development proposal.

This includes assessments of likely impacts on the following, which are listed on the Schedules of the TSC Act:

- threatened species;
- threatened populations; and
- threatened communities.

State Environmental Planning Policy No. 44 - Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline.

This policy applies to the Local Government Areas (LGA) listed in Schedule 1 of SEPP 44. Development control in these LGAs under SEPP 44 has two main steps.

Step 1 determines whether the site is Potential Koala Habitat. Potential Koala Habitat means areas of native vegetation where the trees of the types listed in Schedule 2 (see *Table 1.1*) constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component. If the land is not Potential Koala Habitat, then the consent authority is not prevented by SEPP 44 from granting consent. If the land is Potential Koala Habitat then Step 2 applies.

Table 1.1 Trees listed under Schedule 2 of SEPP 44.

Common Name	Scientific Name
Forest Red Gum	*Eucalyptus tereticornis*
Tallowwood	*Eucalyptus microcorys*
Grey Gum	*Eucalyptus punctata*
Ribbon or Manna Gum	*Eucalyptus viminalis*
River Red Gum	*Eucalyptus camaldulensis*
Broad Leaved Scribbly Gum	*Eucalyptus haemastoma*
Scribbly Gum	*Eucalyptus signata*
White Box	*Eucalyptus albens*
Bimble Box or Poplar Box	*Eucalyptus populnea*
Swamp Mahogany	*Eucalyptus robusta*

Step 2 determines whether the site is Core Koala Habitat. Core Koala Habitat means an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

If the land is not Core Koala Habitat, then the consent authority is not prevented by SEPP 44 from granting consent. However, if the land is Core Koala Habitat, development consent may only be granted if there is a plan of management prepared in accordance with Part 3 of SEPP 44 which applies to the land.

SEPP 19 – Bushland In Urban Areas

The general aim of SEPP 19 is to protect and preserve bushland within the urban areas referred to in Schedule 1 of the policy because of:

- its value to the community as part of the natural heritage,
- its aesthetic value, and
- its value as a recreational, educational and scientific resource.

SEPP 19 has specific objectives which are addressed as part of this report. A table which includes these specific objectives and the way in which this proposal complies with the objectives is provided in *Annex D* to this report.

1.5.3 Local Government Planning Instruments

Ku-ring-gai Planning Scheme Ordinance

The Ku-ring-gai Planning Scheme Ordinance (KPSO) is a legal town planning document which is used to manage the development and conservation of Ku-ring-gai. The KPSO places land into a number of categories and limits the use of land in the Ku-ring-gai LGA.

The provisions of the KPSO can only be varied or amended by following a state regulated process, which includes public exhibition. Submission of a State Significant Study under the Major Projects SEPP 2005 is such a process.

1.5.4 Other Documents

Other documents reviewed as part of this ecological assessment included:

- *Ku-ring-gai Council Riparian Policy* (Ku-ring-gai Council 2004);
- *Ku-ring-gai Council Biodiversity Strategy* (Ku-ring-gai Council 2006);
- *Darwinia biflora Recovery Plan* (DEC 2004a); and
- *Guidelines for Development Adjoining Department of Environment and Conservation Land* (DEC 2006).

Consideration of these documents and the ways in which the proposal addresses the objectives of these documents is provided in *Chapter 6* and *Annex D*.

1.6 REPORT STRUCTURE

The remainder of the report is set out as follows:

- Chapter 2 provides an overview of regional and local flora and fauna species;
- Chapter 3 provides the methodology for flora and fauna surveys and assessments that have been undertaken as part of the project;
- Chapter 4 describes the ecology of the site and surrounding area;
- Chapter 5 provides details of the threatened and migratory species that occur, or potentially occur on, or adjacent to, the site;
- Chapter 6 is an assessment of the potential impacts of the proposed rezoning and Concept Plan / SSS Amendment on native flora and fauna and includes impact mitigation, management and amelioration measures; and
- Chapter 7 details the conclusions of the assessment.

2 BIODIVERSITY OVERVIEW

2.1 LANE COVE VALLEY AND LCNP

This chapter provides an overview of the flora and fauna of the Lane Cove valley and is provided to assist in further discussions of the site in the context of surrounding land.

The site is located in the Lane Cove valley, which is on the southern edge of the Hornsby Plateau within the Sydney Basin Bioregion. The Hornsby Plateau varies from approximately 130 to 160 metres above sea level. The Lane Cove River runs through sometimes steep sandstone landscape in the Lane Cove valley and eventually widens out to join Sydney Harbour at Hunters Hill (NPWS 1998).

Approximately 1000 ha of bushland occurs in the Lane Cove valley, which is surrounded by urban and industrial development. Approximately 569 ha of this bushland is included within LCNP (NPWS 2006).

2.1.1 Location, Soils and Topography

The Lane Cove valley contains steep westerly or easterly facing slopes associated with the Lane Cove River. The ridgelines of the valley have a capping of Wianamatta Shale over Hawkesbury Sandstone. Hawkesbury Sandstone is a coarse-grained sedimentary rock and weathers to form thin, sandy soils with low water retaining qualities. Sandy soils are common throughout the valley along the ridgelines and midslopes.

The Wianamatta Shales of the valley have been deeply eroded, exposing the lower Hawkesbury Sandstone strata. Wianamatta Shale soils occur along the exposed ridge tops, are rich in clay and have relatively high nutrient content and water retaining qualities (NPWS 1998). These soils mainly occur in the Macquarie Park, North Ryde and Fox Valley areas of the valley which support tall forest communities that, due to land clearance and urbanisation, are now rare in the metropolitan area (NPWS 1998, 2006).

Other soils types in the Lane Cove valley include transitional zones from Wianamatta Shales to Hawkesbury Sandstone and an outcrop of prismatised sandstone with a tessellated surface, just north of De Burghs Bridge, which also supports uncommon vegetation types (NPWS 1998).

2.1.2 *Drainage*

The Lane Cove River and a number of smaller tributaries dissect the Lane Cove valley. The steep slopes of the valley are sometimes broken up by minor east - west running creeks and drainage lines. Slopes associated with the minor creeks are of medium to steep gradient.

2.1.3 *Flora*

The native bushland within the Lane Cove valley is mostly confined to the steeper slopes and foreshores. Much of the ridgetop vegetation has been impacted by urban development including residential and industrial development. Typical ridgetop vegetation includes heathlands and woodlands on sandstone soils and tall forests on clay soils. The slopes support woodland and forest on sandstone, tall forests in moist gullies and mangroves and open forest along the Lane Cove River.

LCNP contains a variety of vegetation communities, ranging from closed forests containing Lilly Pilly (*Acmena smithii*) and Blueberry Ash (*Elaeocarpus reticulatus*) and tall forests of Blackbutt/Sydney Blue Gum (*Eucalyptus pilularis/Eucalyptus saligna*), to open woodland and heath on upper slopes and mangroves along the river, particularly around Sugarloaf Point (NPWS 1998). *Table 2.1* lists flora species listed as threatened under the TSC Act that are known to occur in LCNP (NPWS 2007).

Table 2.1 Threatened Flora Species in Lane Cove National Park

Species Name	Common Name	TSC Act	EPBC Act	Habitat Type
Darwinia biflora	-	V	V	Open forest, woodland and heathland communities.
Callistemon linearifolius	Netted Bottle Brush	V	-	Grows in dry sclerophyll forest on the coast and adjacent ranges.
Epacris purpurascens var. *purpurascens*	-	V	-	Sclerophyll forests and woodland, usually near the coast, in sandy loamy soils on sandstone. In Mangrove Mountain and Sydney district.
Tetratheca glandulosa	Black-eyed Susan	V	V	Open forest or woodland communities with sparse understorey on or near ridgelines.
Pimelea curviflora var. *curviflora*		V	V	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.
Melaleuca deanei	Deane's Melaleuca	V	V	Marshy heaths on coastal sandstone plateaus or ridgelines

1. V = Vulnerable

The 1998 Plan of Management for LCNP lists seven flora species considered uncommon in the local area (NPWS 1998). Two of these species, *Epacris purpurascens* and *Melaleuca deanei,* have since been listed as threatened under the TSC Act. The other five species identified as uncommon include:

- *Boronia serrulata* - found in heathland on moist sandy soils;
- *Hibbertia nitida* - found in heath, woodland or forest on sandstone;
- *Prostanthera howelliae* - associated with sandy laterites;
- *Pultenaea scabra* var. *biloba* - mainly restricted to clay soils; and
- *Pultenaea viscosa* - associated with woodland communities on sandy soils.

2.1.4 Endangered Ecological Communities

Several of the plant communities found in LCNP are remnants of formerly widespread vegetation types and have local and regional conservation significance. The following endangered ecological communities occur within the LCNP:

- **Blue Gum High Forest –** listed as endangered under the TSC Act and as critically endangered under the EPBC Act. Occurrence in the Lane Cove Valley is restricted to one small stand on the junction of Terry's Creek and Lane Cove River;
- **Duffy's Forest –** listed as endangered under the TSC Act. Occurrence in the Lane Cove Valley is restricted to one small remnant within LCNP; and
- **Turpentine/Ironbark Forest –** listed as endangered under the TSC Act and as critically endangered under the EPBC Act. Occurrence in the local area is confined to small areas of the Lane Cove valley.

2.1.5 Fauna

Most of the fauna records for the Lane Cove valley come from LCNP, which provides a variety of habitats similar to those found throughout the Sydney sandstone region (NPWS 2006). The valley is also a significant fauna corridor linking Sydney Harbour and Parramatta River bushland area to the Berowra Valley and Hawkesbury River.

Surveys of fauna in the Lane Cove valley have recorded a considerable diversity of native birds, reptiles, amphibians, mammals and seven species of native freshwater fish, which have been recorded in the Lane Cove River above the weir. Fauna habitats of the valley include wet and dry sclerophyll forests, woodlands, shrublands, heath, wetlands and riparian forests. Artificial habitats include urban environments.

Threatened fauna species listed under the TSC Act that occur in LCNP are shown in *Table 2.2* (NPWS 2007). These species may also occur in suitable habitat in vegetation within the greater Lane Cove valley, which is not part of the LCNP.

Table 2.2 Threatened Fauna Species in Lane Cove National Park

Species Name	Common Name	TSC Act	Habitat Type
Ninox strenua	Powerful Owl	V	Forests and woodlands (requires tree hollows for roosting).
Callocephalon fimbriatum	Gang-gang Cockatoo	V, E	Vulnerable species and Endangered Population occurs in forest and woodland (requires hollows for breeding).
Botaurus poiciloptilus	Australasian Bittern	V	
Nettapus coromendelianys	Cotton Pygmy Goose	E	Deeper freshwater swamps, lagoons, lakes and dams with semi-emergent water plants. Nests high in tree with hollows near water. May be a vagrant to the park.
Pseudophryne australis	Red-crowned Toadlet	V	Coastal heath, low open woodland, open forest. Found under litter in ephemeral drainage lines and soaks.
Miniopterus schreibersii oceanensis	Eastern bent-wing Bat	V	Uses a diverse range of habitats including rainforests, wet and dry sclerophyll forests, monsoon forests, open woodlands, paperbark forests and open grasslands.
Pteropus poliocephalus	Grey-headed Flying-fox	V	Inhabits rainforest, woodland and forest and forages on Eucalyptus, Melaleuca and Banksia nectar and pollen and fruits of rainforest trees and vines. Also listed as Vulnerable under the EPBC Act.

1. V = Vulnerable, E = Endangered

2.1.6 Past and Present Land Uses

The Lane Cove valley was one of the first areas outside Sydney Harbour to be settled by Europeans. Early land uses included farms and orchards along the lower sections of the valley. Developments include farm buildings, roads, wharfs and sandstone walls. Parts of the valley have more recently been developed for residential, commercial, educational and industrial purposes. Lane Cove National Park was first opened to the public in 1938.

2.2 THE UTS KURING-GAI CAMPUS

The UTS Kuring-gai Campus is located in the Lane Cove valley in the northern suburbs of Sydney on a sandstone ridge that slopes away on all sides except the north. It is situated in a bushland setting, and buildings and car parking areas are interspersed throughout. The site is bound to the south, east and west by the LCNP and to the north by the 'Film Australia' site and residential lots.

2.2.1 Flora

The native vegetation within the site consists of remnant woodland, heathland and forest on ridges and slopes. This vegetation is contiguous with the LCNP and the site forms part of the catchments of Sugarbag, College and Blue Gum Creeks. College Creek is a steep sided gully with sandstone outcrops and cuts into the southwestern section of the site. Blue Gum Creek drains the southeastern part of the site and Sugarbag Creek drains the eastern sector. All these creeks are tributaries of the Lane Cove River.

The bushland associated with the site adjoins the narrow valley of LCNP. Much of the ridgetop vegetation in this area has been impacted by urban development including residential and industrial development (Film Australia and educational facilities) which in many areas has encroached on the remaining remnant bushland.

Weeds occur in varying densities throughout the site. Areas most impacted by weed invasion include creeks and areas where urban drainage lines create disturbance and supply weed propagules and nutrients.

2.2.2 Fauna Habitat

The native vegetation and other habitat features on the site (such as rock outcrops and drainage lines) provide potential habitat for a large range of fauna that are typical of Sydney Sandstone vegetation. This includes birds, mammals, reptiles and amphibians. The majority of these species are well conserved in the Sydney region, including in the adjacent LCNP.

2.2.3 Threatened Species and Communities

One threatened plant, *Darwinia biflora* and one threatened amphibian, the Red-crowned Toadlet, are known to occur on the site. The threatened Powerful Owl has been recorded on the site and would be likely to visit the site from time to time. Other threatened species that have potential to use the site from time to time include insectivorous bats and birds. All species that have been recorded on the site or with the potential to occur on the site are discussed in more detail in *Chapter 4.*

3 FLORA AND FAUNA ASSESSMENT METHODOLOGY

3.1 BACKGROUND

This report summarises previous flora and fauna assessments undertaken on the site and within surrounding areas. The flora and fauna assessments included database searches, reviews of past reports, field inspections, targeted surveys for Red-crowned Toadlets and *D. biflora,* consultation with DEC (now DECC), site engineers and bushfire consultants, and mapping of constraints and strategic Concept Plan / SSS Amendment options.

3.2 2003 INVESTIGATIONS

3.2.1 Field Survey

The purpose of field investigations undertaken in 2003 for this project was to supplement previous surveys undertaken at the site by ERM Mitchell McCotter (1999a,b) and to update information about the flora and fauna of the site, particularly threatened species.

A two-day field investigation of the site was undertaken by two ecologists on 13 and 14 October 2003 to confirm existing data on the flora and fauna values at the site, namely:

- to confirm the existence of the *D. biflora* in the areas identified by ERM Mitchell McCotter (1999a,b) during the preparation of the Parramatta Rail Link EIS and SIS;
- to undertake additional targeted surveys for threatened plants that have the potential to occur within the site in areas that are likely to be affected by future development based on the current Concept Plan / SSS Amendment design. These species included *D. biflora*, *Tetratheca glandulosa* and *Epacris purpurascens* var. *purpurascens*;
- to refine the location of the Red-crowned Toadlet breeding site surveyed by ERM Mitchell McCotter (1999b), and to identify the catchment for the breeding site;
- to identify any potential nesting trees for the Powerful Owl; and
- to identify habitat for any additional threatened species that have the potential to occur within the site.

3.2.2 Red-Crowned Toadlet Surveys

The following sites were surveyed for Red-crowned Toadlets by an amphibian specialist and a field assistant on the 1, 2 and 3 December 2003:

- the known Red-crowned Toadlet breeding location on the site (RCT1);
- three sites that had previously been identified as potential Red-crowned Toadlet breeding habitat (RCT 2, RCT3, and RCT 4); and
- three sites within LCNP that were selected as reference sites (selected in consultation with staff from NPWS at LCNP headquarters).

Survey locations within the site are shown in *Figure 4.1*. Surveys were undertaken during the daytime and at night. The daytime surveys included assessment of each site to record habitat information. Night time surveys included an initial five minute listening period followed by five minutes of call imitation to elicit a response, and a final five minute listening period.

3.2.3 Consultation

Consultation was undertaken with DEC in relation to the potential for any threatened species to occur on the site and the potential constraints that may result. ERM ecologists also liaised with an engineer from Patterson Britton Pty Ltd to identify the boundaries of the catchment of the Red-crowned Toadlet breeding site surveyed within the area by ERM Mitchell McCotter (1999b).

3.3 2007 INVESTIGATIONS

3.3.1 Database Searches

The NPWS Wildlife Atlas Database was searched for records of threatened species within 10 km of the site (within the locality). The results were plotted using a Geographic Information System (GIS). Updated database searches of the NPWS database were undertaken in 2007 to ensure all state-listed threatened species with the potential to occur within the locality were considered as part of the impact assessment for this project. Additional searches were also undertaken in 2007 for matters of NES that were either known, or that had potential to occur within, the locality.

3.3.2 Literature Review of Past Reports

A literature review of previous surveys, flora and fauna studies and maps including biodiversity information about LCNP and the surrounding area prepared by the NPWS was undertaken to identify the flora and fauna values of the site. Reports reviewed included the UTS Ku-ring-gai Rezoning and Concept Plan / SSS Amendment Report ERM (2004), Environmental Impact Statement (EIS) and Species Impact Statement (SIS) for the Parramatta Rail Link (ERM Mitchell McCotter 1999a,b). Current plans and strategies reviewed included the LCNP Plan of Management (NPWS 1998) and the LCNP Fire Management Startegy (NPWS 2006) and the DEC (2004b) Survey of the Vertebrate Fauna of LCNP.

3.3.3 Consultation - Bushfire

Consultation on site between CRI, ERM and bushfire consultant Barry Eadie has been undertaken on two occasions, in July and August 2007, to ensure that the objectives of conservation within the APZ could be achieved in conjunction with management of fuel levels and the creation of a fire trail at the site.

During the site inspections the location of the fire trail was microsited to ensure that the detailed design considered the appropriate management of threatened species habitat within the APZ. Consultation since the time of the site inspections has been ongoing, to ensure that the bushfire and ecological outcomes are integrated.

3.3.4 Mapping

Locations of ecological constraints identified as a result of the database and literature review, field inspection and liaison were mapped on an aerial photograph using GIS. The current Concept Plan / SSS Amendment for the site was overlayed on the aerial photograph using GIS so that ecological constraints could be accurately located in relation to the Concept Plan / SSS Amendment and accurate impact assessments could be undertaken.

4 ECOLOGY OF THE STUDY AREA

This chapter describes the flora and fauna of the site, and includes information obtained from previous surveys and surveys undertaken for this report.

4.1 VEGETATION

Within LCNP, three major types of vegetation community occur; woodlands, eucalypt forests and saltmarsh/mangroves. Woodland and shrubland communities grow on the upper slopes and ridges where the poorer skeletal soils derived from sandstone occur. Eucalypt forests are found in sheltered gullies, with mangroves and saltmarsh occurring within tidal sections of the river.

Native vegetation on the site is located mostly around the perimeter of the site and is contiguous with the LCNP and other private land. This native vegetation is relatively undisturbed and weeds are restricted to the edges or along the drainage lines where stormwater outlets discharge from the site.

Some remnant native vegetation including trees, shrubs, grasses and herbs have been retained and managed in a number of gardens within the campus and on islands in the car parks. Introduced and native species have also been cultivated in some gardens around the site.

Four vegetation communities were mapped on the subject site by ERM Mitchell McCotter (1999b) and these are shown in *Figure 4.1*. These communities include:

- Heath-leaved Banksia/Scribbly Gum Closed Shrubland;
- Sydney Red Gum/Sydney Peppermint/Red Bloodwood Open Forest;
- Sydney Red Gum/Sydney Peppermint Forest; and
- Blackbutt/Blue Gum Tall Forest.

None of these vegetation communities are listed as endangered under the TSC Act or EPBC Acts. They are considered to be relatively well conserved in LCNP and the Sydney region.

Legend

- Study Area
- Rufous Fantail
- Red-crowned Toadlet
- Red-crowned Toadlet Survey Transects
- *Darwinia biflora ERM 2003*
- *Darwinia biflora ERM 1999*
- Daytime Roost of Powerful Owl
- Potential Roosting Habitat of Powerful Owl ERM 1999

- Blackbutt/Blue Gum Tall Forest
- Sydney Red Gum/Sydney Peppermint/Red Bloodwood OF
- Sydney Red Gum/Sydnet Peppermint Forest
- Heath-leaved Banksia/Scribbly Gum Closed Bushland

Figure 4.1

Flora and Fauna of the Site

Client:	CRI Australia Pty Ltd	
Project:	UTS Kuring-gai Concept Plan/SSS Amendment	
Drawing No:	0034033s_GIS02	
Date:	19/08/2007	Drawing Size: A4
Drawn By:	DH	Reviewed By: RB
Source:	-	
Scale:	Not to scale	

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4.1.1 Trees

An Arborist assessment and report was undertaken to locate and map groups of significant trees within the site, based on Ku-ring-gai Councils *Tree Preservation Order* (TPO), which was prepared under the provisions of the EP&A Act.

4.2 FAUNA

4.2.1 Fauna Habitats

Habitats of value to native fauna are generally associated with the woodland, forest and scrub vegetation and the creeklines within the site. This includes vegetation and other habitat features such as rock outcrops and drainage lines. These features provide potential habitat for a large range of fauna that are typical of Sydney Sandstone vegetation in the Sydney Basin bioregion. The majority of these species are well conserved in the Sydney region, including in the adjacent LCNP.

Disturbed habitats such as the edges of bushland and weed-infested drainage lines generally support populations of native and exotic species that are common in urban/rural environments. The broad fauna habitats of the study area are shown in *Figure 4.1*.

4.2.2 Fauna Species

Mammals

A number of native mammal species are found in LCNP despite its urban location. These include the Brushtail Possum (*Trichosurus vulpecula*), Ringtail Possum (*Pseudocheirus peregrinus*), Sugar Glider (*Petaurus breviceps*), Swamp Wallaby (*Wallabia bicolor*), Brown Antechinus (*Antechinus stuartii*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Long-nosed Bandicoot (*Perameles nasuta*) and microchiropteran bats (DEC 2006b).

Birds

Over 40 species of native birds have been recently recorded within LCNP, which provides a refuge within the Sydney metropolitan area for many native birds (DEC 2004b). Many of these species would also utilise the bushland on the site because similar habitats to those of the LCNP occur on the site.

Vegetation with thick understorey on the site would provide habitat for common birds such as the Superb Fairy Wren (*Malurus cyaneus*), White-browed Scrubwren (*Sericornis frontalis*) and the Eastern Spinebill (*Acanthorhynchus tenuirostris*). Open woodland and forest areas (including the remnant vegetation within landscaped areas on the site) supporting a more open understorey would provide habitat for common species such as the Noisy Miner (*Manorina melanocephala*), Willie Wagtail (*Rhipidura leucophrys*), Spotted Pardalote (*Pardalotus punctatus*) and common canopy species such as the Laughing Kookaburra (*Dacelo novaeguineae*), Eastern Rosella (*Platycercus eximius*), Crimson Rosella (*P. elegans*), Rainbow Lorikeet (*Trichoglossus haematodus*), Galah (*Cacatua roseicapilla*), Pied Currawong (*Strepera graculina*), Raven (*Corvus coronoides*), Magpie (*Gymnorhina tibicen*) and Sulphur-crested Cockatoo (*Cacatua galerita*). These are species that are able to survive on the urban/bushland interface and are relatively common within these interfaces around Sydney.

Other less common species recorded in LCNP that may also utilise the woodland and forest habitat on the site include the Azure Kingfisher (*Alcedo azurea*), Sacred Kingfisher (*Todiramphus sanctus*), Forest Kingfisher (*T. macleayii*), Boobook Owl (*Ninox boobook*) and White-faced Heron (*Ardea novaehollandiae*).

Although a number of waterbirds such as ducks, moorhens, coots and cormorants occur in LCNP, the site does not provide habitat for these species and it would not be significant foraging, breeding or roosting habitat for these species.

The threatened Powerful Owl (*Ninox strenua*) has been recorded in the Lane Cove valley and on the site. The threatened Gang-gang Cockatoo (*Callocephalum fimbriatum*) also occurs within the LCNP. The Gang-gang Cockatoo is listed under the TSC Act as vulnerable and the population that occurs within the Hornsby and Ku-ring-gai LGAs is listed as endangered, being significant because it is the last known breeding population in the Sydney Metropolitan area (DECC 2004).

Reptiles and Amphibians

Approximately 24 species of reptile have been recently recorded in LCNP (DEC 2004b). These are species that are typical of Sydney Sandstone vegetation on the Hornsby Plateau and which are also likely to occur on the bushland on the site and include the Southern Leaf-tailed Gecko (*Phyllurus platurus*), Eastern Brown Snake (*Pseudonaja textilis*), Red-bellied Black Snake (*Pseudechis porphyriacus*), Diamond Python (*Morelia spilota*) and the Eastern Blue Tongue Lizard (*Tiliqua scincoides*).

Eight frog species have been recently recorded in LCNP including the threatened Red-crowned Toadlet, which has also been recorded on the site. Other frog species that are likely to occur on the site include Peron's Tree Frog (*Litoria peronii*) and the Common Eastern Froglet (*Crinia signifera*).

4.2.3 Corridors

Corridor Function

A corridor is defined as a linear landscape element that connects two or more patches of habitat that have been connected in historical time (Soule and Gilpin 1991). As such, corridors are features that help to overcome the effects of habitat fragmentation.

Corridors allow birds and animals to move from one place to another through:

- allowing the flow of genes between populations that would otherwise be isolated, which may prevent in-breeding and hence local or regional extinction;
- allowing species to forage over a much wider area, expand their home range and maintain seasonal movements and migration;
- enabling native flora and fauna to recolonise habitat that has been burnt, or to colonise regenerating habitat, from existing habitat areas; and
- provision of habitat in which native birds and animals can live permanently and which may be the only areas where species which rely on this habitat type can survive.

Lane Cove Valley

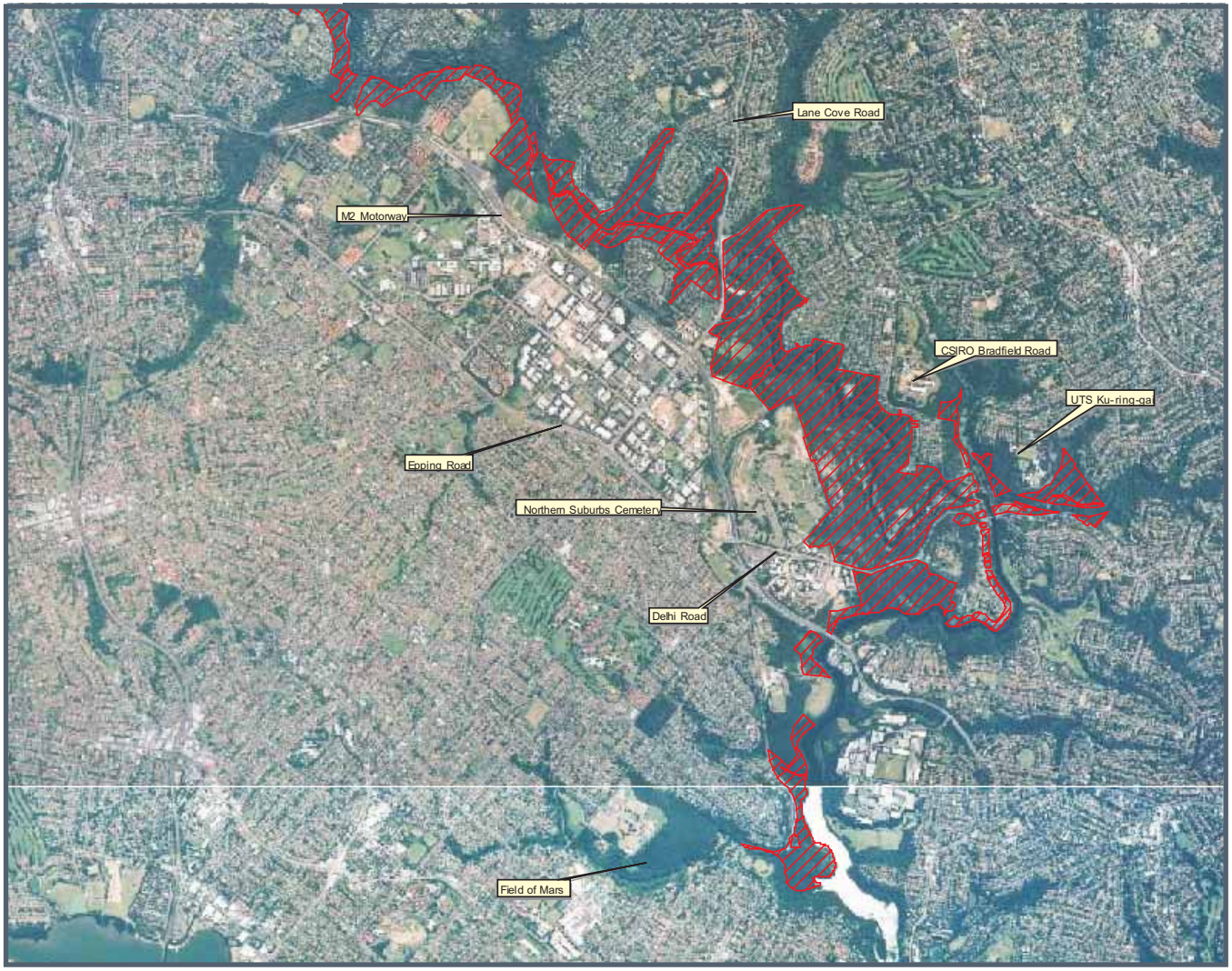
Bushland in the Lane Cove valley (including LCNP) forms an important part of a wider nature conservation corridor linking Sydney Harbour and Parramatta River bushland areas to the Berowra Valley and the Hawkesbury River (NPWS 2006). The majority of the bushland in this corridor is within LCNP.

Lower Lane Cove Valley

The corridor is at one of its widest sections in the Lower Lane Cove Valley at Fullers Bridge (see *Figure 4.2*). This section is bounded by the Northern Suburbs Cemetery in the west and the developed areas around Blue Gum Creek (Chatswood West and Lindfield) in the east. The site is located on the eastern side of this section on a spur between Blue Gum Creek and Little Blue Gum Creek and thus forms part of this corridor.

This section of the corridor is irregular in shape and suffers disturbance in terms of weeds, feral animals, edge effects and associated impacts from construction for the Parramatta Rail Link on Lady Game Drive. However, it is mostly natural vegetation that has persisted in the area despite these disturbances. The corridor is also likely to be large enough to provide habitat for a range of flora and fauna and supports a number of different types of habitats for non-migratory fauna species that are typical of Sydney Sandstone vegetation, including threatened species.

It also forms part of a larger movement corridor for nomadic and migratory species. Mobile species such as birds and bats would also use this corridor as a link between more natural habitats in the Lane Cove valley.



Legend

Lane Cove N.P.

Figure 4.2

Bushland Areas
Lower Lane Cove Valley

Client:	CRA Australia Pty Ltd	
Project:	UTS Kuring-gai Concept Plan	
Drawing No:	0034033s_01	
Date:	22/08/2007	Drawing size: A4
Drawn by:	GC	Reviewed by: -
Source:	NPWS (2003)	
Scale:	Refer to Scale Bar	

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5 THREATENED, SIGNIFICANT AND MIGRATORY FLORA AND FAUNA

This chapter provides an assessment of the threatened, locally or regionally significant and migratory species that are known to occur, or potentially occur at the site. This assessment is designed to identify those species that are most likely to be impacted by any proposed development of the site and to provide details on the distribution and abundance of these species.

A consideration of the likelihood of species and communities listed under the TSC Act and EPBC Act occurring on the site is provided in *Table B.1* in *Annex B*. The likelihood of these species occurring on the site was assessed based on the known habitat requirements of these species and the habitat present on the site.

Species that are known to occur, or that have the potential to occur, on the site are discussed in the following sections. Assessments of significance of impact under Part 3a of the EP&A Act on these species were undertaken and are provided as *Annex C* to this report.

No species listed as Marine Protected Species or species that are obviously marine species listed in *Annex A* are likely to occur on the site and therefore these species are not included in *Table B.1* and are not assessed further. No Migratory Wetland species listed in *Annex A* are included, since there is no wetland habitat on the site. No species listed under the NSW *Fisheries Management Act 1994* (FM Act) are likely to occur on the site.

5.1 THREATENED FLORA SPECIES

5.1.1 *Darwinia biflora*

Only one threatened plant, the shrub *D. biflora*, is known to occur on the site. The *D. biflora* on the site appear to be restricted to scattered patches where there is a shallow capping of yellow sandy/shale soil, over sandstone or grey sandy soil.

The locations of *D. biflora* plants on the site are shown in *Figure 4.1*. Plants represented by hatching were identified in 1999 (ERM Mitchell McCotter 1999a) and plants represented by orange diamonds were identified during surveys undertaken in 2003. 2003 recorded locations include remnant bushland in the car park in the north west of the site and bushland directly south of the car park (in the south west of the site). *Photographs 5.1* to *5.3* shows one of the plants recorded within the car park in the north west.

Ongoing disturbance (such as trampling and underscrubbing) of habitat within the campus grounds is likely to be impacting on recruitment of this small shrub, as not all sites where the species was recorded in 1999 still retain adult plants. However, seeds may still be present within the soil seedbank.

Photograph 5.1 D. biflora within the car park – north west of the site

Photograph 5.2 Growth form of D. biflora– north west of the site

Photograph 5.3 D. biflora flowers, August 2007 (ERM 2007)

A number of other threatened flora species are known from the locality (see *Table B.1*), but have not been recorded on the site. Due to the level of both general and targeted flora surveys conducted on the site it is considered that any threatened flora species that may occur on the site would have been detected.

5.2 *THREATENED FAUNA SPECIES*

Two threatened fauna species, the Powerful Owl and the Red-crowned Toadlet have been previously recorded on the site. The species that are known to occur in the locality are listed in *Table B.1*, along with their conservation status, habitat requirements and an assessment of the likelihood that these species would occur on the site. This assessment was based on the following criteria:

- the species is known to occur on the site;
- the species is known to occur in similar habitats nearby in the Lane Cove valley or in LCNP and has the potential to be impacted by the proposed development;
- the species has been recorded within the last ten years within the locality; and
- habitats for the species occur on or close to the site and are likely to be impacted by any proposed development.

Details of the known or potential distribution and abundance of threatened species that have been recorded on the site or that have a high potential to utilise habitats on the site on occasions are provided below.

5.2.1 *Red-crowned Toadlet*

The Red-crowned Toadlet breeds in Sydney Sandstone vegetation usually along small first and second order creeks just below the ridgeline. Foraging and refuge habitat for this species are usually located on the ridgetops although cliffs, and rock outcrops on slopes adjacent to the breeding habitat are used.

A recorded breeding site for this species occurs on the site and its location is shown in *Figure 4.1*. During the habitat assessment undertaken for this report, potential breeding sites were identified on the site and are also shown in *Figure 4.1*. These potential breeding sites, and the recorded breeding site, were subsequently surveyed for the Red-crowned Toadlet during appropriate weather conditions. This included surveys of control sites in LCNP, so that the likelihood of the occurrence of this species on the site could be assessed (ERM 2004).

The Red-crowned Toadlet was not recorded at either the identified breeding site or any of the potential breeding sites within the site during surveys in 2003. It was recorded in the control sites in LCNP. Therefore, because the weather conditions were appropriate and this species was calling from the control sites in LCNP, it is likely that it does not use the potential or recorded breeding sites on the site.

However, because the Red-crowned Toadlet has been recorded in the past at the recorded breeding site, it was considered possible that individuals were still present in potential overwintering and foraging habitat, including ridgetops, cliffs and rock outcrops adjacent to the breeding site (Ehmann 1997).

5.2.2 Powerful Owl

The Powerful Owl inhabits both wet and dry sclerophyll forest and requires hollows that are 1.5 to 2 m in length or depth for nesting, either in a limb or tree trunk, usually in large eucalypts. It is a generalist predator feeding mainly on arboreal mammals, but will also take ground-dwelling mammals.

This species has not been recorded breeding on the site or in adjacent areas. There are no trees within the site that are a suitable size or with suitable hollows that may provide potential breeding habitat for the Powerful Owl.

The Powerful Owl has been detected on the site roosting on a tree branch during the daytime (*Figure 4.1*) (ERM Mitchell McCotter 1999a). Potential foraging and roosting habitat for Powerful Owls includes woodland and forest vegetation on and around the site.

It is likely that a breeding pair still exists within the Lane Cove valley and uses the site from time to time. The vegetation on the site would support foraging and daytime roosting habitat within its territory. This habitat is relatively small in comparison to the foraging, roosting and nesting habitat available within the Lane Cove valley and in LCNP.

5.2.3 Grey-Headed Flying-Fox

The Grey-headed Flying-fox has been recorded in bushland south west of the site and west of Delhi Road (ERM Mitchell McCotter 1999a). This species inhabits rainforest, woodland and forest and forages on *Eucalyptus*, *Melaleuca* and *Banksia* nectar and pollen and fruits of rainforest trees and vines.

It roosts in large aggregations or 'camps' of up to tens of thousands of animals, depending upon the abundance of locally available food sources. Site fidelity is high and some camps in NSW have been used for over a century. No camps are present on the site.

This species may use the site and adjacent LCNP for foraging. The site would not consist of significant foraging habitat for this species compared to the habitat available within LCNP.

5.2.4 Glossy Black-Cockatoo

The Glossy Black-cockatoo (*Calyptorhynchus lathami*) inhabits forest with large tree hollows for breeding and requires particular *Allocasuarina* species for foraging. The drier forest types with intact and less rugged landscapes are preferred by the species, which shows a preference for tall eucalypts in more open forest types.

The site provides some potential foraging habitat for this species. However, no potential breeding habitat for the Glossy Black-cockatoo will be affected by the proposed development, as there are no suitable hollows on the site.

Because there are some small stands of *Allocasuarina* species on the site in the Heath-leaved Banksia/Scribbly Gum Closed Shrubland, there is some potential for this species to forage from time to time on the site. However, the site is not likely to be significant for this species since it is very wide ranging and more extensive stands of *Allocasuarina* occur in Ku-ring-gai Chase National Park and Berowra Valley Regional Park, which would be within the home range of any Glossy Black-cockatoos that would visit the Lane Cove valley. However, the Glossy-black Cockatoo has not been recorded within the nearby LCNP and no foraging signs of this species (chewed cones of *Allocasuarina*) have been previously recorded on the site.

5.2.5 Swift Parrot and Regent Honeyeater

These species are known to follow flowering of Box-Ironbark woodlands on the western slopes and also coastal Spotted Gum (*Corymbia maculata*) and Swamp Mahogany (*Eucalyptus robusta*) in forests during the winter months. Therefore, the site is not likely to be of special foraging significance, especially given the large expanse of similar vegetation in the adjacent LCNP. Neither species is known to breed or is likely to breed on the Hornsby Plateau and the site does not provide suitable breeding habitat for these species (see *Table B.1*).

5.2.6 Insectivorous Bats

The following threatened insectivorous bats have been recorded in the locality (NPWS Wildlife Atlas 2007):

- Large Pied Bat (*Chalinolobus dwyeri*);
- Large Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*); and
- Eastern Freetail-bat (*Mormopterus norfolkensis*).

Only the Large Bent-wing Bat has been recorded within the adjacent LCNP. It is unknown whether any of these species occur on the site, but using the precautionary principle, this assessment will assume that the species occur on site, primarily for foraging, as there are a limited number of hollow-bearing trees or other structures that would be suitable for nesting.

The Large Pied Bat roosts in caves, underground mines and unused bird nests and uses woodland and forest for foraging. The site does not provide suitable roosting habitat for this species. The site represents a relatively small area of foraging habitat. This habitat type is also present within Lane Cove valley and LCNP.

The Eastern Bentwing-bat uses a diverse range of habitats including rainforests, wet and dry sclerophyll forests, monsoon forests, open woodlands, paperbark forests and open grasslands (Churchill 1998). It roosts in caves or tunnels and has highly specific environmental requirements for nursery caves. This species is likely to forage within the Lane Cove valley. The site would represent a relatively small area of foraging habitat for this species within the Lane Cove valley and within LCNP.

The Yellow-bellied Sheathtail-bat roosts in tree hollows, abandoned nests of Sugar Gliders and animal burrows and uses almost all habitats including forest and woodland for foraging. The site represents a relatively small area of such habitat within the valley.

The Eastern Freetail-bat roosts in tree hollows, crevices, under bark, caves and buildings and forages in wet and dry eucalypt forest, woodland and rainforest. The site represents a relatively small area of such habitat within the Lane Cove valley.

5.3 REGIONALLY SIGNIFICANT SPECIES

The adjacent LCNP provides a variety of habitats and is important for the conservation of local populations of a range of native fauna species. This is because the area surrounding the Lane Cove valley has been developed in the past and flora and fauna habitat in the valley is restricted to LCNP and adjacent bushland. None of the plant species considered uncommon in the local area (see *Section 2.1.4*) were detected within the site during surveys undertaken for this project.

The Systematic Survey for Vertebrate Fauna of LCNP (DEC 2004b) identified three species of mammal of regional significance. Two of these, the Bush Rat (*Rattus fuscipes*), and Brown Antechinus (*Antechinus stuartii*) had not previously been recorded within the study area. The Long-nosed Bandicoot (*Perameles nasuta*) was also recorded and this holds conservation significance, as the species has largely disappeared from more densely populated parts of the Sydney Metropolitan area, between Sutherland and Brookvale (DEC 2004b).

The Long-nosed Bandicoot has been observed within native vegetation on the site during surveys undertaken for this project. Evidence of foraging by this species (conical holes made from digging for invertebrates, roots and fungi) was also observed. No trapping for small ground-dwelling mammals was undertaken during surveys of the site. However, there is the potential for both the Bush Rat and the Brown Antechinus to occur within areas where ground debris is present within the bushland areas.

5.4 MIGRATORY SPECIES

Some species may utilise the habitats at the site on an occasional or seasonal basis. For these species, the habitats within the site may provide resting/roosting points during migration.

Migratory species are protected under international agreements and are protected under the Commonwealth EPBC Act. Migratory species that have been recorded on the site, in the locality or for which suitable habitat occurs on the site are listed in *Table 5.1*. A discussion of their habitat preferences and the likelihood of these species utilising habitats within the site is also provided in *Table 5.1*.

Table 5.1 Migratory Species

Species	Habitat	Habitat on the site and in LCNP	Recorded at the site?
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	Estuaries, inlets, large rivers, inland lakes. Nests in tall live tree near water.	Possibly visits the site. No known nests on site and very limited foraging habitat.	No
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, lakes, towns. Regular summer migrant to eastern Australia.	Likely to forage over the site and LCNP.	No
Black-faced Monarch (*Monarcha melanopsis*)	Rainforest, eucalypt woodland, coastal scrubs, open woodland when migrating.	Likely to utilise woodland habitats on the site and in LCNP.	No
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated forests, taller woodland. Coastal forests, woodlands, trees in open country during migration.	Suitable migratory habitat on the site and in LCNP.	No
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests, wetter eucalypt forests, gullies, paperbarks, coastal scrubs. Farms, streets and buildings during migration.	Suitable habitat within the woodland on the site and in LCNP.	Yes
Regent Honeyeater (*Xanthomyza phrygia*)	Dry open forests, woodlands, trees on farmlands, streets.	Marginal foraging habitat on the site and in LCNP.	No

1. General habitat descriptions taken from Pizzey and Knight (1997)

6 IMPACT ASSESSMENT AND ECOLOGICAL STRATEGIES

6.1 INTRODUCTION

This section discusses the potential impacts of the proposed development on native flora and fauna. A general discussion of direct and indirect impacts on flora and fauna is provided followed by a discussion of proposed impact mitigation measures.

Potential impacts resulting from the proposed development include the removal of approximately 2.8 ha of flora and fauna habitat and a small reduction in the amount of bushland in the Lane Cove valley. Potential indirect impacts include an increase in stormwater run-off, erosion, weeds, feral and domestic animals and potential changes in fire regime.

The majority of these impacts will be avoided or mitigated. Mitigation measures have been developed during the Concept Plan / SSS Amendment process to ensure that species, communities and habitats of conservation significance are not compromised by the proposed development. Proposed measures include a series of management strategies for biodiversity, weeds and feral animals and fire to be prepared as an integral component of development.

Specific management of threatened species and their habitats will be addressed in a Threatened Species Management Plan devised as part of the proposed development. General conservation and management measures are provided in this chapter.

6.2 THREATENED SPECIES IMPACT ASSESSMENTS

A number of threatened species were found to occur, or to have the potential to occur, on the site and consequently assessments of impact were undertaken for the following species:

- *D. biflora*;
- Red-crowned Toadlet;
- Powerful Owl;
- Gang-gang Cockatoo;
- Glossy Black-cockatoo;
- Grey-headed Flying-fox; and
- Microchiropteran bats.

The assessments concluded that the proposal would be unlikely to result in significant impacts to threatened species, provided the proposed impact mitigation and management measures are implemented as part of the proposal. The assessments are provided in full in *Annex C*.

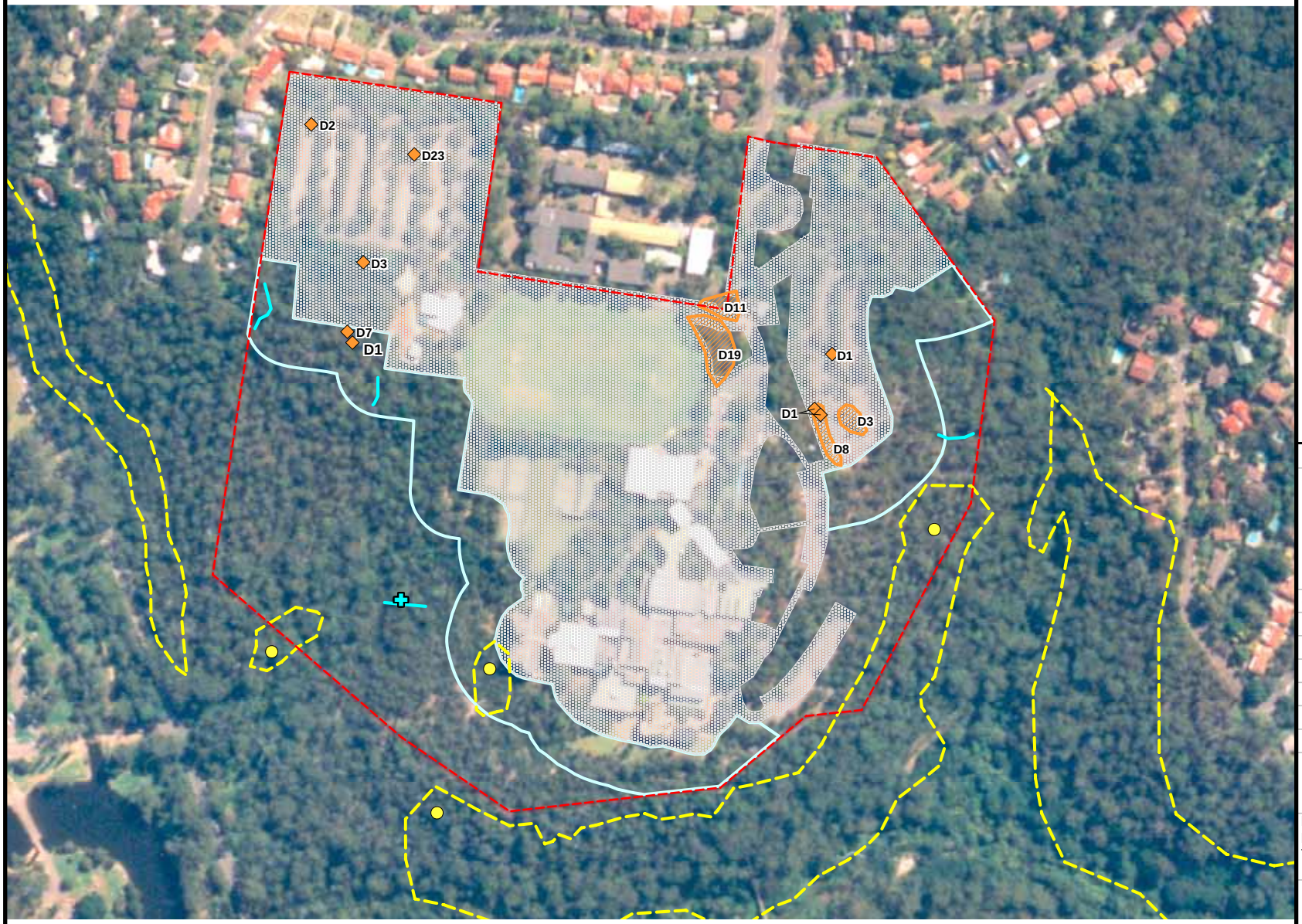
6.3 DIRECT IMPACTS AND MITIGATION MEASURES

Development will result in some direct impacts to native flora and fauna over a relatively small area of the site. Potential direct impacts would include removal of a relatively small area of bushland for construction of residential buildings and infrastructure (approximately 2.8 ha) and a fire trail (approximately 0.24 ha) and modification of some bushland for an Asset Protection Zone (approximately 1.3 ha). The Concept Plan / SSS Amendment layout and Asset Protection Zone are shown in *Figure 6.1*.

Table 6.1 shows the areas in hectares of each vegetation type identified within the site that may be removed under the proposal. The three vegetation types that are likely to be affected by the proposal are considered to be widespread in the region. The area of each vegetation type that exists within LCNP is also provided as a comparison of the area to be removed (or modified within the APZ) from the site as a result of the proposal. The proposal would result in a relatively small reduction (0.37 %) in the size of these vegetation types from the Lane Cove valley.

Table 6.1 Area of Vegetation Type within LCNP and within the Concept Plan / SSS Amendment footprint

Vegetation Type/Land Use	LCNP	Existing on Site	Concept Plan / SSS Amendment Area	APZ (includes fire trail)	Total removed or modified within site (%)	Total removed or modified as percent of available within LCNP (%)
	hectares	**hectares**	**hectares**	**hectares**	**Percent**	**Percent**
C4 – Heath-leaved Banksia/Scribbly Gum Closed Shrubland	25.9	5.0	1.15	2.0	63	12
C2 – Sydney Red Gum/Sydney Peppermint/Red Bloodwood Open Forest	522.2	1.0	0.1	0.1	20	0.04
C3 – Sydney Red Gum/Sydney Peppermint Forest	147.5	3.0	0.05	0.7	25	0.05
B2 – Blackbutt/Blue Gum Tall Forest	409.4	0.1	0	0	0	0
Currently Developed Areas		11.7				
Total	**1,106.2**	**20.8**	**1.3**	**2.8**	**45**	**0.37**



Legend

- Study Area
- Red-crowned Toadlet
- Red-crowned Toadlet Survey Transects
- *Darwinia biflora*
- *Darwinia biflora* ERM 1999
- Powerful Owl Recorded Daytime Roost
- Potential Roosting Habitat of Powerful Owl ERM 1999
- Asset Protection Zone - New
- Concept Plan Developed Area

Figure 6.1

Concept Plan

Client:	CRI Australia Pty Ltd	
Project:	UTS Kuring-gai Concept Plan/SSS Amendment	
Drawing No:	0034033s_GIS03	
Date:	20/08/2007	Drawing Size: A4
Drawn By:	DH	Reviewed By: RB
Source:	-	
Scale:	Not to scale	

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6.3.1 Development Area

The nature of the proposal means that direct impacts within the development area (shaded orange in *Figure 6.1*) on native flora and fauna would be unavoidable. Proposed mitigation measures to reduce the significance and magnitude of impacts include:

- retention of areas of native vegetation and habitat for threatened flora and fauna within the site, including retention of *D. biflora* plants and habitat;
- fencing and flagging of all *D. biflora* plants to be retained within the development area;
- translocation of soil from *D. biflora* habitat where this will be impacted by the development area. Translocation will be detailed within a plan prior to any works beginning on the site;
- fencing during construction of all areas of native vegetation that will not be removed for development, as protection from machinery and personnel;
- where possible, retention and protection of trees, particularly hollow bearing trees, within the development area;
- retention of existing understorey vegetation within landscaped areas. These pockets will be rehabilitated as required to remove exotic species and enhance native shrub and ground covers;
- preclearance surveys by ecologists to ensure fauna are removed prior to clearance, and ecologists on site during all vegetation clearance activities to capture any displaced fauna; and
- harvesting of seed banks for the purposes of on-site regeneration. Greening Australia would be consulted regarding the best way to salvage soil seeds and canopy held seeds. These could be used in landscaping or regeneration of disturbed bushland areas adjacent to developed areas.

6.3.2 APZ

The Asset Protection Zone (APZ) proposed for the site consists of an Inner Protection Area (IPA) and an Outer Protection Area (OPA) resulting in a total APZ width of 50 m. Management of the APZ is described in greater detail within the Bushfire Management Report (Eadie 2007).

Two site visits were undertaken by ERM ecologists in conjunction with bushfire consultant Barry Eadie of Barry Eadie Consulting Pty Ltd and CRI Pty Ltd, to ensure that areas of ecological significance will not be impacted by the creation and maintenance of the APZ at the site. In addition, the areas impacted by the proposed fire trail widening were microsited to ensure that all habitat considered to be significant was avoided.

The APZ at the site will be approximately 50 m in width. The removal of some trees will result from the construction of the fire trail but removal of trees from the APZ will not be necessary, as the canopies are sufficiently spaced so as not to create increased bushfire threat (B. Eadie *pers. comm.*).

Small shrubs and ground cover species such as *D. biflora* will be retained within clumps of vegetation throughout the APZ. These clumps of vegetation will measure a minimum of 2 m in diameter. Existing bushrock would be retained within the APZ since it provides a natural fire retardant and provides important habitat for native fauna

Removal of leaf litter is the primary management measure required for the APZ and this will be removed by hand to avoid soil disturbance and potential erosion and sedimentation. There will be no requirement for hazard reduction burns within the APZ. All riparian habitats will also be retained and avoided, ensuring that the Red-crowned Toadlet habitat is not impacted by APZ or fire trail creation and maintenance.

The following specific measures to avoid and minimise impacts on flora and fauna for fire trail and APZ creation and maintenance will be implemented at the site:

- prior to any clearance for APZ and fire trail creation, a survey will be conducted to identify any hollow-bearing trees or trees considered to provide important fauna habitat. Such trees will be flagged and locations recorded with a GPS and mapped. These trees will be avoided;

- all *D. biflora* will be flagged and locations recorded with a GPS and protected. A map and works plan will then be devised prior to any vegetation clearance or modification for APZ creation. Areas within the APZ where soil seed banks or plants could be translocated will also be investigated and identified prior to any works beginning ;

- small shrubs and ground cover to 50 cm will be retained within the APZ. Larger shrubs can be retained in vegetation clumps where they will not result in fire spreading to tree canopies;

- erosion and sedimentation controls will be put in place prior to any works beginning to ensure that any potential increase in runoff from removal of vegetation or leaf litter does not impact on downstream or off-site environments;

- rocky outcrops and rock will be avoided by the fire trail. No rock will be removed from the APZ or fire trail areas; and

- wooden bridges will be built over the drainage lines on site for construction of the fire trail so that these environments are not disturbed.

6.3.3 Corridors

The site is located on the eastern side of the widest point of Lane Cove valley corridor, the majority of which is within LCNP (*Figure 4.2*). The proposal would result in a small decrease in the amount of vegetation within this corridor. However, this is not likely to prevent the use of the corridor by migratory and nomadic species because a relatively large area of similar habitat that these species would use would remain at this part of the corridor.

This section of the corridor is also likely to be large enough in itself to provide habitat for a wide range of flora and fauna species that are typical of Sydney sandstone vegetation.

To minimise the impact of the Concept Plan / SSS Amendment on corridor function, significant trees will be retained within the development area where possible and trees will be retained within the APZ. Indirect impacts on bushland such as weeds, feral and domestic animals and fire will be managed by implementation of management plans. As a result, the negative impact of these processes on the site is likely to be minimal.

Landscaping with local native species will also help to provide some level of habitat that would help facilitate the movement of native fauna. It is likely that non-migratory species that currently use this habitat for movement, will be able to continue to use the corridor.

6.4 INDIRECT IMPACTS AND MITIGATION MEASURES

There are a range of potential indirect impacts of the proposed development on native flora and fauna. These potential indirect impacts are detailed in the following sections, along with measures to mitigate them.

6.4.1 Stormwater Run-off and Erosion

Stormwater measures will be incorporated into the development to ensure that there is no net adverse impact upon the water quality in College Creek or Blue Gum Creek, or the drainage lines that run through the site, and to ensure that post-development peak run-off rates do not exceed those for existing conditions. This includes stringent controls during the construction period.

To comply with these requirements, a range of measures will be implemented including the following:

- above-ground swales are to be constructed and vegetated with native species and will conserve indigenous flora wherever possible;
- water detention areas are to be provided within the development area; and
- an erosion and sediment control plan is to be prepared for the subdivision development and dwelling construction phases. This plan is to be formulated in accordance with acceptable standards and is to ensure that the development does not contribute to environmental damage of the waterways, bushland or air quality.

The following measures will be undertaken to ensure that the riparian vegetation is suitable as habitat and as a movement corridor for native species:

- the native tree canopy will be retained and, where necessary, enhanced to ensure that riparian habitat (including College Creek) is retained; and
- a Weed Management Plan and control measures will be implemented to remove noxious and environmental weeds from the creek corridors, and only species native to the local area will be used in any landscaping within the development area.

More detailed information on these measures is contained within the Patterson Britton & Partners (2004).

6.4.2 Weeds

Weeds currently exist throughout the site, and are concentrated in bushland areas below stormwater outlets. Development of the site has potential to create conditions favourable to the spread and establishment of weeds. Particular hazards include:

- soil disturbance and stock piling during construction;
- introduction and spread of weed propagules from vehicles and machinery during construction;
- spread of invasive species into LCNP if used in landscaping/gardens; and
- increased run-off and nutrient laden runoff carrying seed into LCNP.

The control and management of weeds will be addressed within a Weed Management Plan that would be prepared for the proposed development as part of subsequent approval, and would link in with stormwater control strategies. This plan would address weed control measures for noxious and environmental weeds that currently exist on the site, strategies to avoid and minimise the potential for weed spread and establishment during construction, and controls to prevent weed invasion into LCNP after the construction phase.

This is most likely to result in improved weed control on the site and significantly decrease the current impacts of weeds on the site, in particular within the riparian areas, and on adjacent areas including LCNP.

6.4.3 Feral and Domestic Animals

Feral and domestic/stray animals currently occur on the site. These are likely to include foxes, dogs, cats, rabbits, black rats and house mice. Feral and domestic animals can impact on native flora and fauna through predation, competition and soil degradation and by disturbing foraging and nesting patterns.

Development of the site would have the potential to increase feral animal populations, and may result in an increase in the number of domestic animals within the study area. Particular hazards include:

- encouraging feral animals by providing foraging/scavenging opportunities;
- encouraging feral animals by providing sheltering/nesting habitat such as stock piles of building materials and cleared vegetation;
- predation on native fauna by domestic cats; and
- disturbance to foraging and nesting of native fauna by unrestrained dogs.

Management of feral and domestic animals within the site would be addressed by feral and domestic animal management strategies. This would include control measures during and post construction to minimise habitats for feral animals and set out restrictions and controls for domestic cats and dogs.

6.5 THREATENED SPECIES, POPULATIONS AND COMMUNITIES

This section discusses the threatened species and populations that may be affected by the proposed development and the likely extent of potential impacts. No threatened communities are known from or are likely to occur on the site.

Assessments of significance of impacts to threatened species and populations are provided as *Annex C* to this report. An assessment of significance under the EPBC Act for potential impacts to *D. biflora* was also undertaken and this is also provided within *Annex C.*

The assessments of significance concluded that impacts from the proposal are unlikely to be significant given the mitigation and management measures that will be implemented as part of the development and that the status of the threatened species known to occur within the site will be maintained and improved through protection and ongoing management. The species assessed are discussed in further detail in the following section.

6.5.1 *Darwinia biflora*

The current locations of *D. biflora* are shown in *Figure 4.1*. Areas shown as hatched were areas of habitat recorded in 1999. Areas labelled with D(x) are where the species was recorded during 2003 surveys. The proposed Concept Plan / SSS Amendment (see *Figure 6.1*) would result in removal of the following plants from the site:

- twelve individuals located within small isolated areas of remnant bushland in the car park in the east of the site;
- twenty-five individuals located within small isolated areas of remnant bushland in the car park in the north west of the site; and
- three individuals located just south of the car park in the north west of the site.

The following locations would be retained and managed for the ongoing viability of plants:

- the remnant bushland area east of the oval where 30 individuals have previously been recorded; and
- the eight individuals and surrounding habitat in the south west.

This would result in the retention of the two largest areas of habitat for this species on the site. These areas would also contain the species in the soil seed bank. The number of individuals retained may increase under appropriate protection and management.

Based on the continued presence of this species in isolated and disturbed areas on the site, and the fact that self-pollination is thought to occur more often than outcrossing (DEC 2004a,), it is likely that retention and management of these two habitat areas (one of which is relatively undisturbed) would enable a viable population to persist on the site. Protection measures put in place will mean that the on-site population of *D. biflora* is likely to be more secure than the current situation given uncontrolled slashing and other impacts that are occurring.

Translocation of adult plants and soil from areas that will be removed for development will be discussed with DECC and if considered viable, then a detailed translocation plan will be devised prior to any works at the site.

A Threatened Species Management Plan that will incorporate expert opinion on the management of retained plants will be implemented as part of the proposal. Therefore, the proposed Concept Plan / SSS Amendment would result in a population of *D. biflora* being maintained and managed on the site, in accordance with the draft recovery plan. There is also the potential for the population to be studied on the site, to contribute to the knowledge of the ecology of the species, particularly if the adult plants and the soil seed bank are translocated. An assessment of significance of impacts to *D. biflora* was undertaken and is provided in *Annex C.*

6.5.2 Red-crowned Toadlet

This species has been recorded breeding at one location on the site (*Figure 4.1*). The Concept Plan / SSS Amendment has been designed to protect this breeding habitat and adjacent habitats (see *Figure 6.1*). This has specifically included:

- redesign of the Concept Plan / SSS Amendment layout to avoid the drainage lines that provide potential breeding habitats and adjacent foraging habitat;
- development of stormwater control so that the hydrology of the breeding site is maintained;
- avoidance of the riparian habitats on site during construction of the fire trail by the installation of bridges and maintenance of riparian vegetation;
- additional sedimentation controls and erosion controls to be installed around riparian areas to avoid any impacts of construction or creation and management of the APZ. These controls will require input from specialists to ensure they are adequate to protect the Toadlets breeding habitat;
- management of weeds and water quality upstream of the breeding site;
- maintenance of shrub vegetation and associated sedges within the catchment of the breeding site to maintain catchment hydrology; and
- retention of riparian vegetation.

Any Red-crowned Toadlets breeding on the site are therefore likely to persist on the site. Some foraging habitat may be impacted by the removal of leaf litter for management of the APZ. This fuel management will occur within the first 50 m adjacent the development. An assessment of significance of impacts to the Red-crowned Toadlet was undertaken and is provided in *Annex C.*

6.5.3 Powerful Owl

The Powerful Owl has been detected on the site roosting on a tree branch during the daytime (*Figure 4.1*) and may use the site for foraging. Potential nesting habitat (large hollow-bearing trees) occurs on the lower slopes of the site, below the APZ and are unlikely to be affected by the proposal. No hollow-bearing trees on the upper slopes were suitable for Powerful Owls.

Potential impacts on this species include a very small reduction in foraging and daytime roosting habitat. These impacts would be minimised by:

- incorporating native tree species within the landscaping, thereby helping to maintain levels of prey (possums) for the Powerful Owl; and
- retention of trees within the development footprint where possible and retention of trees within the APZ. The Powerful Owl has been known to forage in the Royal Botanic Gardens, Sydney and in urban areas close to bushland in the Lane Cove valley. This will help maintain foraging and roosting habitat on the site.

The site is likely to constitute a small part of the large home range for the Powerful Owl, which has also been recorded in national parks within the locality. An assessment of significance of impacts to the Powerful Owl was undertaken and is provided in *Annex C.*

6.5.4 Glossy Black-cockatoo

Potential marginal foraging habitat (*Allocasuarina* species) is present on site. The site also provides potential corridor habitat for this species. The species has not been recorded within the adjacent LCNP. The Concept Plan / SSS Amendment would result in the removal of a relatively small amount of potential foraging habitat for this species. However, *Allocasuarina* species would be used in landscaping, thereby ensuring that this resource would remain on the site. In addition, the retention of trees wherever possible and landscaping with local native species will help maintain the site as a movement corridor for this species in the long term. An assessment of significance of impacts to the Glossy Black-cockatoo was undertaken and is provided in *Annex C.*

6.5.5 Gang-Gang Cockatoo

The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In addition to the species being listed as vulnerable under the TSC Act, a population of the species within the Hornsby and Ku-ring-gai LGAs has been listed as endangered. The 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.

In New South Wales, it is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. In summer the Gang-gang Cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, they may occur at lower altitudes in drier more open eucalypt forests and woodlands and are often found in urban areas. Nesting and roosting occurs in old growth areas and requires hollow-bearing trees.

There is potential foraging habitat within the site for the Gang-gang Cockatoo. No breeding pairs have been recorded on site. However, there may be suitable hollow-bearing trees on site for the nesting of this species. Hollow-bearing trees will be retained within the APZ area and a hollow-bearing tree survey will be undertaken prior to any vegetation removal or disturbance. If a nest tree is identified within the site then this tree will be marked and any removal of hollow-bearing trees will be undertaken outside of the nesting period for this species (breeding season is October to January). An assessment of significance of impacts to the Gang-gang Cockatoo was undertaken and is provided in *Annex C.*

6.5.6 Swift Parrot and Regent Honeyeater

Marginal foraging habitat for these species occurs on the site. The Concept Plan / SSS Amendment will result in the loss of some of this habitat, but this is not expected to be significant for these species since similar and better quality habitat (i.e. Swamp Mahogany) is conserved in the adjoining LCNP. In addition, the retention of trees wherever possible and landscaping with native species will help maintain the site value as a movement corridor for these species in the long term. Assessments of significance of impacts to these species was not considered necessary given the limited amount of marginal foraging habitat available on site.

6.5.7 Grey-headed Flying-fox

Potential impacts on this species include a small reduction in foraging habitat. This impact would be minimised by retention of trees where possible and landscaping with native species. Only a relatively small amount of bushland or potential foraging habitat would be removed. Therefore, the Grey-headed Flying-fox is likely to continue to use the site as a corridor and for foraging. An assessment of significance of impacts to the Grey-headed Flying-fox was undertaken and is provided in *Annex C.*

6.5.8 Insectivorous Bats

Marginal foraging habitat and some potential breeding habitat for threatened insectivorous bats occurs on the site. The Concept Plan / SSS Amendment will result in the loss of some of this habitat, but this is not expected to be significant for these species since these species are highly mobile and similar habitat is conserved in the adjoining LCNP. In addition, the retention of trees wherever possible and landscaping of native species will help maintain the site value as a movement corridor for these species in the long term. An assessment of significance of impacts to these bat species was undertaken and is provided in *Annex C.*

6.6 EPBC LISTED MIGRATORY SPECIES

The site provides known habitat for the Rufous Fantail, which is a migratory species listed under the EPBC Act. It also provides marginal potential habitat for other migratory species listed under the EPBC Act such as the Regent Honeyeater. Potential impacts on migratory species include a reduction of known and potential habitat. The Rufous Fantail breeds in gullies, and undergrowth of littoral rainforest, paperbarks and coastal scrubs and has been recorded on the site. Potential breeding habitat for this species also occurs on the site in College Creek and in Blue Gum Creek, to the south of the site.

Such habitats would be retained on the site and indirect impacts would be managed. Therefore, it is unlikely that the Concept Plan / SSS Amendment would have a significant impact on the Rufous Fantail. This species uses farms, streets and buildings during migration and the Concept Plan / SSS Amendment is unlikely to have a significant impact on the migrating ability of this species. Therefore, the removal of approximately 2.8 ha of bushland from the site is not considered to be a significant area for these migratory species and an EPBC referral was not considered necessary for these species.

6.7 *STATE ENVIRONMENTAL PLANNING POLICY NO. 44 – KOALA HABITAT PROTECTION*

This policy applies to the LGA listed in Schedule 1 of (SEPP 44), which includes Ku-ring-gai LGA and the subject site. The steps in applying this policy are outlined in Section *1.5.2*.

It is likely that Scribbly Gum (*Eucalyptus haemastoma*) makes up more than 15% of the trees on the site and therefore, the site consists of Potential Koala Habitat. However, the site is not likely to be Core Koala habitat since there is no evidence of Koalas, nor recent or historical records of a population. Therefore, further consideration under SEPP 44 is not required.

6.8 *ECOLOGICALLY SUSTAINABLE DEVELOPMENT*

Only a relatively small amount of bushland would be removed (approximately 2.8 ha) or modified (approximately 1.3 ha) as part of the proposed development. High biodiversity values such as *D. biflora* plants and habitat, breeding habitat for the Red-crowned Toadlet, foraging habitat for the Powerful Owl and potential foraging habitat for other threatened species, would be retained and managed on the site within the APZ and beyond the APZ as a buffer to the LCNP.

In addition, a range of mitigation measures that have been proposed to minimise and control the predicted indirect impacts of urban development is discussed within this report. Mitigation measures have been designed following the principles of ecologically sustainable development to ensure that species, communities or habitats of conservation significance are not compromised in the long term. These measures include:

- management of feral and domestic animals;
- management of weeds;
- management of stormwater;
- management of fire; and
- specific management measures such as protecting Red-crowned Toadlet breeding catchments, *D. biflora* and planting feed trees for the Glossy Black-cockatoo and Gang-gang Cockatoo.

7 CONCLUSIONS

7.1 DISCUSSION OF ASSESSMENT

The Concept Plan / SSS Amendment would result in the protection and enhancement of biodiversity values on the site, including threatened flora and habitats for threatened fauna. A local population of *D. biflora* would be retained and managed in two locations on the site. Currently the species Is unprotected and is being impacted by trampling and underscrubbing.

In addition, there will be conservation of land between the site and the LCNP, which contains recorded breeding and foraging habitat for the Red-crowned Toadlet and potential foraging habitat for a number of threatened species, including the Powerful Owl, Glossy Black-cockatoo, Gang-gang Cockatoo and insectivorous bats.

The Concept Plan / SSS Amendment would result in the removal of a relatively small area of native vegetation and flora and fauna habitat on the site (approximately 2.8 ha). It would also entail clearing of some *D. biflora*, a threatened plant, with remaining individuals protected within the site. Development is not likely to result in the loss of a population of threatened species from the site, from the adjacent LCNP or from the Lane Cove valley in the long term.

Potential indirect impacts to the site and adjacent vegetation are not currently managed, and include sedimentation and erosion, weeds, feral and domestic animals and inappropriate fire regimes. The proposed Concept Plan / SSS Amendment would result in improved management of these processes in the long term, ensuring the ongoing viability of habitat on the site.

The proposed Concept Plan / SSS Amendment would result in removal of a relatively small area of bushland from the site and from the Lane Cove valley. Mitigation measures would ameliorate any potential adverse impacts of the removal and modification of vegetation on threatened species and corridor function. Implementation of management plans will result in the improved management of threatening processes, which are not currently managed on the site.

7.2 *CONCLUSION*

This assessment has concluded that the proposed Concept Plan / SSS Amendment will not place any species at risk of extinction, and will enhance the long term viability of threatened species habitats and threatened species within the site and within the region. The following provides a summary of the justification for this conclusion:

- The proposed Concept Plan / SSS Amendment has been designed to minimise the area of vegetation removal from the site;

- The proposal includes actions to avoid and mitigate potential direct and indirect impacts. Biodiversity values will be maintained and enhanced through control of threatening processes such as weeds, feral animals, pollution runoff and augmentation of feeding resources through the management of threatened species and their habitats on site;

- The proposal will not reduce the long-term viability of a local population of threatened species or populations, as determined through the threatened species assessments detailed in *Annex C*;

- The proposal will not accelerate the extinction of a threatened species or population and will not place species or populations at risk of extinction, as determined through the threatened species assessments detailed in *Annex C*; and

- There is no critical habitat to be impacted by the proposal, and habitats for threatened species will be maintained, improved through weed removal and management of access and managed through the implementation of management plans for their long-term viability within the site and within the region.

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Annex A

EPBC Report on Matters of NES

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Australian Government
Department of the Environment and Water Resources

Protected Matters Search Tool

9 August 2007 11:08

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

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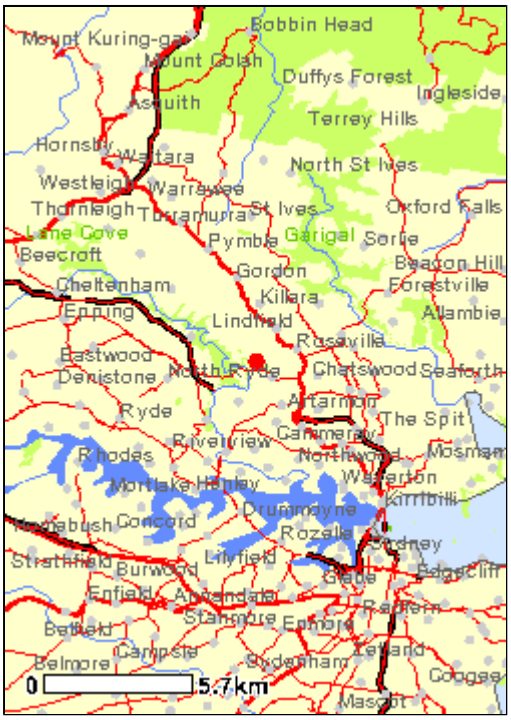

Search Type: Point

Buffer: 10 km

Coordinates: -33.789881,151.160598

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	1
National Heritage Places:	5
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	2
Threatened Species:	53
Migratory Species:	34

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area

you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	11
Commonwealth Heritage Places:	21
Places on the RNE:	712
Listed Marine Species:	49
Whales and Other Cetaceans:	9
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	6
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Dataset Information]

Sydney Opera House NSW

National Heritage Places [Dataset Information]

Cockatoo Island NSW

First Government House Site NSW

Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves NSW

Sydney Harbour Bridge NSW

Sydney Opera House NSW

Wetlands of International Significance [Dataset Information] (Ramsar Sites)

TOWRA POINT NATURE RESERVE	Within same catchment as Ramsar site

Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
Blue Gum High Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Diomedea antipodensis * Antipodean Albatross	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni * Gibson's Albatross	Vulnerable	Species or species habitat may occur within area
Lathamus discolor * Swift Parrot	Endangered	Species or species habitat may occur within area
Macronectes giganteus * Southern Giant-Petrel	Endangered	Species or species habitat may occur within area
Macronectes halli * Northern Giant-Petrel	Vulnerable	Species or species habitat may occur within area
*Pterodroma neglecta neglecta** Kermadec Petrel (western)	Vulnerable	Species or species habitat may occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri * Buller's Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta * Shy Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida * Campbell Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini * Salvin's Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi * White-capped Albatross	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia *	Endangered	Species or species habitat likely to

Regent Honeyeater		occur within area
Frogs		
Heleioporus australiacus * Giant Burrowing Frog	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea * Green and Golden Bell Frog	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni * Littlejohn's Tree Frog, Heath Frog	Vulnerable	Species or species habitat may occur within area
Mixophyes balbus * Stuttering Frog, Southern Barred Frog (in Victoria)	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus * Southern Barred Frog, Giant Barred Frog	Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri * Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
*Dasyurus maculatus maculatus (SE mainland population)** Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Species or species habitat may occur within area
Eubalaena australis * Southern Right Whale	Endangered	Species or species habitat likely to occur within area
*Isoodon obesulus obesulus** Southern Brown Bandicoot	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae * Humpback Whale	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata * Brush-tailed Rock-wallaby	Vulnerable	Species or species habitat may occur within area
*Potorous tridactylus tridactylus** Long-nosed Potoroo (SE mainland)	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus * Grey-headed Flying-fox	Vulnerable	Roosting known to occur within area
Ray-finned fishes		
Macquaria australasica * Macquarie Perch	Endangered	Species or species habitat may occur within area
Prototroctes maraena * Australian Grayling	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Chelonia mydas * Green Turtle	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Vulnerable	Species or species habitat may occur within area
Hoplocephalus bungaroides * Broad-headed Snake	Vulnerable	Species or species habitat likely to occur within area

Sharks

*Carcharias taurus (east coast population)** Grey Nurse Shark (east coast population)	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias * Great White Shark	Vulnerable	Species or species habitat may occur within area
Rhincodon typus * Whale Shark	Vulnerable	Species or species habitat may occur within area

Plants

Acacia bynoeana * Bynoe's Wattle, Tiny Wattle	Vulnerable	Species or species habitat likely to occur within area
Acacia pubescens * Downy Wattle, Hairy Stemmed Wattle	Vulnerable	Species or species habitat likely to occur within area
*Acacia terminalis subsp. terminalis** Sunshine Wattle	Endangered	Species or species habitat likely to occur within area
Caladenia tessellata * Thick-lipped Spider-orchid, Daddy Long-legs	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana * Leafless Tongue-orchid	Vulnerable	Species or species habitat may occur within area
Darwinia biflora *	Vulnerable	Species or species habitat likely to occur within area
Deyeuxia appressa *	Endangered	Species or species habitat likely to occur within area
Eucalyptus camfieldii * Camfield's Stringybark	Vulnerable	Species or species habitat likely to occur within area
Grevillea caleyi * Caley's Grevillea	Endangered	Species or species habitat likely to occur within area
Haloragodendron lucasii * Hal	Endangered	Species or species habitat likely to occur within area
Lasiopetalum joyceae *	Vulnerable	Species or species habitat likely to occur within area
Leptospermum deanei *	Vulnerable	Species or species habitat likely to occur within area
Melaleuca deanei * Deane's Melaleuca	Vulnerable	Species or species habitat likely to occur within area
Microtis angusii *	Endangered	Species or species habitat likely to occur within area
*Persoonia mollis subsp. maxima**	Endangered	Species or species habitat likely to occur within area
*Pimelea curviflora var. curviflora**	Vulnerable	Species or species habitat likely to occur within area
Prostanthera marifolia *	Extinct	Species or species habitat likely to occur within area
Tetratheca glandulosa *	Vulnerable	Species or species habitat likely to occur within area

Thesium australe * Austral Toadflax, Toadflax	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus * Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Migratory	Breeding may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii * Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover	Migratory	Species or species habitat likely to occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross	Migratory	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross	Migratory	Species or species habitat may occur within area
Macronectes giganteus	Migratory	Species or species habitat may occur

Southern Giant-Petrel		within area
Macronectes halli Northern Giant-Petrel	Migratory	Species or species habitat may occur within area
Sterna albifrons Little Tern	Migratory	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross	Migratory	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross	Migratory	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross	Migratory	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross	Migratory	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross	Migratory	Species or species habitat may occur within area
Migratory Marine Species		
Mammals		
Balaenoptera edeni Bryde's Whale	Migratory	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale	Migratory	Species or species habitat may occur within area
Eubalaena australis ***** Southern Right Whale	Migratory	Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin	Migratory	Species or species habitat may occur within area
Megaptera novaeangliae ***** Humpback Whale	Migratory	Species or species habitat known to occur within area
Reptiles		
Chelonia mydas ***** Green Turtle	Migratory	Species or species habitat may occur within area
Dermochelys coriacea ***** Leathery Turtle, Leatherback Turtle, Luth	Migratory	Species or species habitat may occur within area
Sharks		
Carcharodon carcharias Great White Shark	Migratory	Species or species habitat may occur within area
Rhincodon typus Whale Shark	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus	Listed -	Species or species habitat may occur

Fork-tailed Swift	overfly marine area	within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross	Listed	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross	Listed	Species or species habitat may occur within area
Gallinago hardwickii ***** Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Lathamus discolor ***** Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel	Listed	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel	Listed	Species or species habitat may occur within area
Merops ornatus ***** Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Listed - overfly marine area	Breeding may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Breeding likely to occur within area
Pluvialis fulva Pacific Golden Plover	Listed	Species or species habitat likely to occur within area

Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Sterna albifrons Little Tern	Listed	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross	Listed	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross	Listed	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross	Listed	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross	Listed	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross	Listed	Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri New Zealand Fur-seal	Listed	Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal	Listed	Species or species habitat may occur within area
Ray-finned fishes		
Acentronura tentaculata Hairy Pygmy Pipehorse	Listed	Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish	Listed	Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish	Listed	Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish	Listed	Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish	Listed	Species or species habitat may occur within area
Hippocampus abdominalis Eastern Potbelly Seahorse, New Zealand Potbelly, Seahorse, Bigbelly Seahorse	Listed	Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse	Listed	Species or species habitat may occur within area
Histiogamphelus briggsii Briggs' Crested Pipefish, Briggs' Pipefish	Listed	Species or species habitat may occur within area
Lissocampus runa	Listed	Species or species habitat may occur

Javelin Pipefish		within area
Maroubra perserrata Sawtooth Pipefish	Listed	Species or species habitat may occur within area
Notiocampus ruber Red Pipefish	Listed	Species or species habitat may occur within area
Phyllopteryx taeniolatus Weedy Seadragon, Common Seadragon	Listed	Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse	Listed	Species or species habitat may occur within area
Solenostomus cyanopterus Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Listed	Species or species habitat may occur within area
Solenostomus paradoxus Harlequin Ghost Pipefish, Ornate Ghost Pipefish	Listed	Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish	Listed	Species or species habitat may occur within area
Stigmatopora nigra Wide-bodied Pipefish, Black Pipefish	Listed	Species or species habitat may occur within area
Syngnathoides biaculeatus Double-ended Pipehorse, Alligator Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bend Stick Pipefish, Short-tailed Pipefish	Listed	Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish	Listed	Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish	Listed	Species or species habitat may occur within area
Reptiles		
Chelonia mydas ***** Green Turtle	Listed	Species or species habitat may occur within area
Dermochelys coriacea ***** Leathery Turtle, Leatherback Turtle, Luth	Listed	Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake	Listed	Species or species habitat may occur within area
Whales and Other Cetaceans [Dataset Information]	Status	Type of Presence
Balaenoptera edeni Bryde's Whale	Cetacean	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale	Cetacean	Species or species habitat may occur within area
Delphinus delphis Common Dolphin	Cetacean	Species or species habitat may occur within area
Eubalaena australis ***** Southern Right Whale	Cetacean	Species or species habitat likely to occur within area
Lagenorhynchus obscurus	Cetacean	Species or species habitat may occur

Dusky Dolphin		within area
Megaptera novaeangliae * Humpback Whale	Cetacean	Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin	Cetacean	Species or species habitat may occur within area
Tursiops aduncus Spotted Bottlenose Dolphin	Cetacean	Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin	Cetacean	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Commonwealth Bank of Australia

Commonwealth Trading Bank of Australia

Communications, Information Technology and the Arts - Australian Broadcasting Corporation

Communications, Information Technology and the Arts - Australian Postal Corporation

Communications, Information Technology and the Arts - Telstra Corporation Limited

Defence

Defence - Defence Housing Authority

Education, Science and Training - CSIRO

Transport and Regional Services - Airservices Australia

Treasury - Reserve Bank of Australia

Unknown

Commonwealth Heritage Places [Dataset Information]

Admiralty House Garden and Fortifications NSW

Admiralty House and Lodge NSW

Barracks Block NSW

Biloela Group NSW

Cockatoo Island Industrial Conservation Area NSW

Commonwealth Naval Stores Building (former) NSW

Customs Marine Centre NSW

Fitzroy Dock NSW

Kirribilli House Garden & Grounds NSW

Kirribilli House NSW

Mess Hall (former) NSW

Military Guard Room NSW

Power House / Pump House NSW

Prison Barracks Precinct NSW

Pyrmont Post Office NSW

Snapper Island NSW

Spectacle Island Explosives Complex NSW

Sutherland Dock NSW

Sydney Customs House (former) NSW

Underground Grain Silos NSW

Woolwich Dock NSW

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

ASN Hotel (former) NSW

Abbotsford House NSW

Accountants House NSW

Addington NSW

Admiralty House Garden and Fortifications NSW

Admiralty House and Lodge NSW

Agar Steps & Adjacent Trees NSW

Agar Steps Houses NSW

Alcee NSW

Alfred Street Entrance Luna Park NSW

Alfreds Terrace NSW

Alicia NSW

All Saints Anglican Church NSW

All Saints Rectory NSW

Alroy NSW

Ammunition Store (former) NSW

Annabel Lea NSW

Annandale North Public School NSW

Araluen House NSW

Araluen NSW

Ardath NSW

Arden Lea NSW

Argyle Cut and Argyle Street Space NSW

Argyle House NSW

Argyle Place Park NSW

Argyle Place Precinct NSW

Argyle Precinct NSW
Argyle Stores NSW
Argyle Terrace NSW
Audley NSW
Australasian Steam Navigation Company Building NSW
Australian Financial Press Building NSW
Australian Hotel NSW
Australian Joint Stock Bank (former) NSW
Bakery (former) NSW
Bakery House and Loft (former) NSW
Balmain Civic Group NSW
Balmain Cooperative Society Building (former) NSW
Balmain Courthouse, Police Station and Post Office NSW
Balmain Public School NSW
Balmain Volunteer NSW
Bantry Bay Public Magazine NSW
Barracks Block NSW
Bathurst NSW
Bayfield NSW
Belvedere NSW
Beneficial House NSW
Bentham NSW
Bettington and Merriman Streets Group NSW
Biloela Group NSW
Blacksmith and Machine Shop NSW
Blair Athol NSW
Blenerne NSW
Booth House (former) NSW
Brooklyn Hotel NSW
Buildings NSW
Burnham NSW
Burns Philp Building (former) NSW
CBC Bank Facade (former) NSW
CSR Cooperage Building (former) NSW
CSR Gate House (former) NSW
CSR Laboratory B Building (former) NSW
CSR Main Office Building (former) NSW
CSR Managers House (former) NSW

CSR Store House (former) NSW
CSR Tablet House (former) NSW
Cadmans Cottage Space NSW
Cadmans Cottage including Grounds and Trees NSW
Cahill Expressway Space NSW
Callan Park Conservation Area NSW
Callan Park House NSW
Cambridge NSW
Cambridge Street Precinct NSW
Camelot NSW
Campbell Street Group NSW
Campbells Cove Space NSW
Campbells Storehouse NSW
Carabella Street Group NSW
Carey Cottage NSW
Carleith NSW
Carlson Terrace NSW
Chamber of Commerce Building (former) NSW
Chatswood South Uniting Church & Grounds NSW
Cheong House NSW
Chief Secretarys Building NSW
Chinese Christian Church NSW
Christ Church Anglican Church, Gates & Grounds NSW
Christ Church Anglican Rectory NSW
Church of the Holy Name of Mary NSW
Cintra NSW
Circular Quay West / Campbells Storehouse Space NSW
Cleland Bond Store NSW
Cleverton NSW
Cliff Tunnel and Chamber NSW
Clifton (including Front Fence) NSW
Clifton NSW
Clifton Villa NSW
Clivedon NSW
Clyde Bank NSW
Cockatoo Island Industrial Conservation Area NSW
Commercial Buildings NSW
Commercial Terrace NSW

Commercial Terrace NSW
Commercial Terrace NSW
Commonwealth Bank NSW
Commonwealth Bank and Gallipoli Club NSW
Comus Villa NSW
Coney Island Luna Park NSW
Congregational Church NSW
Congregational Manse NSW
Convicts Dungeon (former) NSW
Coorabel NSW
Coralynn NSW
Corio NSW
Corner Shop NSW
Coroners Court (former) NSW
Cottage NSW
Cottage NSW
Cottage NSW
Cottage NSW
Cottages and Gardens NSW
Craigends NSW
Cranbrook Avenue Group NSW
Crows Nest Fire Station NSW
Croxted NSW
Crystal Palace Luna Park NSW
Cumberland Street Group NSW
Customs House Hotel NSW
Customs Marine Centre NSW
Cypress Grove NSW
Dacre Villa NSW
Dalgety Terrace NSW
Dalgetys Bond Store (former) NSW
Dawes Point Park and Reserve NSW
Dawn Fraser Swimming Pool NSW
Daybreak NSW
Doctors Residence NSW
Don Bank NSW
Drill Hall (former) NSW
Drummoyne Telephone Exchange NSW

Duke of Edinburgh Hotel NSW

Dunheved NSW

Dunkirk Hotel NSW

ES&A Bank (former) NSW

Eastwood House (former) NSW

Eaton Street Group NSW

Education Department Building NSW

Edwardian Buildings Group NSW

Edwardian Commercial Group NSW

Ellesmere NSW

Elsetta NSW

Entrance Face and Towers Luna Park NSW

Erskine Street Watch House Group NSW

Eryldene Garden NSW

Eryldene and Garden NSW

Escarpment Terraces NSW

Esher NSW

Esslemont and Grounds NSW

Eumalga including Stone Wall, Gates and Posts NSW

Eurodux NSW

Eurondella NSW

Euthella NSW

Everleigh Glendoon NSW

Exchange Hotel NSW

Fairhaven NSW

Father Michael Rohan Memorial School NSW

Federation Pavilion (former) NSW

Fernbank NSW

Festival Records Building NSW

Fig Tree House NSW

Fig and Coral Trees Luna Park NSW

Fire Station NSW

First Government House Site NSW

Fitzroy Dock NSW

Five Storey Building NSW

Fort Street School (former) (western addition) NSW

Fortuna NSW

Four Dwellings and former Shop NSW

Garden of Thomas Walker Convalescent Hospital NSW

Gardeners Cottage NSW

Garibaldi Inn (former) NSW

Gatekeepers Cottage NSW

Gatekeepers Lodge NSW

Genoa NSW

Gents Lavatory and Stone Walls NSW

Geological and Mining Museum NSW

George Patterson House NSW

George Street / Kendall Lane Precinct NSW

George Street Business Precinct NSW

Georgian Cottage NSW

Georgian Terrace NSW

Georgian Terrace NSW

Georgian Townhouses NSW

Georgian Warehouse (former) NSW

Gladesville Drill Hall (former) NSW

Gladesville Mental Hospital Precinct NSW

Glebe Conservation Area NSW

Glebe Island Bridge NSW

Glen Mahr NSW

Glencairn NSW

Glenrock NSW

Glenview NSW

Gloucester Street North Precinct NSW

Gloucester Street North, Gloucester Walk and Escarpment Space NSW

Glover Cottages NSW

Goat Island Ammunition Store Group NSW

Goat Island Precinct NSW

Gordon Public School NSW

Gore Hill Memorial Cemetery NSW

Government House NSW

Government House, Associated Buildings and Garden NSW

Grafton Bond Store (former) NSW

Grandview NSW

Graythwaite including Gardens and Outbuildings NSW

Group of Service Buildings NSW

Guard Room (former) NSW

Guardhouse and Officers Quarters (former) NSW
Haberfield Conservation Area NSW
Haeremai NSW
Harrington Argyle Precinct NSW
Harrington Place Space NSW
Hastings NSW
Hawken and Vance Produce Exchange (former) NSW
Hayling NSW
Health Commission Building (former) NSW
Health Department Building (former) NSW
Helensleigh NSW
Herne NSW
Hero of Waterloo Hotel NSW
Hestock NSW
Hexam Terrace NSW
Hillrest NSW
Hitching Posts (two) NSW
Hollingworth NSW
Holy Trinity Anglican Church Hall NSW
House NSW
House NSW
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House NSW
House NSW
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Houses NSW
Houses and Terraces NSW
Houses and Terraces NSW
Housing Board Building NSW
Hunters Hill Conservation Area NSW
Hunters Hill Post Office NSW
Huntleys Point House NSW
Hurworth NSW
IOOF Hall NSW
Industrial Therapy Unit NSW
Industrial Therapy Unit NSW
Ingleholme and Grounds NSW
Innisfallen Castle and Grounds NSW
Innisfree NSW
Iolanthe NSW
Irene NSW
Isere NSW
Italianate House NSW
Italianate Terrace NSW
Italianate Terrace NSW
Ivanhoe NSW
Jobbins Terrace NSW
John Street Terrace Group NSW
Josie NSW
Kaoota NSW

Kareela NSW
Kareela NSW
Kellys Bush NSW
Kent Street Terrace Group East Side NSW
Kent Street Terrace Group West Side NSW
Kentigern NSW
Kiola NSW
Kirkbride Block NSW
Kirribilli House Garden & Grounds NSW
Kirribilli House NSW
Kirribilli Neighbourhood Centre NSW
Kooyong Outbuildings and Garden NSW
Kyarra NSW
Kyle House NSW
Labrena NSW
Lands Department Building NSW
Lantana NSW
Lilyvale NSW
Lilyville NSW
Linsley Terrace NSW
Lisgar House NSW
Lochnager NSW
Longs Lane Precinct NSW
Loombah NSW
Lord Nelson Hotel NSW
Loreto Convent NSW
Low Level Sewage Pumping Station No 2 NSW
Lower Fort Street West Side Group NSW
Lower Fort Street East Side Group NSW
Lugano NSW
Luna Park Precinct NSW
Lyndcote NSW
Lyndhurst NSW
MMI Building NSW
Macknade House (former) NSW
Macquarie Cottage NSW
Macquarie House NSW
Macquarie Place Buildings Group NSW

Macquarie Place Park & Structures NSW

Macquaries Obelisk NSW

Maiala NSW

Main Gates (former) NSW

Marist Fathers Seminary NSW

Maritime Services Board Building (former) NSW

Martin Place GPO Precinct NSW

Martin Place Urban Conservation Area NSW

Maruna NSW

Marveen Duplex NSW

Maybanke Kindergarten NSW

McCafferys Building NSW

McComas and Price Williams Wool Press NSW

Meadowbank Railway Bridge NSW

Medical Records Department NSW

Medical Superintendents Residence (former) NSW

Melba NSW

Memorial to World War One NSW

Mendip NSW

Mens Lavatory NSW

Mercantile Hotel NSW

Merimbah NSW

Merriman Street Precinct NSW

Meryla NSW

Mess Hall (former) NSW

Mia Mia NSW

Military Guard Room NSW

Millers Point Post Office NSW

Milsons Point Public School (former) NSW

Milthorpe NSW

Milton Terrace NSW

Montefalco NSW

Moocooboolah NSW

Moon House NSW

Moore Stairs NSW

Moorefield House NSW

Morts Dock Historic Site NSW

Mrs Quirks Cottage NSW

Muirbank NSW
Myall NSW
NSW Department of Labour & Industry Building (former) NSW
NSW Government Railway Administrative Building NSW
NSW Sports Club Five Storey Building NSW
NSW Sports Club Four Storey Building NSW
Nalpa NSW
National Trust Centre NSW
New Metcalfe Bond / George Street Precinct NSW
New Metcalfe Bond NSW
New York Hotel NSW
Nicholson Street Public School NSW
Nobel NSW
North Sydney Courthouse NSW
North Sydney Olympic Pool Complex NSW
North Sydney Post Office Group NSW
North Sydney Technical High School (former) NSW
North Sydney Telephone Exchange NSW
Norwood NSW
Nurses Quarters NSW
Nutcote and Garden NSW
Oatlands NSW
Observatory Park NSW
Observer Hotel NSW
Obyin, Including Stone Walls NSW
Old Training Block, Fort Street School (former) NSW
Opera House Gate Royal Botanic Gardens NSW
Oreldalodge NSW
Orient Hotel NSW
Original (1836-38) Quadrangular Asylum Ranges NSW
Original Public School & Eulbertie NSW
Osborne House NSW
Ozanam House and Marist Chapel NSW
Pacific Highway Group NSW
Pair of Joined Houses NSW
Pair of Neo Classic Town Houses NSW
Pair of Semi-detached Houses NSW
Pair of Stone Houses NSW

Pair of Stone Houses NSW
Palisade Hotel NSW
Palisade Hotel and adjoining Terraces NSW
Pangas House NSW
Paragon Hotel (former) NSW
Paraza NSW
Parker Galleries NSW
Passy NSW
Peniarth NSW
Pibrac and Garden NSW
Pinnacle House NSW
Playfair, George, Hickson Space NSW
Police Station (former) NSW
Police Station (former) NSW
Pottery Building NSW
Power House / Pump House NSW
Premises NSW
Presbyterian Church NSW
Presbyterian Hall NSW
Presbyterian Manse NSW
Prison Barracks Precinct NSW
Provision Store NSW
Punt Road Gates NSW
Purulia and Garden NSW
Pyrmont Bridge Hotel NSW
Pyrmont Bridge NSW
Pyrmont Bridge Road Hotel NSW
Pyrmont Conservation Area NSW
Pyrmont Fire Station NSW
Pyrmont Point Carriageway Dividing Fence NSW
Pyrmont Point Escarpment Face NSW
Pyrmont Point Escarpment Palisade Fence and Stone Gateposts NSW
Pyrmont Point Railway Cutting & Tunnel NSW
Pyrmont Post Office NSW
Pyrmont Power Station Building A NSW
Pyrmont Public School (former) NSW
Pyrmont Square Group NSW
Pyrmont and Murray Streets Residential Group NSW

Quarrymans Hotel NSW
Quedgley NSW
Queens Place Group NSW
Rawson Institute for Seamen (former) NSW
Red Cross House NSW
Redleaf NSW
Redleaf NSW
Regency Townhouses NSW
Reinga NSW
Residence and Shop NSW
Reynolds Cottage and Shop NSW
Richmond NSW
Richmond Villa NSW
Rocklands NSW
Rosamond NSW
Rose Seidler House NSW
Royal Australian Naval House NSW
Royal Automobile Club NSW
Royal Botanic Gardens and Domain NSW
Royal College of Radiologists Building NSW
Royal Edward Victualling Yard Group NSW
Royal Exchange Assurance Building (former) NSW
Royal George Hotel (former) NSW
Royal Pacific Hotel NSW
Rozelle Public School NSW
Rydal NSW
Ryde Police Station (former) NSW
Ryde Public School 1877-1919 Buildings NSW
Saintonge NSW
Sanderslaben NSW
Sandstone Walling NSW
Schute, Bell, Badgery & Lumby Store NSW
Seaforth House NSW
Semi detached Houses NSW
Sergeant Majors Row Terraces NSW
Shetland NSW
Ship Inn Hotel (former) NSW
Shipping Agents Office (former) NSW

Shipwrights Arms Hotel (former) NSW

Shop & House NSW

Shop NSW

Shop NSW

Shops Residences and Offices NSW

Shops and Hotel Group NSW

Shops and Offices NSW

Sierra Lucena NSW

Sirius Anchor and Cannon NSW

Sirius House NSW

Skinners Family Hotel (former) NSW

Snapper Island NSW

Spectacle Island Explosives Complex NSW

Sport House including Original Interiors NSW

St Andrews Congregational Church and Hall NSW

St Annes Anglican Church and Churchyard NSW

St Augustines Church and Former Church NSW

St Bedes Church, School & Presbytery NSW

St Brigids Catholic Church & School NSW

St Francis Xaviers Catholic Church NSW

St Francis Xaviers Church School Hall NSW

St Francis Xaviers Presbytery NSW

St Ignatius College Riverview Main Building NSW

St Ives NSW

St John House NSW

St Johns Rectory (former) NSW

St Josephs College NSW

St Kevins NSW

St Marks Anglican Church NSW

St Marys Catholic Church NSW

St Patricks Catholic Church NSW

St Patricks Convent Chapel NSW

St Patricks Convent NSW

St Patricks Hall and School NSW

St Pauls Presbyterian Church (former) NSW

St Peter Chanel Catholic Church NSW

St Peters Presbyterian Church NSW

St Peters Presbyterian Church and Manse NSW

St Peters Presbyterian Manse NSW
St Peters Presbyterian Schoolhouse NSW
St Philips Anglican Church NSW
St Thomas Anglican Church NSW
St Thomas Anglican Church Rectory NSW
St Thomas Kindergarten Hall NSW
Stafford Terrace (part) NSW
Statue of Dunmore Lang NSW
Stone Cottage and Adjacent Stone Wall NSW
Stone Wall NSW
Stone Wall, Entrance Gate and Sentry Box NSW
Stoneleigh House NSW
Stoneleigh NSW
Sunnyside NSW
Sunnyside and Grounds NSW
Susannah Place Terrace NSW
Suspension Bridge NSW
Sussex Street Group NSW
Sutherland Dock NSW
Sydney Ancher House NSW
Sydney Customs House (former) NSW
Sydney Harbour Bridge NSW
Sydney Hospital Nurses Annex NSW
Sydney Observatory NSW
Sydney Opera House and Surrounds NSW
Sydney Sailors Home (former) NSW
T S Mort Statue NSW
Tank Stream Tunnel NSW
Taunton and Eldon NSW
Telford Trust Building NSW
Telford Type Roadway NSW
Terana NSW
Terminus Hotel NSW
Terrace Facade NSW
Terrace House NSW
Terrace House NSW
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Terrace and Townhouses NSW
Terrace of Three Shops NSW
Terraced Houses NSW
Terraces Facade NSW
Terraces Facade NSW
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Terraces NSW
Terraces NSW
Terraces NSW
Terraces and Retaining Wall NSW
Terraces and Townhouses NSW
Thames Street Ferry Wharf and Shelter NSW

The Abbey and Stone Walls NSW
The Barn (Scout Hall) NSW
The Bungalow NSW
The Bushells Building NSW
The Chalet NSW
The Cobbles NSW
The Counting House NSW
The Duncan House NSW
The Eagles NSW
The Fishwick House NSW
The Garrison Church NSW
The Gladstone NSW
The Guest House NSW
The Haven NSW
The Hermitage and Garden NSW
The Jacaranda Including Outbuilding NSW
The Lodge NSW
The Priory NSW
The Rocks Conservation Area NSW
Thomas Walker Convalescent Hospital Group NSW
Three Victorian Residences NSW
Town Hall NSW
Town Hall NSW
Town House NSW
Townhouse NSW
Townhouses NSW
Towns Store NSW
Traffic Court Group (former) NSW
Traffic Court No 1 (former) NSW
Traffic Court No 2 (former) NSW
Transport House NSW
Treago NSW
Treasury Building & Premiers Office NSW
Tucker and Company Warehouse NSW
Tulkiyan NSW
Two Fig Trees NSW
Two Storey House NSW
Undercliff Cottage (former) NSW

Underground Grain Silos NSW
Union Bond Store NSW
Unwins Coach House NSW
Unwins Store NSW
Vailele NSW
Veredelaise NSW
Victorian Shops NSW
Vienna NSW
View Terrace Facade NSW
Viewforth NSW
Villa Maria Group NSW
Vinetta NSW
Visitors Accommodation (former) NSW
Wadim (Bill) Jegorow Reserve NSW
Wainload NSW
Wairoa NSW
Waite and Bull Building NSW
Waiwera and St Claire NSW
Wales House NSW
Walker Street Group NSW
Walsh Bay Wharves NSW
Walshale NSW
Walter Burley Griffin Incinerator NSW
Walton and Herberton NSW
Wandella NSW
Ward 14 and15 NSW
Wards 17 and 18 NSW
Warehouse (former) NSW
Warehouse NSW
Warehouses (former) NSW
Warrawillah NSW
Watch House (former) NSW
Watch House NSW
Ways Terrace NSW
Westpac Bank Archives (former) NSW
Westpac Bank NSW
Wharf 19, 20 & 21 NSW
Wharf Road Precinct NSW

Whites Creek Sewer Aqueduct NSW

Wild Cat Luna Park NSW

Willandra NSW

Wilona House NSW

Winden NSW

Windermere NSW

Windmill Street North Side Group NSW

Windmill Street Southside Group NSW

Windradine NSW

Winery Warehouse NSW

Winsbury Terrace NSW

Wongonui & Wlangaroa NSW

Woodbank NSW

Woodstock NSW

Woodstock NSW

Woodville NSW

Woolwich Dock NSW

Working Mens Institute NSW

Workshop NSW

Wurley Court NSW

Wyaldara NSW

Wybalena NSW

Wybalena NSW

Wyoming NSW

Yandra NSW

Yaralla Estate NSW

Yaralla Garden NSW

Young Princess Hotel (former) NSW

Ysabel NSW

Indigenous

Berry Island Reserve NSW

Natural

Bantry Bay Reserve Area (former) NSW

Brays Bay Wetland NSW

Dalrymple Hay Nature Reserve NSW

Ku-ring-gai Chase National Park (1980 boundary) NSW

Lane Cove Bushland Park NSW

Macquarie Hospital Bushland NSW

Majors Bay Wetlands NSW

Manly Dam and Surrounds NSW

Meadowbank Park Foreshore Wetland NSW

Yaralla Bay Wetlands NSW

Extra Information

State and Territory Reserves [Dataset Information]

Dalrymple-Hay Nature Reserve, NSW

Garigal National Park, NSW

Ku-ring-gai Chase National Park, NSW

Lane Cove National Park, NSW

Sydney Harbour National Park, NSW

Wallumatta Nature Reserve, NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Annex B

Likelihood of Occurrence of Threatened Species

Table B.1 Likelihood of Occurrence of Threatened Species on the Site

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
FLORA					
Acacia bynoeana	Tiny Wattle	Endangered	Vulnerable	Heath and dry sclerophyll forest on sand and sandy clay often with ironstone gravels and very infertile and well-drained soils. Potential habitat present. Not detected on the site during targeted surveys.	No
Acacia pubescens	Downy Wattle	Vulnerable	Vulnerable	Alluviums and shales at the intergrade between shales and sandstones with characteristically gravelly soils, often with ironstone. Habitat not present. Not detected on the site during targeted surveys.	No
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	Endangered	Endangered	Scrub and dry sclerophyll woodland between Botany Bay and the northern foreshore of Port Jackson. A very limited distribution. No potential habitat present on the site. Not detected on the site during targeted surveys.	No
Arachnorchi tessellata (prev. *Caladenia tessellata)*	Thick-lipped Spider-orchid	Vulnerable	Vulnerable	Clay loam or sandy soils from south of Swansea on the central and southern coasts, the southern highlands and Victoria. No potential habitat on the site. Unlikely to occur.	No
Callistemon linearifolius	-	Vulnerable	-	Dry sclerophyll forest on the coast and ranges from the Georges River to Hawkesbury River in the Sydney area. Potential habitat on the site. Not detected on the site during targeted surveys.	No
Camarophyllopsis kearneyi		Endangered		Its occurrence appears to be limited to the Lane Cove Bushland Park. Surveys in potentially suitable habitats elsewhere in the Sydney Basin Bioregion have failed to find *Camarophyllopsis kearneyi*. Unlikely to occur at the site.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Darwinia biflora	-	Vulnerable	Vulnerable	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. Known from the site.	No
Deyeuxia appressa	-	Endangered	Endangered	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. Unlikely to occur at the site.	No
Epacris purpurascens var. *purpurascens*	*Camarophyllopsis kearneyi*	Vulnerable	-	Sclerophyll forest, scrubs and swamps, from Gosford and Sydney districts in the Central Coast botanical subdivision. Potential habitat on the site. Not detected on the site during targeted surveys.	No
Eucalyptus camfieldii	Camfield's Stringybark	Vulnerable	Vulnerable	Restricted to a few stands on shallow soiled sandstone or laterite on ridgetops, often of restricted drainage. It is found in association with *Angophora hispida*, *Eucalyptus haemastoma* and *Eucalyptus oblonga*. Potential habitat present. Not detected on the site during targeted surveys.	No
Genoplesium baueri	*Bauer's Midge Orchid*	Endangered	Endangered	The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Grows in sparse sclerophyll forest and moss gardens over sandstone. Potential habitat does exist at the site but species not detected at the site.	No
Grevillea caleyi	Caley's Grevillea	Endangered	Endangered	Restricted to an 8km square area around Terrey Hills, approximately 20km north of Sydney. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *E. gummifera.* Unlikely to occur at the site.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Haloragodendron lucasii	-	Endangered	Endangered	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 dry sclerophyll forest. Not detected within the site. Unlikely to occur.	No
Leptospermum deanei	-	Vulnerable	Vulnerable	Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Not detected within the site. Unlikely to occur.	No
Melaleuca deanei	Deane's Melaleuca	Vulnerable	Vulnerable	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. The species grows in heath on sandstone. Not detected within the site. Unlikely to occur.	No
Microtis angusii	*Angus's Onion Orchid*	Endangered	Endangered	Currently only known from one site at Ingleside in the north of Sydney. Known from areas supporting Duffy's Forest. Not detected within the site. Unlikely to occur.	No
Pimelea curviflora var. *curviflora*	-	Vulnerable	Vulnerable	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 ridgetops and upper slopes amongst woodlands. No suitable soil present. Not detected within the site. Unlikely to occur.	No
Syzygium paniculatum	Magenta Lilly Pilly	Vulnerable	Vulnerable	Occurs on gravels, sands, silts and clays in riverside gallery rainforests and littoral rainforest communities. No suitable vegetation type and not detected within the site. Unlikely to occur.	No
Tetratheca glandulosa	Black-eyed Susan	Vulnerable	Vulnerable	Grows in sandy or rocky heath or scrub, from Mangrove Mountain to the Blue Mountains and Sydney. Flowers from July to October. Potential habitat present. Not detected during targeted surveys.	No
Tetratheca juncea	Black-eyed Susan	Vulnerable	Vulnerable	Sandy, occasionally swampy heath and in dry sclerophyll forest. Central and North coast species, chiefly in coastal districts from Bulahdelah to Lake Macquarie, previously recorded from Port Jackson to Botany Bay. Suitable habitat present but species not detected during targeted surveys.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Grassland or woodland, often in damp sites; widespread but rare. No potential habitat present. Not detected during targeted surveys.	No
Wilsonia backhousei	Narrow-leafed Wilsonia			Occurs along the margins of salt marshes, and lakes, both coastal and inland. Unlikely tot occur, no suitable habitat present.	No
ENDANGERED ECOLOGICAL COMMUNITIES					
Blue Gum High Forest		Endangered	-	Higher rainfall ridgelines on the northern side of Sydney from Crows Nest to Hornsby and west along the ridges between Castle Hill and Eastwood. Relatively fertile soils derived from Wianamatta Shales. Dominant canopy trees are Blue Gum (*Eucalyptus saligna*) and Blackbutt (*E. pilularis*). Does not occur on the site.	No
Turpentine/Ironbark Forest		Endangered	-	This community is restricted to the inner western suburbs of Sydney on Winamatta Shale. Dominant canopy species include Turpentine (*Syncarpia glomulifera*) and Grey Ironbark (*Eucalyptus paniculata*). No potential habitat on the site. Does not occur on the site.	No
Hygrocybeae community of Lane Cove Bushland Park		Endangered	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. This community is known only from Lane Cove Bushland Park and is unlikely to occur on the site.	No
FUNGI					
Camarophyllopsis kearneyi	An agaric fungus	Endangered	-	Associated with a dense tree canopy and sandstone rocks and have the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park. Potential habitat in College Creek. Low likelihood of occurrence.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Hygrocybe anomala var. *ianthinomarginata*	An agaric fungus	Vulnerable	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park and Royal and Blue Mountains National Parks. Potential habitat in College Creek. Low likelihood of occurrence.	No
Hygrocybe aurantipes	An agaric fungus	Vulnerable	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park, Blue Mountains National Park and Hazelbrook. Potential habitat in College Creek. Low likelihood of occurrence.	No
Hygrocybe austropratensis	An agaric fungus	Endangered	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park. Potential habitat in College Creek. Low likelihood of occurrence.	No
Hygrocybe collucera	An agaric fungus	Endangered	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park. Potential habitat in College Creek. Low likelihood of occurrence.	No
Hygrocybe griseoramosa	An agaric fungus	Endangered	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park. Potential habitat in College Creek. Low likelihood of occurrence.	No
Hygrocybe lanecovensis	An agaric fungus	Endangered	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park. Potential habitat in College Creek. Low likelihood of occurrence.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Hygrocybe reesiae	An agaric fungus	Vulnerable	-	Associated with a dense tree canopy and sandstone rocks and has the potential to occur in both mossy areas on creek banks or in sheltered gullies and on ridgetops. Known only from Lane Cove Bushland Park, the Blue Mountains National Park (near Hazelbrook) and in Tasmania. Potential habitat in College Creek. Low likelihood of occurrence.	No
Hygrocybe rubronivea	An agaric fungus	Vulnerable		Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by Lilly Pilly *Acmena smithii*, Grey Myrtle *Backhousia myrtifolia*, Cheese Tree *Glochidion ferdinandi* and Sweet Pittosporum *Pittosporum undulatum*. Associated with alluvial sandy soils of the Hawesbury Soil Landscapes.	No
BIRDS					
Botaurus poiciloptilus	Australasian Bittern	Vulnerable	-	Terrestrial and estuarine wetlands, generally with permanent water. Prefers dense sedges, rushes and reeds but also dense saltmarsh and flooded grassland. No potential habitat present. Not likely to occur.	No
Burhinus grallarius	Bush Stone-curlew	Endangered	-	Lightly timbered, open forest or woodland vegetation of Casuarina, *Eucalyptus* or *Acacia* or *Eucalyptus polycarpa,* estuaries and saltmarshes. No potential habitat present. Not likely to occur.	No
Callocephalon frimbriatum	Gang Gang Cockatoo	Vulnerable	-	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Potential to occur.	Yes
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	-	Drier forest types with low soil nutrient status in intact and less rugged landscapes. Forest with tree hollows for breeding; key *Allocasuarina* species for foraging. No feeding signs have been recorded on the site but there is potential foraging habitat on the site.	Yes

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Diomeda exulans	Wandering Albatross	Endangered	Vulnerable	Breeds on sub Antarctic Islands, but visits waters extending from Fremantle (WA) across the southern waters of Australia to the Whitsunday Islands in Queensland. It has been recorded along the length of the NSW coast. No potential habitat on the site. Unlikely to occur.	No
	Eastern Bristle-bird				No
Erythrotriorchis radiatus	Red Goshawk	Endangered	Vulnerable	Woodlands and forests with a mosaic of vegetation types that are open enough for fast maneuvering flights. They avoid very dense or open habitats and prefer to hunt along ecotones. No potential habitat on the site. Unlikely to occur.	No
Esacus neglectus	Beach Stone-curlew	Endangered	-	Open undisturbed beaches, islands, reefs and estuarine intertidal sand and mudflat. No potential habitat on the site. Unlikely to occur.	No
Haliaeetus leucogaster	White-bellied Sea Eagle	-	M	A sedentary and dispersive species that occurs in coastal Australia and is also associated with larger rivers, lakes and storages. Its range includes India, southeast Asia to Papua New Guinea and the Solomon Islands. Potential flyover habitat on the site. Potential to occur.	No
Hirundapus caudacutus	White-throated Needletail	-	M	Airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. It breeds from western Siberia and the Himalayas to eastern Japan and is a regular summer migrant to Australia. Potential habitat on the site. Potential to occur.	No
Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable	-	Intertidal rocky and coral reefs, mostly on ocean shores, breeds mostly on offshore islands. No habitat on the site. Unlikely to occur.	No
Ixobrychus flavicollis	Black Bittern	Vulnerable		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.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Lathamus discolor	Swift Parrot	Endangered	Endangered	The species breeds in Tasmania during spring and summer, migrating in the winter and autumn months to south eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland.	No
Limicola falcinellus	Broad-billed Sandpiper	Vulnerable	-	Tidal mudflats, reefs, saltmarsh, freshwater wetlands, sewage ponds, favours muddy ooze. No habitat on the site. Not likely to occur.	No
Limosa limosa	Black-tailed Godwit	Vulnerable	-	Migratory wading bird primarily found along the coast on sand spits, lagoons and mudflats. No habitat on the site. Not likely to occur.	No
Myiagra cyanoleuca	Satin Flycatcher	-	M	Heavily vegetated gullies in forests, taller woodlands. Potential habitat present on mid to lower slopes. Likely to occur.	No
Monarcha melanopsis	Black-faced Monarch	-	M	In NSW it inhabits open woodlands. Resident in north east Queensland and is a summer breeding migrant to coastal south east Australia from August to April. Habitat unlikely to be present on site. Unlikely to occur.	No
Nettapus coromendalianus	Cotton Pygmy-goose	Endangered	-	A rare vagrant with the southern part of its range in northern NSW. It is almost entirely aquatic and inhabits deep freshwater lagoons, swamps and dams, particularly those with floating vegetation. No habitat on the site. Unlikely to occur.	No
Ninox connivens	Barking Owl	Vulnerable	-	Open forests, woodlands, dense scrubs, and large trees near watercourses. Generally nests in tree hollows but occasionally on ground. No potential habitat present. Not likely to be occur.	No
Ninox strenua	Powerful Owl	Vulnerable	-	Decayed debris, hollow trunks or limbs in high in trees in mountain forests, gullies and forest margins; sparser hilly woodlands; coastal forests, woodlands, scrubs; exotic pine plantations; large trees in gardens and some cities. Foraging and known daytime roosting habitat on the site. Known to occur on the site.	Yes
Pandion haliatus	Osprey	Vulnerable	-	Coasts, estuaries, bays, inlets, islands and surrounding waters, coral atolls, reefs, lagoons, rock cliffs, stacks. Ascends large rivers. No habitat present. Not likely to occur.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Polytelis swainsonii	Superb Parrot	Vulnerable	Vulnerable	A highly mobile species, which undertakes distinct movements between breeding and non-breeding parts of its range each year. River Red Gum forests in the Murray-Riverina area, and other eucalypts on the south-west slopes. No habitat present. Not likely to occur.	No
Ptilinopus superbus	Superb Fruit-Dove	Vulnerable	-	Coastal north-east Australia, non-breeding migrant to south of the Hunter Valley. Rainforest, adjacent mangroves and eucalypt forests. No habitat present. Unlikely to occur.	No
Rhipidura rufifrons	Rufous Fantail	-	M	Undergrowth of rainforests and wetter eucalypt forest, gullies, monsoon forests, paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. It breeds in summer in south-eastern Australia and is a regular autumn-winter migrant to Papua New Guinea across the Torres Strait. Potential habitat on the site. Recorded on the site during surveys.	No
Sterna albifrons	Little Tern	Endangered	-	Almost exclusively coastal and prefers sheltered environment. No habitat on the site. Unlikely to occur.	No
Stictonetta naevosa	Freckled Duck	Vulnerable	-	A variety of plankton-rich wetland types, including swamps heavily vegetation with Cumbungi, Lignum, Canegrass or Tea-tree (in coastal areas), large open lakes and their shores, farm dams, sewage ponds and floodwaters. No habitat on the site. Unlikely to occur.	No
Tyto capensis	Grass Owl	Vulnerable	-	Native tussock grasslands, but also in heaths, swamps, coastal dunes, tree-lined creeks, treeless plains, grassy gaps between trees and crops. No habitat present. Not likely to occur.	No
Tyto novaehollandiae	Masked Owl	Vulnerable	-	A diverse range of woodland habitats that provide large hollow-bearing trees for roosting and nesting and nearby open areas for foraging. Recorded in LCNP. No habitat present on the site. Unlikely to occur.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Xanthomyza phrygia	Regent Honeyeater	Endangered	Endangered	Temperate eucalypt woodlands and open forest in south-east Australia. Eucalypt woodland and open forest for foraging and breeding (particularly Spotted Gum and Swamp Mahogany in Wyong Shire). Some low potential foraging habitat present. Low potential to occur.	No
MAMMALS					No
Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	-	Tree hollow or other cranny in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath; western slopes of the Great Dividing Range and on the coastal plains. Potential habitat on the site. Unlikely to occur due to isolation and fragmentation of bushland and disturbance from adjacent developed areas.	No
Chalinolobus dwyeri	Large Pied Bat	Vulnerable	Vulnerable	Caves, underground mines and unused bird nests for roosting, woodland and forest for foraging. Potential foraging habitat on the site. Potential to occur on the site.	Yes
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered	Tree and log hollows and rock crevices in rainforests, wet and dry sclerophyll forests, coastal heath and scrubs, sometimes Red Gum forests along inland rivers. Potential habitat on the site. Unlikely to occur due to isolation and fragmentation of bushland on the site and disturbance from adjacent developed areas.	No
Dasyurus viverrinus	Eastern Quoll	Endangered	-	Dry sclerophyll forest, shrub heathland and agricultural land. Potential habitat on the site. Unlikely to occur due to isolation and fragmentation of bushland on the site and disturbance from adjacent developed areas.	No
Isoodon obesulus	Southern Brown Bandicoot	Endangered	Endangered	Heath, heathy forest, shrubland and woodland which is usually supported by well-drained soils. Potential habitat on the site. Unlikely to occur due to isolation and fragmentation of bushland on the site and disturbance from adjacent developed areas.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Miniopterus schreibersii oceanensis	Large Bent-wing Bat	Vulnerable	-	Mainly caves for breeding (also man-made structures such as culverts); a range of eucalypt forest and woodland for foraging. Potential foraging habitat on the site. Potential to occur.	Yes
Mormopterus norfolkensis	Eastern Freetail-bat	Vulnerable		Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Potential to occur.	Yes
Petaurus australis	Yellow-bellied Glider	Vulnerable	-	Tall open sclerophyll forest with mature trees that provide tree hollows for breeding; a mix of eucalypts, eucalypt nectar and sap, honeydew, manna, pollen and invertebrates under decorticating bark. Wet sclerophyll forest from Mackay in Queensland to near Melbourne, also in Otway Range and south western Victoria. No potential habitat on the site. Unlikely to occur.	No
Phascolarctos cinereus	Koala	Vulnerable	-	Eucalypt forest and woodland with preferred *Eucalyptus* sp. for foraging. Foothills and plains, either side of the Great Dividing Range; also along riverine forests and in coastal areas. Potential for habitat on the site. No core Koala habitat (SEPP 44) is present. Not likely to occur due to the isolation and fragmentation of bushland in the Lane Cove valley and disturbance from adjacent developed areas.	No
Potorous tridactylus tridactylus	Long-nosed potoroo	Vulnerable	Vulnerable	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. Potential foraging habitat may be present. Unlikely to shelter on site due to lack of suitably dense ground cover.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable	Rainforest, woodland and forest with Eucalyptus, Melaleuca and Banksia nectar and pollen, fruits of rainforest trees and vines for foraging and breeding (camp sites). Potential foraging habitat on the site. Potential to occur.	Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat			Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Yes
REPTILES					
Varanus rosenbergi	Rosenberg's Goanna	Vulnerable	-	Sydney sandstone vegetation utilising sandstone outcroppings and crevices as important shelter and over wintering habitat. Ground termite mounds are known to be utilised as breeding chambers by this species. No termite mounds detected on the site. Unlikely to occur due to the isolation and fragmentation of bushland in the Lane Cove valley and disturbance from adjacent developed areas.	No
Hoplocephalus bungaroides	Broad-headed Snake	Endangered	Vulnerable	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Sandstone present but unlikely to occur within the Sydney urban area. Not recorded within the Ku-ring-gai LGA.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
AMPHIBIANS					No
Crinia tinnula	Wallum Froglet	Vulnerable		Wallum Froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country. The species is a late winter breeder. Males call in choruses from within sedge tussocks or at the water edge. Unlikely to occur.	No
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Vulnerable	Within the Pittwater subregion breeding habitat occurs as 1st or 2nd order semi-permanent creeks; ponded sections of unmarked drainage lines; culverts and other ridge top structures containing water. Foraging occurs in heath, woodland or forest; generally with sandy or friable soils; not generally found where there is a grassy groundlayer; often forage along tracks and roads during warm evenings. Sheltering may occur in deep leaf litter and/or loose soil; burrow structures that they construct or may use abandoned yabbie burrows. There is no breeding habitat on the site. . The species has not been detected on the site and there are no records from the Ku-ring-gai LGA. Therefore considered unlikely to occur.	No
Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable	Large permanent ponds and swamps with shallow, still and chemically unpolluted water, with a substrate of sand, and some aquatic vegetation, especially emergent reeds. No habitat on the site. Unlikely to occur.	No
Litoria littlejohni	Littlejohn's Tree frog	Vulnerable	Vulnerable	Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Unlikely to occur.	No
Mixophyes balbus	Stuttering Frog	Vulnerable	Endangered	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Unlikely to occur.	No

	COMMON NAME	STATUS (TSC Act)	STATUS (EPBC Act)	HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRENCE ON THE SUBJECT SITE	Assessment Of Impact Required?
Mixophyes iteratus	Southern barred Frog	Endangered	Endangered	Within Hawkesbury/Nepean Catchment Management Region the Giant Barred Frog breeds in second to fourth order streams with riparian vegetation and forage in streamside vegetation mostly in subtropical and cool temperate forests, but also in wet sclerophyll forests. sheltering habitat is Forest leaf litter. Unlikely to occur within the site. Has not been recorded on site.	No
Pseudophryne australis	Red-crowned Toadlet	Vulnerable	-	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. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Previously recorded downstream of the site. Likely to occur.	Yes
ENDANGERED POPULATIONS					No
Gang-gang Cockatoo Population, Hornsby & Ku-ring-gai LGAs		Endangered	-	Hornsby and Ku-ring-gai LGAs in an area bounded by Beecroft – Cheltenham in the west, Epping – North Epping in the south, Turramurra – South Turramurra in the east, and Thornleigh – Wahroonga to the north, including parts of LCNP. Potential habitat on the site. Potential for individual birds to occur on the site.	Yes

1. M = Migratory under the EPBC Act.

2. Habitat requirements for species are from: Harden (1992, 1993, 2000, 2002), Bishop (2000), Churchill (1998), NPWS (1999), Pizzey and Knight (1998), Garnett and Crowley (2000), Cogger (1996) and Ehmann (1992).

Annex C

Threatened Species Impact Assessment

C.1 THREATENED SPECIES ASSESSMENT

C.1.1 Darwinia biflora

Darwinia biflora is restricted to the northern and north-western suburbs of Sydney, from Maroota to North Ryde. The species is known from approximately 130 highly fragmented sites across an area of approximately 600km2. The total number of individuals is variable, as adult plants are killed by fire. However the number of plants is likely to be greater than 10 000. Twenty-one of the 130 known sites are known to occur within conservation reserves including Marramarra National Park (NP), Kuring- gai Chase NP, Lane Cove NP and Mougamarra Nature Reserve, and an additional 24 sites are known to occur within Berowra Valley Regional Park (Hogbin 2002).

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will result in the removal of approximately 40 plants of *D. biflora*. The plants to be retained within the APZ will be protected and managed for ongoing viability at the site. A Threatened Species Management Plan that will incorporate expert opinion will be devised prior to any works beginning on the project.

b) disrupts the breeding cycle;

D. biflora is primarily self-pollinating, and therefore the removal of some individuals will not result in significant reduction of pollination of the population. Seedling recruitment has been found to follow fire, with heat breaking the dormancy of some seeds. In established seedlings, fruit production has been found to be low until plants are five years old (Myerscough 1998). Seeds are dispersed by ants and plants regenerate through fire. The seedbank of the plants to be removed can be translocated within the proposal area and ecological burning undertaken to assist in regeneration of plants. Therefore the removal of plants for the development of the site will not significantly impact on the life cycle of the species at the site, or within the locality or region.

c) disturbs the dormancy period;

D. biflora does not have a dormancy period essential for the persistence of the population. In obligate-seeding species such as *D. biflora*, dormant seed has been found to be present in the soil, but the proportion and persistence of seed in the soil seedbank varies between species and populations. To generate sufficient heat to break dormancy of seeds in the soil for significant germination, fires need to consume high levels of fuel. Ecological fire management of the population to be retained within the APZ can be used to break the dormancy of seeds and germinate seedlings.

d) affects migration and dispersal ability;

Dispersal of seeds of *D. biflora* is by ants (Benson & McDougall 1998). Ants will not be significantly impacted by the proposal as habitat for them will not be removed from the APZ.

e) disrupts pollination cycle;

The proposal will result in the removal of some plants from the site but will not impact significantly on pollination. Pollination of the plants is primarily through insect activity and insects are unlikely to be impacted by the proposal given that habitat within the APZ will remain.

f) disturbs seedbanks;

The proposal will result in the removal of soil that may hold the seed bank of *D. biflora*. The soil in areas where *D. biflora* currently occurs can be translocated to retained areas and encouraged to germinate through the use of fire. This can be detailed within a Threatened Species Management Plan that will be devised as part of the development.

g) disrupts recruitment (ie. germination and establishment of plants);

The proposal will not result in disruption to germination and establishment of *D. biflora* as the retained plants will be managed for ongoing viability through the implementation of a Threatened Species Management Plan. This plan will detail the potential for ecological burning in retained areas to encourage the germination of new plants that may be within the seed bank.

h) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

The removal of 40 plants from the site will not impact on other species within the community. There are no species known to be reliant on *D. biflora* and the retention of plants within the APZ will ensure ongoing interaction with pollinators.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) degrades soil quality;

Control measures to ensure no indirect impacts to the habitat of the retained *D. biflora* will be implemented as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

b) clears or modifies native vegetation;

The proposal will result in the removal of 40 *D. biflora* plants and approximately 2.8 ha of vegetation from the site, and modification of 1.3 ha within the APZ.

c) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that areas containing *D. biflora* are managed to reduce the potential for weed invasion. Storm water run off will also be controlled to ensure that there will be no impact on the plants from this source.

d) affects natural revegetation and recolonisation of existing species following disturbance; and

D. biflora is commonly recorded in areas where there has been disturbance through clearing or fire. Therefore, the creation of the APZ may result in an increase in the recolonisation of this species at the site, through the removal of the large shrubs and dead vegetation that is currently present within the APZ area, and through the management of this area for the persistence of the species. The potential for this to occur and to be identified will be detailed in the Threatened Species Management Plan that will be devised as part of this project, to ensure that any new plants are also protected and managed within the APZ or landscaped areas.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

D. biflora is not at the limit of its known distribution at the site, and 38 plants will be protected and managed for viability. Therefore *D. biflora* will not be lost from the site and a population will be managed to persist on the site.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

e) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ within which the *D. biflora* will be protected. The APZ will be managed to reduce the potential for wild fire. However, ecological burning to encourage the germination of *D. biflora* may form part of the Threatened Species Management Plan. Too frequent fire kills *D. biflora* so the protection and management of the plants within the APZ is likely to increase the chance of the species viability, rather than negatively impact on it. This will be an improvement on the current situation of no fire management.

f) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

g) creates a barrier to fauna movement;

No barriers to fauna movement (pollinators) will result from the proposal.

h) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area. This is unlikely to impact on the connectivity of *D. biflora* plants on the site to others in the locality or region, given that populations on other sites are already significantly separated from the site population, and that individual plants within the site are currently separated by built up and landscaped areas.

i) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. This modification will not impact on habitat connectivity for *D. biflora*.

How Is The Proposal Likely To Affect Critical Habitat?

a) removes or modifies key habitat features;
b) affects natural revegetation or recolonisation of existing species following disturbance;
c) introduces weeds, vermin or feral species
d) generates or disposes of solid, liquid or gaseous waste;
e) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

C.1.2 Red-crowned Toadlet

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will not result in the displacement of Red-crowned Toadlets from the site, as all potential habitat for the species at the site will be retained and protected within the APZ.

b) disrupts the breeding cycle;

The Red-crowned Toadlet breeding site identified within the site in 1999 (ERM 1999b) will be retained and will not be modified as a result of the proposal. No bushrock will be removed for the APZ or fire trail creation and bridges for the fire trail will be constructed over each of the riparian habitats identified within the site. Leaf litter around the riparian habitat will be retained where possible. Therefore no breeding habitat for the Toadlet will be impacted by the proposal. In addition, controls to ensure no increased runoff or sedimentation occurs within riparian areas as a result of development will be implemented at the site prior to any vegetation clearance or development being undertaken.

c) changes foraging behaviour;

The range over which the Red-crowned Toadlet moves to forage is not known. Therefore it is assumed that Red-crowned Toadlets may forage within leaf litter across the bushland of the site. The removal of leaf litter from the APZ may therefore result in impacts on foraging habitat for the species. To reduce the impact of leaf litter removal, litter within the OPA can be retained in clumps, as long as litter does not accumulate within 3 m of trees. The management of leaf litter within the APZ will be detailed in a Management Plan that will incorporate the requirements of the Red-crowned Toadlet.

d) affects migration and dispersal ability;

The range over which Red-crowned Toadlets move has not been established. However the retention of riparian vegetation and limited modification of vegetation within the APZ should ensure that dispersal of the species is not impacted by the proposal.

e) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

There are no known interactions between the Red-crowned Toadlet and other species within the community that may be impacted by the proposal.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

The proposal will not disturb any waterbodies and the creeklines on the site will not be disturbed by development. Bridges will be built over these areas for the creation of the fire trail and sedimentation and runoff controls will be implemented prior to any vegetation clearance or development.

b) degrades soil quality;

Control measures to ensure no indirect impacts will be implemented as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

c) clears or modifies native vegetation;

The proposal will result in the removal of a total of approximately 2.8 ha of vegetation from the site and removal of the large shrub layer and litter within the APZ (1.3 ha). Riparian vegetation will be protected.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that habitat for the Red-crowned Toadlet is likely to improve. Currently the creeklines have noxious and environmental weeds that have entered through runoff from development upstream. Runoff will be controlled and treated and Water Sensitive Urban Design will be implemented as part of the proposed development.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

Some foraging habitat for the Red-crowned Toadlet in the form of leaf litter will be lost from the site. No sandstone outcrops or bushrock will be removed or disturbed at the site.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

The Red-crowned Toadlet is not at the limit of its known distribution at the site.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

a) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ which will be managed to reduce the potential for wild fire. Therefore the proposal will result in the improvement of management of fire for the Red-crowned Toadlet at the site, as this species is thought to be sensitive to frequent fire. No ecological burning regime has been devised for this species.

b) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

a) creates a barrier to fauna movement;

No barriers to movement of the Red-crowned Toadlet will result from the proposal. The removal of leaf litter may restrict movement within the APZ area but riparian habitats will be retained and movement for the species is possible downhill from the APZ and fire trail.

b) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area and removal of large shrubs and leaf litter reduction from within the APZ (1.3 ha). This should not affect any major movement corridors for the Red-crowned Toadlet, given that any potential movement northwards through the site is already restricted through hardstand development.

c) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. This modification may restrict some movement of Red-crowned Toadlets across the ridgetop. However, the distance of movements and home range of the species is not known, so the extent of this restriction can not be predicted.

How Is The Proposal Likely To Affect Critical Habitat?

a) removes or modifies key habitat features;
b) affects natural revegetation or recolonisation of existing species following disturbance;
c) introduces weeds, vermin or feral species
d) generates or disposes of solid, liquid or gaseous waste;
e) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

C.1.3 Powerful Owl

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will not result in the displacement of the Powerful Owl from the site, as all potential roosting habitat for the species at the site will be retained and protected within the APZ.

b) disrupts the breeding cycle;

The proposal will not result in impacts to breeding habitat for the Powerful Owl. There are no suitable nest trees within the site.

c) disrupts roosting behaviour;

Potential daytime roosting sites for the Powerful Owl will be retained within the APZ of the site. No roost sites are known from the vegetation to be removed as a result of the proposal. Therefore no known or potential roost sites will be removed as a result of the proposal.

d) changes foraging behaviour;

The proposal will result in the removal of approximately 2.8 ha of vegetation that may provide habitat for prey species. The removal of this habitat is unlikely to change the foraging behaviour or number of prey species available to the Powerful Owl given the amount of vegetation in adjacent areas. Habitat for prey species will be retained within the APZ.

e) affects migration and dispersal ability;

The removal of approximately 2.8 ha of vegetation from the site will not impact on the dispersal or migration ability of the Powerful Owl.

f) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

The proposal will result in the removal of some limited habitat for prey species of the Powerful Owl. However most of the habitat for prey species will be retained within the APZ and the Powerful Owl has a large home range ((400-1450 ha) (DECC 2007c) over which to forage. Therefore the proposal is unlikely to affect any interaction between prey species and the Powerful Owl.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

The proposal will not disturb any waterbodies and the creeklines on the site will not be disturbed by development.

b) degrades soil quality;

Control measures to ensure no indirect impacts will result as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

c) clears or modifies native vegetation;

The proposal will result in the removal of approximately 2.8 ha of vegetation from the site and modification of the large shrub layer and leaf litter within the APZ (1.3 ha). The removal and modification of this vegetation is unlikely to impact the Powerful Owl given the amount of vegetation available in adjacent areas and the retention of trees within the APZ.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that habitat is likely to improve

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

No hollow-bearing trees suitable for the Powerful Owl will be removed. There will be removal of a small area of foraging habitat for the species in the form of loss of trees for prey species. This is not considered significant given the amount of existing vegetation within adjacent areas, the large home range of the Powerful Owl and the proximity of LCNP.

f) affects natural revegetation and recolonisation of existing species following disturbance; and

The proposal may result in the management of regeneration within the APZ. This is not considered to represent a significant impact for the Powerful Owl within the site or the locality.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

The Powerful Owl is not at the limit of its known distribution at the site.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

a) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ which will be managed to reduce the potential for wild fire. Therefore the proposal will result in the improvement of management of fire at the site.

b) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

a) creates a barrier to fauna movement;

No barriers to movement of the Powerful Owl will result from the proposal.

b) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area and some removal of shrubs, ground cover and litter from the APZ (1.3 ha). This will not impact on the ability of the Powerful Owl to move between habitats within the locality.

c) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. No wildlife corridors for the Powerful Owl or its prey species will be impacted by this modification.

How Is The Proposal Likely To Affect Critical Habitat?

f) removes or modifies key habitat features;
g) affects natural revegetation or recolonisation of existing species following disturbance;
h) introduces weeds, vermin or feral species
i) generates or disposes of solid, liquid or gaseous waste;
j) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

C.1.4 Glossy Black-cockatoo

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will not result in the displacement of the Glossy Black-cockatoo from the site, as there are no trees containing hollows suited to this large species.

b) disrupts the breeding cycle;

The proposal will not result in impacts to breeding habitat for the Glossy Black-cockatoo. There are no suitable nest trees within the site.

c) disrupts roosting behaviour;

No potential roost sites for the Glossy Black-cockatoo will be removed as a result of the proposal.

d) changes foraging behaviour;

The proposal will result in the removal of some *Allocasuarina* species that may provide foraging habitat for this species. The removal of these trees from the site is unlikely to change foraging behaviour of the species, and there have been no foraging signs (chewed cones) recorded within the site. Replacement and additional *Allocasuarina* species can be included in landscaping and regenerative plantings at the site.

e) affects migration and dispersal ability;

The removal of approximately 2.8 ha of vegetation from the site will not impact on the dispersal or migration ability of the Glossy Black-cockatoo.

f) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

There are no known interactions between the Glossy Black-cockatoo and other species within the community that may be impacted by the proposal.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

The proposal will not disturb any waterbodies and the creeklines on the site will not be disturbed by development. Therefore if this species uses the site as a watering point, they can continue to do so post-development.

b) degrades soil quality;

Control measures to ensure no indirect impacts will result as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

c) clears or modifies native vegetation;

The proposal will result in the removal of approximately 2.8 ha of vegetation from the site and modification of the large shrub layer and leaf litter within the APZ. The removal and modification of this vegetation is unlikely to impact the Glossy Black-cockatoo given the amount of vegetation available in adjacent areas and the retention of trees within the APZ.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that habitat is likely to improve

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

No hollow-bearing trees suitable for the Glossy Black-cockatoo will be removed. There will be removal of a small area of foraging habitat for the species in the form of some loss of *Allocasuarina*. This is not considered significant given the amount of existing vegetation within adjacent areas.

f) affects natural revegetation and recolonisation of existing species following disturbance; and

The proposal may result in the management of regeneration within the APZ. This is not considered to represent a significant impact for the Glossy Black-cockatoo within the site or the locality. *Allocasuarina* species can be planted in regeneration and landscaped areas.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

The Glossy Black-cockatoo is not at the limit of its known distribution at the site.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

a) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ which will be managed to reduce the potential for wild fire. Therefore the proposal will result in the improvement of management of fire at the site.

b) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

a) creates a barrier to fauna movement;

No barriers to movement of the Glossy Black-cockatoo will result from the proposal.

b) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area and some removal from the APZ of shrubs and ground cover. This will not impact on the ability of the Glossy Black-cockatoo to move between habitats within the locality.

c) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. No wildlife corridors for the Glossy Black-cockatoo will be impacted by this modification and the species is highly mobile.

How Is The Proposal Likely To Affect Critical Habitat?

a) removes or modifies key habitat features;
b) affects natural revegetation or recolonisation of existing species following disturbance;
c) introduces weeds, vermin or feral species
d) generates or disposes of solid, liquid or gaseous waste;
e) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

C.1.5 Gang-gang Cockatoo

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will not result in the displacement of any known breeding pairs of Gang-gang Cockatoos from the site. However, prior to any vegetation clearance a hollow-bearing tree survey will be undertaken and clearing will be undertaken outside of the breeding time for this species.

b) disrupts the breeding cycle;

Prior to any vegetation clearance a hollow-bearing tree survey will be undertaken and clearing will be undertaken outside of the breeding time for this species. Therefore the timed removal of these trees will be unlikely to impact on the breeding cycle of the species.

c) changes foraging behaviour;

The proposal will result in the removal of approximately 2.8 ha of potential foraging habitat for the Gang-gang Cockatoo. There have been no foraging signs of cockatoos (chewed cones or fruits) recorded within the site and the Gang-gang Cockatoo is a generalist forager and would not be reliant on the site for resources. Therefore, the removal of vegetation from the site is unlikely to change foraging behaviour of the species.

d) affects migration and dispersal ability;

The removal of approximately 2.8 ha of vegetation from the site will not impact on the dispersal or migration ability of the Gang-gang Cockatoo.

e) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

There are no known interactions between the Gang-gang Cockatoo and other species within the community that may be impacted by the proposal.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

The proposal will not disturb any waterbodies and the creeklines on the site will not be disturbed by development. Therefore if this species uses the site as a watering point, they can continue to do so post-development.

b) degrades soil quality;

Control measures to ensure no indirect impacts will result as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

c) clears or modifies native vegetation;

The proposal will result in the removal of approximately 2.8 ha of vegetation from the site and modification of the large shrub layer and leaf litter within the APZ. The removal and modification of this vegetation is unlikely to impact the Gang-gang Cockatoo given the amount of vegetation available in adjacent areas and the retention of trees within the APZ.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that habitat is likely to improve

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

Prior to any vegetation clearance a hollow-bearing tree survey will be undertaken and clearing will be undertaken outside of the breeding time for this species. Therefore the timed removal of these trees will be unlikely to impact on the breeding cycle of the species.

f) affects natural revegetation and recolonisation of existing species following disturbance; and

The proposal may result in the management of regeneration within the APZ. This is not considered to represent a significant impact for the Gang-gang Cockatoo within the site or the locality.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

The Gang-gang Cockatoo is not at the limit of its known distribution at the site. However, the endangered population is restricted to the Hornsby and Ku-ring-gai LGAs and this population can be considered to be at the limit of its distribution at the site, if it occurs there.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

a) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ which will be managed to reduce the potential for wild fire. Therefore the proposal will result in the improvement of management of fire at the site.

b) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

a) creates a barrier to fauna movement;

No barriers to movement of the Gang-gang Cockatoo will result from the proposal.

b) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area and some removal from the APZ of shrubs and ground cover. This will not impact on the ability of the Gang-gang Cockatoo to move between habitats within the locality, given it is a highly mobile species with generalist foraging behaviour.

c) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. No wildlife corridors for the Gang-gang Cockatoo will be impacted by this modification.

How Is The Proposal Likely To Affect Critical Habitat?

a) removes or modifies key habitat features;
b) affects natural revegetation or recolonisation of existing species following disturbance;
c) introduces weeds, vermin or feral species
d) generates or disposes of solid, liquid or gaseous waste;
e) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

C.1.6 Grey-headed Flying-fox

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will not result in the displacement of Grey-headed Flying-foxes from the site as there are no known camp sites within the site.

b) disrupts the breeding cycle;

The proposal will not result in impacts to the breeding cycle of the Grey-headed Flying-fox. There is only a small amount of foraging habitat available on the site.

c) disrupts roosting behaviour;

There has been no roosting sites of the Grey-headed Flying-fox identified within the site.

d) changes foraging behaviour;

The proposal will result in the removal of approximately 2.8 ha of vegetation that may provide foraging habitat for the Grey-headed Flying-fox. This area of habitat is not considered significant given the amount of vegetation available for foraging within adjacent areas and within the greater region.

e) affects migration and dispersal ability;

The removal of approximately 2.8 ha of vegetation from the site will not impact on the dispersal or migration ability of the Grey-headed Flying-fox.

f) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

There are no known interactions between the Grey-headed Flying-fox and other species within the community that may be impacted by the proposal. Pollination by this species of trees within the site can continue in retained areas.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

The proposal will not disturb any waterbodies and the creeklines on the site will not be disturbed by development.

b) degrades soil quality;

Control measures to ensure no indirect impacts will result as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

c) clears or modifies native vegetation;

The proposal will result in the removal of approximately 2.8 ha of vegetation from the site and modification of the large shrub layer and leaf litter within the APZ. The removal and modification of this vegetation is unlikely to impact the Grey-headed Flying-fox given the amount of vegetation available in adjacent areas and the retention of trees within the APZ.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that habitat is likely to improve.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

There are no habitats of significance for the Grey-headed Flying-fox within the site that will be removed as a result of the proposal.

f) affects natural revegetation and recolonisation of existing species following disturbance; and

The proposal may result in the management of regeneration within the APZ. This is not considered to represent a significant impact for the Grey-headed Flying-fox within the site or the locality.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

The Grey-headed Flying-fox is not at the limit of its known distribution at the site.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

a) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ which will be managed to reduce the potential for wild fire. Therefore the proposal will result in the improvement of management of fire at the site.

b) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

d) creates a barrier to fauna movement;

No barriers to movement of the Grey-headed Flying-fox will result from the proposal.

e) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area and some removal from the APZ of shrubs and ground cover. This will not impact on the ability of the Grey-headed Flying-fox to move between habitats within the locality.

f) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. No wildlife corridors for the Grey-headed Flying-fox will be impacted by this modification.

How Is The Proposal Likely To Affect Critical Habitat?

a) removes or modifies key habitat features;

b) affects natural revegetation or recolonisation of existing species following disturbance;

c) introduces weeds, vermin or feral species

d) generates or disposes of solid, liquid or gaseous waste;

e) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

The Grey-headed Flying-fox is also listed as vulnerable under the EPBC Act. However, the small amount of potential foraging habitat that will be removed as a result of the proposal would not constitute a significant impact under the EPBC Act significant impact criteria and a referral for this species was not considered necessary.

C.1.7 Microchiropteran Bats

Large Pied Bat;

Large Bentwing-Bat;

Yellow-Bellied Sheathtail-Bat; and

Eastern Freetail-Bat.

How Is The Proposal Likely To Affect The Lifecycle Of A Threatened Species And/Or Population?

a) displaces or disturbs threatened species and/or populations.

The proposal will result in the removal of some trees from the APZ and some vegetation for development of the site. There have been no hollow-bearing trees identified within the site that provide habitat for those bat species dependent on this resource. The proposal is therefore unlikely to displace any of these species from the site. There are no caves suitable as roosting habitat on site. Prior to any vegetation clearance any trees bearing hollows will be surveyed and marked for retention.

b) disrupts the breeding cycle;

The proposal will not result in impacts to the breeding cycle of these species. No breeding sites have been identified within the site.

c) disrupts roosting behaviour;

There have been no roosting sites for these species identified within the site. The site is very limited with respect to hollow-bearing trees. However, a hollow-bearing tree survey will be undertaken prior to vegetation removal or disturbance and these trees can be avoided for the creation of the fire trail. Where any hollow-bearing trees require removal an ecologists will be present on site to remove any displaced fauna. A preclearance strategy that details the removal of vegetation with respect to fauna species protection will be implemented as part of the project.

d) changes foraging behaviour;

The proposal will result in the removal of approximately 2.8 ha of vegetation that may provide foraging habitat for these bat species. This area of habitat is not considered significant given the amount of vegetation available for foraging within adjacent areas and within the greater region.

e) affects migration and dispersal ability;

The removal of approximately 2.8 ha of vegetation from the site will not impact on the dispersal or migration ability of these species.

f) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

There are no known interactions between these bat species and other species within the community that may be impacted by the proposal.

How Is The Proposal Likely To Affect The Habitat Of A Threatened Species, Population Or Ecological Community?

a) disturbs any permanent, semi-permanent or ephemeral water bodies;

The proposal will not disturb any waterbodies and the creeklines on the site will not be disturbed by development.

b) degrades soil quality;

Control measures to ensure no indirect impacts will result as part of the development and therefore soil quality is unlikely to be degraded as a result of the proposal.

c) clears or modifies native vegetation;

The proposal will result in the removal of approximately 2.8 ha of vegetation from the site and modification of the large shrub layer and leaf litter within the APZ (1.3 ha). The removal and modification of this vegetation is unlikely to impact these bat species given the amount of vegetation available in adjacent areas and the retention of trees within the APZ.

d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;

The proposal includes the implementation of a weed and feral species management plan. This will ensure that existing weeds are removed and that habitat is likely to improve.

e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;

A hollow-bearing tree survey will be undertaken prior to any vegetation clearance so that potential habitat for these species is protected within the site. No caves or rock crevices will be impacted or removed under the proposal.

f) affects natural revegetation and recolonisation of existing species following disturbance; and

The proposal may result in the management of regeneration within the APZ. This is not considered to represent a significant impact for these bats within the site or the locality.

Does The Proposal Affect Any Threatened Species Or Populations That Are At The Limit Of Its Known Distribution?

None of these threatened bat species are at the limit of their known distributions at the site.

How Is The Proposal Likely To Affect Current Disturbance Regimes?

a) modifies the intensity and frequency of fires;

The proposal will result in the creation of an APZ which will be managed to reduce the potential for wild fire. Therefore the proposal will result in the improvement of management of fire at the site.

b) modifies flooding flows.

Flooding flows will not be impacted by the proposal.

How Is The Proposal Likely To Affect Habitat Connectivity?

a) creates a barrier to fauna movement;

No barriers to movement of these mobile species will result from the proposal.

b) removes remnant vegetation or wildlife corridors;

The proposal will result in the removal of approximately 2.8 ha of bushland from the development area and some removal from the APZ of shrubs and ground cover. This will not impact on the ability of these bat species to move between habitats within the locality.

c) modifies remnant vegetation or wildlife corridors.

There will be some modification of vegetation within the APZ as discussed. No wildlife corridors for these mobile species will be impacted by this modification.

How Is The Proposal Likely To Affect Critical Habitat?

a) removes or modifies key habitat features;
b) affects natural revegetation or recolonisation of existing species following disturbance;
c) introduces weeds, vermin or feral species
d) generates or disposes of solid, liquid or gaseous waste;
e) uses pesticides, herbicides, other chemicals.

There is no critical habitat that will be impacted by the proposal.

C.2 EPBC ACT VULNERABLE SPECIES SIGNIFICANT IMPACT CRITERIA

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;*

The *D. biflora* on the site is not recognised as an 'important population' as defined under the EPBC Act and the population within the site will be able to persist post-development.

- *reduce the area of occupancy of an important population;*

The *D. biflora* on the site is not recognised as an 'important population' as defined under the EPBC Act and the population within the site will be able to persist post-development.

- *fragment an existing important population into two or more populations;*

The *D. biflora* on the site is not recognised as an 'important population' as defined under the EPBC Act and the population within the site will be able to persist post-development.

- *adversely affect habitat critical to the survival of a species;*

The habitat on the site is not considered critical to the survival of *D. biflora*, and individuals will be protected and maintained within the development.

- *disrupt the breeding cycle of an important population;*

The *D. biflora* on the site is not recognised as an 'important population' as defined under the EPBC Act and the population within the site will be able to persist post-development.

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

The proposal will result in a decrease in the known area that *D. biflora* inhabits at the site. However, the removal of some large senescent shrub species from the APZ may result in an increase in suitable habitat within the APZ. This habitat will be monitored after clearing within the APZ.

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

The proposal will result in the management of invasive species and therefore the availability of habitat for *D. biflora* is likely to increase.

- *introduce disease that may cause the species to decline; or*

Activities associated with the proposal will be managed to reduce the risk that *Phytophthora cinnamomi* could be introduced or spread at the site.

- *interfere substantially with the recovery of the species.*

The proposal will not interfere substantially with the recovery of the species, as assessed against the objectives of the *D. biflora* Recovery Plan (DEC 2004a) (see *Annex D*).

Notes: 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

• for activities such as foraging, breeding, roosting, or dispersal;

• for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

• to maintain genetic diversity and long term evolutionary development; or

• for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

• key source populations either for breeding or dispersal;

• populations that are necessary for maintaining genetic diversity; and/or

• populations that are near the limit of the species range.

Annex D

Assessment of Concept Plan / SSS Amendment Against Relevant Documents

Table D.1 Concept Plan / SSS Amendment assessed against Darwinia biflora Recovery Plan (DEC 2004a)

***Darwinia biflora* Recovery Plan(DEC 2004a)**			**UTS Kuring-gai Project-Specific Controls**	
Environmental Consideration	**Objective**	**Criteria**	**Action**	
Reservation /protection status	To ensure that a representative sample of *D. biflora* populations occurring on public and private lands are protected from habitat loss and managed for conservation.	The number of sites that are afforded legislative protection is increased from 90 sites to 110* sites (47 %) by 2009.	DECC to identify sites that are a high priority to protect.	*D. biflora* and its habitat will be protected *in situ* within the existing development footprint, and within the APZ. Translocation of soil seed bank from areas that will be removed for development into identified areas, with high intensity fire to germinate will also be undertaken. Monitoring to detect success of germination should be undertaken after 24 months, when seedlings are likely to emerge.
			DECC carry out negotiations with public authorities to protect sites.	N/A
			DECC to liaise with private landholders to protect sites.	Protection of the plants within the APZ will occur through fencing (around clumps). Ongoing management will occur through implementation o f a management plan.

Darwinia biflora Recovery Plan(DEC 2004a)			UTS Kuring-gai Project-Specific Controls	
Environmental Consideration	**Objective**	**Criteria**	**Action**	
Threat and Habitat Management	To reduce the impacts of threats at sites and to ensure that any planning and management decisions that are made that may affect the species, are based on information within this recovery plan.	Threat and habitat management programs have been prepared and are being implemented at 117 sites* (49%) by 2009. The level of protection for *D. biflora* populations is increased through informed conservation planning and land use decisions.	Threat and habitat management programs will be implemented by public authorities on public lands	A Threatened Species Management Plan, Weed Management Plan and translocation plan will be devised as part of the development. These plans will incorporate expert opinion to ensure the adequacy of proposed management measures. Currently habitat of rare species is unmanaged and threats to the species at the site are ongoing.
			Easement maintenance activities will not affect the long term survival of populations of *D. biflora*	N/A
			Informed environmental assessment and planning decisions will be made	The proposal footprint has incorporated existing *D. biflora* plants and the environmental assessments undertaken have been comprehensive.

Darwinia biflora Recovery Plan(DEC 2004a)			UTS Kuring-gai Project-Specific Controls	
Environmental Consideration	**Objective**	**Criteria**	**Action**	
Research	To increase knowledge of the biology, ecology and distribution of the species to assist management decisions.	A greater understanding of biology and ecology is achieved through the commencement of a research program and this information is used in management of the species.	Investigate aspects of the ecology of the species	A monitoring program to ensure ongoing viability and gain information on the reproduction of the species will be devised as par to the development. This will include monitoring the health of in situ plants, and the success of the translocated soil seed bank.
			Identify and survey potential habitat	Prior to any vegetation removal the site will be surveyed and all plants identified will be marked in the field.
Community education, awareness and involvement	To raise awareness about the conservation status of the species and involve the community in the recovery program.	Stakeholders are informed about the species and involvement of stakeholders in conservation programs is increased.	Encourage community involvement	Future residents will be provided with material to ensure they are aware of the environmental sensitivity of adjacent environments, with particular attention given to the presence of threatened species and their habitats.
			Provide advice and assistance to private landholders	As above.

Darwinia biflora Recovery Plan(DEC 2004a)			UTS Kuring-gai Project-Specific Controls	
Environmental Consideration	**Objective**	**Criteria**	**Action**	
Re-assess conservation status	To re-assess the conservation status of the species.	Assessment of the conservation status is undertaken, based on accurate information about the distribution of the species, its management and threats to its survival.	DEC to be advised of any consents or approvals that affect *D. biflora*	DECC will be advised of any future potential for impacts to *D. biflora*.
			Re-assess conservation status of species	Information gained during the monitoring of *D. biflora* at the site will be provided to the DECC Threatened Species Officer.

Table D.2 Concept Plan / SSS Amendment assessed against SEPP 19 - Bushland in Urban Areas Objectives

SEPP 19 - Bushland in Urban Areas Objectives	UTS Kuring-gai Project-Specific Controls
To protect the remnants of plant communities which were once characteristic of land now within an urban area	The proposal will result in the removal of a total area of approximately 2.8 ha of vegetation. A small area of the site will be managed as APZ. However this will result only in the removal of some large shrubs and the removal of leaf litter. Trees will remain within the APZ. The remaining area of bushland within the site will be conserved and managed for environmental protection.
To retain bushland in parcels of a size and configuration which will enable the existing plant and animal communities to survive in the long term	Bushland on the site will remain adjacent to the LCNP, with buffers between the APZ of the site and the park for most of the site boundary. Therefore retained bushland is of a viable size.
To protect rare and endangered flora and fauna species,	*Darwinia biflora* will be protected and monitored within the APZ. Breeding and foraging habitat for the Red-crowned Toadlet will also be protected and conserved within the site. There will be no removal of other significant features such as hollow-bearing trees or rock from the site.
To protect habitats for native flora and fauna	As above.
To protect wildlife corridors and vegetation links with other nearby bushland	The removal of the bushland from the site will not impact on the connectivity of bushland within the region. This is evident from aerial photographs of the locality and the greater region.
T protect bushland as a natural stabiliser of the soil surface	The area in which the APZ will be managed has a sparse ground cover, with sandy soil and rocky outcrops and platforms. All trees, small shrubs and some clumps of larger shrubs will be retained within the APZ. No other areas of the site will result in potential for destabilisation of the soil surface.
To protect bushland for its scenic values, and to retain the unique visual identity of the landscape	The scenic values of the site should not alter significantly, as all trees can be retained within the APZ.
To protect significant geological features	There are no significant geological features that will be impacted by the proposal.
To protect existing landforms, such as natural drainage lines, watercourses and foreshores	Natural drainage lines within the site will be protected and enhanced through weed management.
To protect archaeological relics	N/A to this assessment.
To protect the recreational potential of bushland	The proposal will not impact on this aim.
To protect the educational potential of bushland	The proposal will not impact on this aim.
To maintain bushland in locations which are readily accessible to the community	The proposal will not impact on this aim. The majority of existing bushland will be retained within the site.
To promote the management of bushland in a manner which protects and enhances the quality of the bushland and facilitates public enjoyment of the bushland compatible with its conservation	The bushland on site is currently unmanaged. The proposal will result in the management of retained bushland for the conservation of threatened and native flora and fauna.

Table D.3 Concept Plan / SSS Amendment assessed against Guidelines for development Adjoining Department of Environment and Conservation Land

Guidelines for development Adjoining Department of Environment and Conservation Land		UTS Kuring-gai Project-Specific Controls
Environmental Consideration	**Objective**	
Erosion and Sediment Control	No detrimental change in hydrological regimes, minimisation of erosion and prevention of sediment movement into DEC land during the construction and Post construction phases of development.	WSUD to be incorporated in the proposal. See section 6.4 for further discussion.
Stormwater Runoff	Minimise nutrient levels and flow regimes/patterns to mimic natural levels prior to reaching DEC land.	Controls will be put in place to manage runoff. See WSUD report.
Management Implications, Pets, weeds, Edge Effects	The development does not lead to increase in weeds or access by domestic pets.	Management plans to manage these potential impacts will be devised as part of the proposal.
	Facilitate informal tracks, negative impacts on cultural or natural heritage values or other impacts of higher visitation	A walking track to assist in informal tracks creation will also be put in place around the development. Residents will be provided with information regarding the sensitivity of the surrounding environment to further prevent impacts.
	Compromise natural fire regimes	Wildfire has the potential to impact on habitat for all of the threatened species discussed in this report. Therefore the management of the APZ will improve the fire management of the site for these species.
	Result in encroachments or inappropriate fencing	No fencing will be placed within bushland or close to the boundary of the LCNP.
	Impede DEC access for management purposes	No access will be impeded by the proposal. Improved access for management of the park may be provided in the west of the site through the fire trail link, alongside residences and the boundary of the UTS site.
Fire and Location of APZ	All asset protection mechanisms are within the development area and there is no expectation for DECC to change its fore management regime for the land it manages.	The APZ will be located away from the boundary of the site with LCNP. Therefore the proposal will not result in any necessary changes in management regimes for DECC.
Boundary Encroachments	No pre-construction or post construction activity is to occur on DEC managed land	No activities will be undertaken within DECC Land and the APZ will be located away from the boundary of the LCNP.

Guidelines for development Adjoining Department of Environment and Conservation Land		UTS Kuring-gai Project-Specific Controls
Environmental Consideration	**Objective**	
Threats to Ecological Connectivity	Maintenance and where possible enhancement of vegetation and other flora and fauna habitats that provide a linkage, buffer, home range and / or refuge role on land that is adjacent to park	For the majority of the site a buffer will be maintained between the APZ of the site and the boundary with the LCNP. This area will be managed to protect and manage the habitats within it. Enhancement of these habitats will be through weed management. The removal of a small area of bushland in the southwest of the site will not impact on connectivity of vegetation within the LCNP.

Table D.4 Concept Plan / SSS Amendment assessed against Ku-ring-gai Council Biodiversity Strategy (2006)

Ku-ring-gai Council Biodiversity Strategy (2006) Objectives	UTS Kuring-gai Project-Specific Controls
Prevent loss of local native biodiversity on public and private lands by eliminating or ameliorating threatening processes	Impacts to local native species have been considered throughout the planning of this proposal. Mitigation, management and amelioration of impacts to biodiversity have been provided within Chapter 6 of this report.
Protect, enhance and where appropriate increase local biodiversity on public and private lands	The proposal will result in the removal of some native bushland. However, areas that will be retained within the site are currently unmanaged and will benefit from the management of weeds and runoff. This is likely to lead to an increase in the biodiversity of these areas.
Protect and enhance aquatic and terrestrial ecosystems and habitats and connectivity between reserves	Connectivity will not be compromised due to this proposal. A Threatened Species Management Plan and Weed Management Plan will ensure that aquatic and terrestrial ecosystems present on the site will be protected and enhanced where they are currently degraded, such as alongside the drainage lines of the site.
Increase awareness of biodiversity and its values within our community and Council	Future residents will be provided with material which will inform them of the sensitivity of the adjacent environments.
Encourage and maintain active and effective community, government and other stakeholder partnerships with Council to better manage biodiversity	As above.
Extend and seek further opportunities and partnerships with other statutory authorities and non-government organisations to help maintain or enhance regional biodiversity	The conservation of threatened species and their habitats within the site provides the potential for government bodies and NGO involvement in research and monitoring of these species within the site.

Table D.5 Assessment of Concept Plan / SSS Amendment against Ku-ring-gai Riparian Policy (2004)

Ku-ring-gai Riparian Policy (2004) Objectives	UTS Kuring-gai Project-Specific Controls
Conservation, enhancement, and protection of existing riparian corridors, giving priority to those that are most intact, and those that pass through endangered ecological communities or threatened species populations.	Riparian corridors will be protected within the APZ. There will be no removal of trees from the riparian areas. Weeds that are currently invading the riparian zones will be removed and managed through a Weed Management Plan devised for the site.
Rehabilitation and restoration of degraded, fragmented and highly modified riparian corridors that provide some of the functions of an intact system	Rehabilitation will occur through the removal of weed species and where necessary the revegetation with appropriate endemic species.
Restoration of the bio-link value of riparian corridors by creating greater lateral and longitudinal connections between isolated or narrow riparian zones.	The proposal will not interfere with the lateral or longitudinal bio-link value of riparian corridors either within the site or the LCNP. All corridors will be protected and maintained.
Conservation and enhancement of local biodiversity and habitat quality.	The riparian corridors on site will be protected through installation of sediment and erosion controls, with an overall improvement in habitat quality through the management of weeds that are currently present along the riparian corridors.
Prevention of further piping and channeling of watercourses and where possible reinstate existing piped or channelised watercourses to their natural form.	No additional piping or channeling will result from the proposal.

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